SARTRE 4

European road users' risk perception and mobility

The SARTRE 4 survey

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Warning: The SARTRE 4 project has received funding from the European Union Commission, and from participating countries.

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Acknowledgement

The authors would like to thank Jean-Pierre Cauzard, the SARTRE “soul”, who retired in 2010, after coordinating SARTRE 2, 3 and setting on the right tracks SARTRE 4 - in particular in defining the objectives of this survey and building the questionnaire.

Table of Contents

General introduction 9

Car driver 25

Description of Car Drivers Group 27

Car Drivers' General Attitudes, Beliefs and Reported Behaviors 45

Car drivers' perceptions of speeding and speed enforcement 63

Alcohol, drugs and other factors affecting fitness to drive 87

Car Drivers Intelligent Transportation Systems 113

Summary and recommendations for Car Drivers 135

Powered Two Wheelers 139

Introduction 141

Speeding experience and attitudes 147

Driving a powered two wheeler while impaired 161

Driving style, risk perception and motives for driving a powered two wheeler 179

Use of safety equipment 193

Injury accidents 213

Motorcyclists' Profiles 227

Summary and recommendations for Powered Two Wheelers 241

Other road users 247

Introduction of Other Road Users section 249

Other Road Users motivations and travelling style 253

Pedestrians 269

Cycling other road users 295

Summary and recommendation for other Road Users 317

Road users comparison 319

Comparison section introduction 321

Attitudes 327

Environmentally-friendly travel behaviour 343

Driving under influence 357

Summary and recommendations from road users' comparison 391

General conclusion 393

References 399

Appendices 411

1 - Questionnaire 413

2 - Important changes since SARTRE 3 447

3 - Contextual data 467

General introduction

General Introduction

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The SARTRE project

The SARTRE (Social Attitudes to Road Traffic Risk in Europe) project started in 1991. It consists of a European wide survey about knowledge of road traffic laws and road traffic risks, attitudes regarding road safety issues, reported road traffic behaviours, transport habits and needs in several European countries. Various topics related to road safety are in the focus of the project such as alcohol, drugs, or phone use while driving, speeding, use of advanced driver assistance systems and the transport infrastructure and environment.

The project's goal is to compare the participating countries in order to recommend road safety measures at the national or European level. Indeed, as Jean-Pierre Cauzard wrote in 2004, "*the various countries, beyond common aspects, obtain apparently different success in their policies to reduce road traffic risk. This is a reason to develop a comparative study to learn best practices from each other*". This is still perfectly true eight years later with, again, many differences in the road safety progress of different countries.

Of course the question of how to improve road safety, year after year, requires considering carefully the human factors that guide behaviours such as motivations, risk perception or culture. In fact, technological developments of cars and infrastructures, including road signs and pavement markings, have already reached a very high level. Moreover, some new developments are forecasted to be developed or even generalized: alcohol interlocks (that prevents drink driving), Intelligent Speed Assistance (that prevents speeding), and even autonomous cars (that prevent driving!). Despite the considerable efforts of car engineers, and the crucial role of traffic laws to increase road safety with licensing and enforcement conditions, there will always be someone in the car that will have to make some decisions and inappropriate behaviours are often considered as contributing for a large part to accidents (Elgarov, 1995). That is why, with enforcement and road engineering, we need to search for behavioural improvements and how to achieve them. And that is the purpose of the SARTRE project.

After the first edition of SARTRE, a follow-up has been performed in 1996 (SARTRE2) and 2002 (SARTRE 3) among an increasing number of countries (15 in 1991, 19 in 1996 and 23 in 2002), see

Figure 1. This follow-up allowed researchers to study evolutions of knowledge of road traffic laws and road traffic risks, attitudes regarding road safety issues, reported road traffic behaviours, transport habits among Europeans and to examine efficacy of road safety measures on these dimensions.

The first three editions of the SARTRE survey used the similar questionnaire and were directed to car drivers. For this fourth edition of the survey, the target groups extended to drivers of "powered two wheelers", pedestrians, cyclists and public transport users.

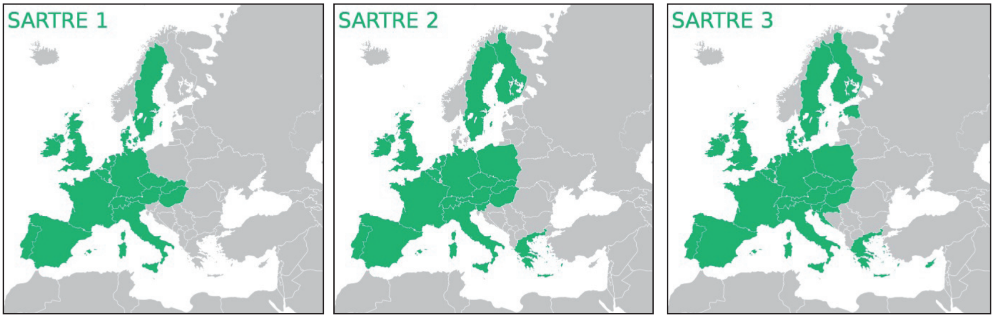

Figure 1: Evolution of participating countries.

This evolution of SARTRE is linked to modifications within European mobility.

First, the use of powered two wheelers increased in several countries (the number of vehicles in circulation – the "circulating park" - in Europe increased by 17% between 2003 and 2010[1]), most often in urban areas with dense traffic. Meanwhile, and fortunately, the number of people killed in car crashes decreased significantly over ten years in all European countries (41% mean decrease among SARTRE 4 countries); whereas the number of motorcyclists killed increased by 22%[2]. Consequently, the proportion of motorcyclists among road deaths increased dramatically in some countries. This situation clearly showed that despite the overall good results, road users do not benefit equally from road safety improvements and the necessity to address more efficiently the question of motorcyclists' safety on the road.

Second, over the past ten years, a great push towards the use of "soft" transportation modes has been observed in several European countries. This increase of soft modes use may be linked to several causes including oil price increases, the fact that environment preservation has been raised as a major challenge for the transportation sector and more recently, the financial crisis, but also the increase of health problems such as obesity or cardiovascular diseases. Whatever, we have to ensure that this increase in soft modes use does not increase the number and severity of accidents because soft modes users such as pedestrians and cyclists are vulnerable road users.

This innovation in the project's history led us to modify the questionnaire that was used in previous editions. Indeed, we had to create new questions dedicated to the new sub-groups of road users and to eliminate some questions from the previous questionnaire in order to maintain a reasonable completion time.

Data collection for this fourth edition started in 2010. The SARTRE 4 survey includes 19 countries (see Figure 2). Compared to SARTRE 3, six countries are missing (Croatia, Denmark, Portugal, Slovakia, Switzerland, and United Kingdom) but two non-European countries joined the project (Israel and Serbia).

1 - Source ACEM (2010).

2 - In fact, some countries recorded some progress between 2000 and 2008 for motorcyclist fatalities too (Germany, -30%; Netherlands, -25%; Austria, -19%; France, -15%), but some other countries registered dramatic increases (Finland, +260%; Hungary, +75%; Poland, +47%; Italy, +41%; Sweden, +31%; Spain, +26%).

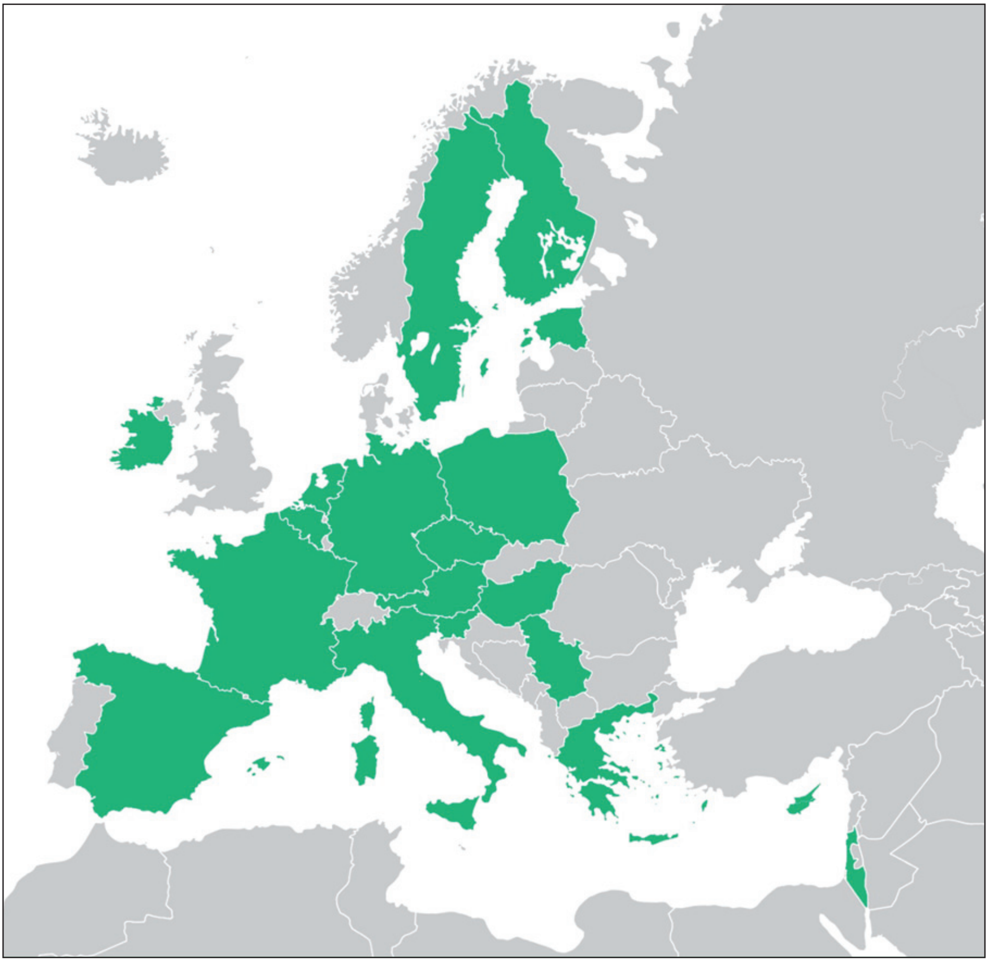

Figure 2: Countries participating to SARTRE 4 survey.

Survey method

In contrast to former SARTRE-editions, SARTRE 4 focused on three target groups: car drivers (CD), powered two wheelers (PTW), and other road users (ORU). The objective of the survey was to describe actual opinions and (self-reported) behaviours towards traffic risk and road safety of these three road user groups in countries covered by the project. Each partner carried out the survey in its own country. After completion and data checking, the results were sent to the coordinating partner, IFSTTAR, and merged into a single data file.

In the following, the methodological specifications for the SARTRE 4 survey are described (see Table 1), which were also the bases for the polling agencies' work. Each partner and polling agency had to comply with these specifications to guarantee a uniform methodological survey procedure. Exceptions or possibilities for individual modifications are explicitly mentioned.

Definition of target groups to be surveyed

Each interviewee was to be surveyed only in one single role, i.e. as car driver, or as powered two wheeler user or as another road user. Different inclusion criteria had to be considered for each role.

a) Inclusion criteria for car drivers (CD): Licence holder ("Do you have a (full) car driving licence or permit?") and driven during last twelve months ("Have you driven a car in the last twelve months?"). The interviewee was eligible for the CD group if the answer was "yes" to both questions.

b) Inclusion criteria for powered two wheelers (PTW): License holder of PTW > 50 cc ("Do you have a driving license or permit that allows you to ride a PTW > 50 cc?") and driven a PTW > 50 cc during the last twelve months ("Have you ridden a PTW > 50 cc in the last 12 months?"). The interviewee was eligible for PTW group if the answer was "yes" to both questions.

c) Inclusion criterion for other road users (ORU): Defined by predominantly non-motorised means of transport ("What was your most frequent mode of transport during the last twelve months? (a) driving a car, (b) riding a PTW > 50cc, (c) none of the above"). The interviewee was eligible for ORU group if the answer was "(c)".

Sampling

Concerning sampling the following aspects had to be considered: sample size, representativeness, sampling method, survey method and survey period:

a) *Sample size*: The targeted total number of interviewees was 1.000 for each country, divided into the following subsamples: 600 car drivers, 200 powered two wheelers and 200 other road users. The proportions of PTW and ORU were intentionally oversampled in order to reach a sample size adequate for reliable statistical analysis within each country's subgroup. Indeed, in most countries, the actual proportion of PTW and/or ORU among road users is far below 20% and we would not have had enough participants for these groups if we had followed a rule of representativeness for the full country sample. The consequence of this choice is that the 1.000 interviewees for a given country are NOT representative of all road users in that country. However, as explained below, each subsample is representative of the corresponding subgroup.

b) *Representativeness*: The target population was the general adult population of each country, i.e. persons ≥ national car licensing age (which is 17 or 18 years). Persons below full licensing age were not to be included. Sampling variables were: sex (male, female), age and occupation (non-active, independent and salaried). The proportions of the above mentioned sampling variables were to be representative for their distribution in the population for each of the three subsamples (CD, PTW, ORU). The sampling variables proportions for each subsample were known or could be estimated by the polling agency. Although each interviewee was only surveyed in one role, subgroups were not to be artificially distinct to keep comparability with SARTRE 3. This meant, for example, in the CD sample there had to be a certain proportion of interviewees who also ride a PTW (as could be assumed also for SARTRE 3).

c) *Sampling method*: The sampling method had to be chosen according to the partner's best practice (e.g. quota or random route). If quota method was chosen the following sampling variables had to be considered: sex, age (>= national car licensing age) and occupation (non-active, independent and salaried). National samples had to be geographically stratified according to at least NUTS1 regions (i.e. ZEAT, Bundesländer). If individual partners preferred applying a stricter NUTS (Nomenclature of territorial units for statistics) criterion they were free to do so. Agglomeration sizes were to be included to respect a balance between rural and urban areas. Independent of the chosen sampling method, a weight to correct the samples was not allowed.

d) *Survey form*: The surveys were carried out by face-to-face interviews (exception, the Netherlands performed an on-line survey among car drivers, motorcyclists and other road users as well as face-to-face interviewing car drivers, this allows us to test the modality effect of data collection, see Box 1). The answer modalities were presented via show cards; the use of laptops was allowed. The show cards had been developed for the face-to-face questionnaire and had to be used by each partner.

e) *Survey period*: 15th September 2010 – 30th November 2010.

Methodological requirements for the countries' questionnaires

The content had to respect, as far as possible, the English reference version after translation in the respective languages. The translation itself had to be verified by back translation. A test of each language and national version had to be carried out with about ten cases. This could be done either by the polling agency or by the partner itself. It was recommended that various country versions in the same languages should be coordinated (English, French, German, etc.).

Additional screening information from polling agency

In order to assess the quality of each country's sample and the work of the respective poll agencies it was advised to request the following additional screening information: (1) Response rate (willingness to cooperate) for all three subgroups (CD, PTW, ORU), (2) eligibility rate for all three subgroups, (3) whatever sampling variable category information (e.g. sex, age, etc.) was available for refusals and (4) whatever sampling variable category information (e.g. sex, age, etc.) was available for screened out cases.

Sample

Table 1: Data collection details by country.

Country	Poll agency	Sampling method	Sample size	Field dates
Austria	Triconsult	Face-to-Face / in-home; quota sampling (quotas for the respective groups – car drivers, powered two wheelers, other road users - were based on a representative omnibus survey which was performed in June/ July 2010); stratification by NUTS regions and urban/ rural areas; quota: sex, age and occupation.	CD:600 PTW: 200 ORU: 200	September / November 2010
Belgium	Information & Data	An omnibus survey has been conducted in order to determine sample characteristics and quotas for each subgroup.	CD: 600 PTW: 200 ORU: 200	September / October 2010
Cyprus	Cyprus Energy Agency	Age, sex and geographical distribution according to NUTS-region. Random sampling method.	CD: 635 PTW: 204 ORU: 217	November / December 2010
Czech Republic	Factum Invenio	Quota method by region, gender and age.	CD: 600 PTW: 202 ORU: 200	September / October 2010
Estonia	Klaster	Quota method by region, gender and age.	CD: 596 PTW: 346 ORU: 137	November / December 2010
Finland	Taloustutkimus	The sampling method used was random sampling combined with starting point method, where the interviewers made five interviews starting from the given address. Each interviewer had personal quotas to make sure that the shares of genders, age groups, occupation groups and regional areas would be balanced in the sample.	CD: 615 PTW: 211 ORU: 206	November 2010
France	GFK-ISL	An omnibus survey has been conducted in order to determine sample characteristics and quotas for each subgroup.	CD: 601 PTW: 209 ORU: 205	October / December 2010
Germany	TNS Infratest GmbH	The quota method was chosen for sampling. Participants were recruited by direct contact.	CD: 611 PTW: 204 ORU: 222	October / November 2010
Greece	Global Link International Marketing Research Ltd.	A national representative sample was obtained on the basis of gender, age, education, and urbanisation level.	CD: 601 PTW: 202 ORU: 200	February 2011
Hungary	TÁRKI Social Research Institute	A multi-stage, proportionally stratified random sampling procedure was used. In the first stage stratification was made by region and locality types, then within each stratum on the basis of the motor vehicle and motorcycle fleets data of the Hungarian Central Statistic Office (KSH) TSTAR. During the survey, “walking” random selection procedure was used in order to select a household; then “Kish-key” helped to choose the person to whom the interviewer addressed the random-questionnaire. Where the questionnaires were completed in the required number in subsamples 1 and 3, due to low number of motorcyclists the interviewer was allowed to use further a method similar to that of the ’snowball’ sampling method and ask who used to ride in the neighbourhood concerned by questioning and thus to choose the person supposed to respond.	CD: 606 PTW: 204 ORU: 206	December 2010
Ireland	Amárach Research	Face-to-face interview of a thousand 17 years of age and over road users taking account of the proportions in the population of different types of users by age or sex, reflecting in proportion the different levels of income, education, driving experience and so on in Ireland.	CD: 600 PTW: 200 ORU: 200	October / November 2010

Israel	Midgam Consulting & Research LTD	855 interviews were done by door to door. Additional MC drivers, to complete the required sample, were interviewed Face to Face on streets and by roadsides according to a sampling plan of locations with high presence of PTWs. Location, gender and age quotas were controlled. The sampling was done separately for Arabic, Hebrew and Russian Speakers. According to known quotas published by the CBS the sample included two controls: Geographical Area (6) Size of MC (in cc.)	CD: 613 PTW: 202 ORU: 224	November 2010 / January 2011
Italy	SIPSiVi network of traffic psychologists	The sampling method used was by quota: age, gender, city dimension and transportation mode mainly used (Car Drivers, Motorized two wheelers and Other Road Users). The participants' recruitment had been carried out by phone calls and by personal contacts.	CD: 603 PTW: 194 ORU: 203	October / December 2010
Nether-land	Dutch Bureau Motivaction	The Netherlands used on-line interviewing as well as face-to-face interviewing (376 car drivers). For the on-line sampling, each of the subsamples: car drivers, motorcyclists and other road users were retrieved from the on-line research panel StemPunt.nu, owned by Motivaction. The technique of propensity sampling was used. This is an advanced method for obtaining a more valid sample from an internet panel. The major advantage of the propensity method over the quota sampling method is that more—and different—variables may be incorporated into the sample selection than simply socio-demographic variables. The propensity sampling method also corrects for the characteristics of non-internet users, and for social and/or cultural characteristics.	Face-to-face: CD: 376 Online: CD: 381 PTW: 208 ORU: 210	October / December 2010
Poland	SMG/KRC Poland Human Resources	An omnibus survey has been conducted in order to determine sample characteristics and quotas for each subgroup.	CD: 730 PTW: 545 ORU:540	October / November 2010
Serbia	Students from the police academy	Quota method by gender and age.	CD: 519 PTW: 152 ORU: 158	December 2010 / March 2011
Slovenia	Interstat	The method used was a two-level sampling. On the first level 175 Primary Sampling Units (PSU) were chosen based on the Cluster of Enumeration Areas (CEA) or sampling points at the disposal of the Statistical Office of the Republic of Slovenia. PSUs were randomly chosen with the probability in proportion to the CEA size with regard to the definition of the target population and prior stratified according to region and settlement type. On the second level 10 persons per PSU were chosen through simple random sampling (175 PSU x 10 persons= 1,750 persons). Since a certain quota of motorcyclists had to be included, all available owners of motorcycles (based on the Motorcycle Owners' Register) in the 175 PSU were included.	CD: 610 PTW: 205 ORU: 201	November / December 2010
Spain	IKERFEL	Multistage random sampling: region, town size and random routes to choose homes and individuals (age, sex and road user type). The recruitment at home was made choosing first the possible motorcycle rider, as they are more difficult to find. To complete quotas in this group, it was necessary to go to places where they meet together and to arrange the posterior interview.	CD: 1421 PTW: 396 ORU:353	January / February 2011
Sweden	Imri AB	The sample was geographically stratified by NUTS1 regions. The selection was representative with regard to gender, age and occupation.	CD: 589 PTW: 199 ORU: 208	November / December 2010

All data files have been scrupulously cleaned with all doubtful or erroneous answers either checked and corrected (by confirmation phone call to the respondent) or deleted.

In particular, the Serbian sample was especially problematic because it revealed a high number of duplicates (n= 236). Consequently, the duplicates were deleted from the data file and the final Serbian sample thus totals only 829 participants[3].

The final total sample is 21280 for the 19 countries, including 12507 car drivers, 4483 powered two wheelers, and 4290 other road users.

Box 1: The Dutch sample: online and face-to-face comparison.

The Netherlands did not have the means to conduct all interviews face-to-face. In order to reach the same amount of participants in the Dutch sample, the choice was made to collect part of the data with an online panel. This practical decision offers the opportunity for comparing outcomes of these two methods which may provide lessons for continuing interview work in future years in countries where the penetration rate of microcomputers and Internet access in households will be not too low.

There are two possible differences between online and face-to-face methods. First a population effect can occur. Population effects are response differences at the sample level resulting from population biases of different modes. Because different groups of people have different access to a computer or internet-enabled device, some people are excluded from the internet survey.

Second there may be a modality effect. Modality effects are response differences at the individual level related to the mode of data collection. That is, because of the different mode, people answer the questions differently. For instance, with face-to-face interviews, the interviewer can give some additional explanation. Another modality effect is the risk of social desirable answers, which is considered to be higher when the data collection is more personal in character (Frey, 1989). For example, it is more likely respondents would underestimate their alcohol drinking behaviour in a face to face interview than online when there is no interviewer presents (Midanik, 1988).

This section will analyse the possibility that population effects and/or modality effects affected the Dutch sample.

METHOD

- **Participants**

The Dutch partners aimed for slightly more participants in the group of car drivers (n= 750) compared to most other countries (n= 600). Half of the car drivers were obtained from an on-line panel, and half were interviewed face-to-face. The Netherlands used on-line interviewing as well as face-to-face interviewing (376 car drivers).

After data cleaning 799 respondents remained in the online-dataset, of which 381 were categorised as car drivers, 208 were categorised as motorcyclists, and 210 categorised as other road users. The face-to-face sample of car drivers consists of 376 respondents, of which 26 records had missing values for age and gender.

- **On-line sampling**

For the on-line sampling, each of the sub samples: car drivers, motorcyclists and other road users were retrieved from the on-line research panel that contains approximately 80.000 Dutch respondents, who are willing to participate in occasional on-line research.

The technique of propensity sampling was used for obtaining a more valid sample from an internet panel (Joffe & Rosenbaum, 1999). The major advantage of this technique is that more—and different—variables may be incorporated into the sample drawing than simply socio-demographic variables. It corrects also for characteristics of non-internet users, and for social and/or cultural characteristics.

3 - As a non-EU country, Serbia received no funding for the research and the data collection was done by students.

- **Face-to-face interviews**

A random sample of postal codes was drawn. The postal codes were a good representation by Region and the degree of urbanization of The Netherlands. Within the sample a total of 38 locations were selected.

Interviewers visited the 38 locations and did a total of 350 interviews. They started to bring in interview respondents in the pre-selected street at every location. After completing an interview they skipped seven houses and started the procedure to bring in respondents again. When interviewers reached an intersection they turned right.

RESULTS

The differences between the face-to-face and online sample were analysed with Chi-square analysis at the 99% confidence level. This higher level of confidence was chosen because of the relatively large sample sizes.

This section describes the differences between the face-to-face and online sample of car drivers. In the first part the population effects are presented (e.g. do the samples differ on gender and age, etc.). The second part deals with modality effects (i.e. do the samples differ in their attitudes on several traffic safety issues?).

- **Population effects**

There is not much difference between the response of the online car drivers and car drivers that were interviewed face-to-face. Chi-square analysis indicated that only the difference between these groups with respect to education is significant ($\chi 2_{(2,N=754)} = 9.63$; $p < .01$).

In addition a significant difference was found between the face-to-face and online sample in type of occupation. A significant difference was found for the separate occupations ($\chi 2_{(10,N=757)} = 68.46$; $p < .001$) as well as the categorisation (Self-employed, employed and unemployed) used to compare with the population occupation information ($\chi 2_{(2,N=757)} = 29.85$; $p < .001$). There was an overrepresentation in both samples for self-employed car drivers compared to the population mean. The face-to-face sample was especially overrepresented by car drivers owning a business or a shop. This overrepresentation is probably due to the time of day the interviewers conducted their interviews, and the higher chance of finding people at home to participate in the interviews.

- **Modality effects**

This section presents some results on the difference in attitudes of the face-to-face and on-line samples. The only variables presented are those for which there was a significant difference between samples.

Probably one of the most interesting variables with respect to the social desirability bias was variable CD23 - regarding violating several traffic rules. Compared to the face-to-face sample, the online sample is more in favour of more cycle lanes and more sidewalks for pedestrians, more strongly agrees that penalties for not wearing a helmet on a motorcycle should be much more severe, reports more often that they ‘not always’ or ‘very often’ use child seatbelts or restraints.

CONCLUSION

Population differences between the face-to-face and the online sample are modest. There was no difference in age and gender. This is probably due to the fact that respondents were selected to participate in the study based on the population means. With respect to Modality effects, there are no clear differences in answering patterns between both samples. One of the most interesting variables, regarding violating several traffic rules, showed no difference between both samples. The question about using child seatbelts or restraints did show a difference that could be interpreted as a social desirability bias, as the online respondents more easily reported that they not always use seatbelts or restraints for their children. However, the few differences that were found in the questions regarding countermeasures and increasing severity of penalties were in a direction not consistent with socially desirable answers. With these questions the online respondents were more in favour of the countermeasures and increasing penalty severity.

To conclude, the differences that could indicate a population effect or a modality effect are moderate. We therefore conclude that it is legitimate to use the on-line data from the Netherlands in this SARTRE study.

Data analysis

The type of statistical test to be used for SARTRE 4 data has not been predetermined for all data and topics. Authors of a chapter were free to use any method they considered to be appropriate regarding their particular set of questions.

Most often, frequency tables or figures are given with the appropriate Chi-square test. For all statistical tests, when possible and appropriate, authors were requested to report effect sizes (R^2, Cohen's d or eta^2).

Considering the type of scales used, the recommended statistical approach is non parametric (Jamieson, 2004). However, a number of authors defended the possibility to use parametric statistics with Likert scales (Borgatta, 1968; Norman, 2010). We are aware that this debate is still open among statisticians and we chose to let the authors follow their habitual practices. As a consequence, both parametric and non parametric statistics are used in the present report.

Another issue regarding data, which always comes to questionnaire-based researches, is the issue of social desirability bias and to what extend declared behaviour corresponds to "real" behaviour. However, the correlations between self-reported measures and observed measures have often been found (Corbett, 2001). Moreover, self-reported measures are often used to assess unobservable behaviours such as "frequency of drink driving during the last month among 12.500 European car drivers".

Questionnaire

In the first three SARTRE surveys, the focus was on car drivers. Consequently the questions were mainly focused on opinions, attitudes and self-reported behaviour of the subjects as car drivers, who were interviewed about the main road safety issues. The questionnaires of these editions of SARTRE were similar, including sections that explored issues such as "changes over times", attitudes to "new technologies" and differences among countries concerning the habits of car drivers.

This fourth edition of the SARTRE survey moves the focus onto three different types of road users: car drivers, motorcyclists and "other road users" (i.e. pedestrians, cyclists and users of public transport). It was already challenging to create a questionnaire for a single group such as car drivers that could be used across a number of European countries, taking into consideration all the differences among them. However, it is even harder to produce a questionnaire that tries to exhaustively explore three different categories of road users across the participating countries. For example, it is necessary to acknowledge the distinctive qualities of a motorcyclist in a Northern European country compared to a Southern European country, or the perspective of a public transport user in a country with a high-quality public transport system compared to a country where the public transport is poor, or the point of view of a cyclist in a country with an established tradition of cycling versus a country where cycling is not seen as a usual mode of transport. One possible solution could have been to create a new questionnaire in order to satisfy the three road user category needs and characteristics. However, doing so would have lost the continuity with previous SARTRE questionnaires, frustrating comparisons of changes over time in European road users.

SARTRE 4 had the following aims and methods:

> *The project will address issues such as mobility experiences, perception of safety needs by different types of road users; opinions and experiences about speeding, impaired driving; attitudes towards motorcycle riders, pedestrians and other road users. It is based on a common representative survey to be conducted in each participating member state, and a shared analysis of the large database. The information will be*

> *useful for comparing the relative standing of member states on the issues examined. It will also aid assessing citizens' acceptance of EU (and national) road safety policies, the limitations or successes of existing road safety measures, or support for new measures and policies.*

To achieve these goals, the questionnaire was revised to include new sections, but minimal changes were made compared to previous versions to facilitate comparisons over time. It was decided to use one standard questionnaire with questions to filter respondents to the most appropriate set of questions, recognising that many people use multiple forms of transportation.

The questionnaire began with an introduction, "Good morning/afternoon [as appropriate]. Would you mind completing a short questionnaire with me? It should take no more than 20 minutes and it relates to road safety and driving habits." Then, respondents were asked their gender, their age and their occupation. Occupation was coded under three sub-headings (self-employed, employed, not employed) with a total of eleven categories.

Then the respondents were asked some filtering questions. To be eligible as a motorcyclist, it was necessary to have a driving licence for a motorcycle with an engine larger than 50 cc and to have driven such a vehicle in the previous 12 months. To be eligible as a car driver, it was necessary to have a full car licence and to have driven a car in the past 12 months. Next, respondents were asked what they considered to be their most frequent mode of transport in the past 12 months from driving a car, riding a motorcycle with an engine greater than 50 cc or none of the above. If the third of these was chosen, they were selected as being another road user. Interviewers were instructed that respondents could *only* be surveyed in a single role, i.e. a motorcyclist, car driver or other road user.

Next in a common section respondents were asked about: their usage of a variety of different travel modes over the previous 12 months; degree of concern for various social issues; questions relating to road safety; support for electronic safety devices; road safety improvements; support for penalties for various misdemeanours; perception of danger of various transport modes. After the common section, respondents were asked questions based on which of the three categories they had been allocated (i.e. car driver, motorcyclist or other road user). Questions focused on respondents' perceptions and their own experiences of various issues relating to road traffic safety.

Car drivers were asked: to estimate the kilometres driven in a car in previous 12 months; estimate of frequency of speed limit violation for different road types; perceived effect of 20 km/h zones; their own speeding behaviour, including any checks and penalties; use of appropriate restraints if carrying a child, attitudes to drink driving; their own drink driving behaviour; estimate of legal units of drink if driving and desired level; experience of alcohol checks; actions to combat fatigue while driving and frequency of such fatigue; accident experience in past three years; support for measures to improve the environment; safety features of their usual car; their driving style; perception of car accident causes; car engine size and experience of car driving; effect of medication, their usage and their experience of checks and penalties.

Motorcyclists were asked: the total distance they had driven in the previous 12 months by motorcycle and car; perception and experience of speeding – and penalties; own helmet use for different road types; typical use of safety equipment; attitudes to helmet wearing and whether they had been penalised for not wearing one; attitudes to drink driving; their own drink driving behaviour; estimate of legal units of drink if driving and desired level; experience of alcohol checks; experience of being fatigued while driving; accident experience in past three years; support for measures to improve the environment; their driving style; perceptions of the danger of different driving styles; reasons and purposes for choosing a motorcycle; perceived causes of accidents for motorcyclists; engine size of usual motorcycle; motorcycle type; experience of motorcycle use and typical annual usage; effect of medication, their usage and their experience of checks and penalties.

Other road users were asked: their reasons for walking/cycling/using public transport; kilometres per day using these modes (and as car passenger or by moped); their travelling style as a pedestrian; satisfaction with aspects of the pedestrian environment; their annoyance with car drivers, motorcyclists and cyclists. Cyclists (i.e. those who reported non-zero cycling) were asked about various behaviours while they were cycling; satisfaction with various aspects of the cycling environment; their annoyance with car drivers, motorcyclists and cyclists. Users of public transport were asked about their satisfaction with various aspects. All were asked about their attitudes to drinking and walking/cycling. Finally, they were asked their accident experience in past three years as different types of other road users.

Then, there was another common section where respondents were asked their marital status, whether they had children (and if so, how many), highest level of education and the type of area where they currently lived. Finally, respondents were asked for their contact details to facilitate monitoring of interviewers only.

The English version of the full questionnaire is available in appendix 1.

Despite all efforts to make survey questions equally relevant to all participating countries, it was inevitable that certain country-specific characteristics regarding transport, mobility, traffic legislation or enforcement, made some questions (or response options) appear irrelevant, somewhat peculiar or ambiguous in the local context. For example, the response option “I think that the legal BAC should be lower” in countries where the local legal BAC is already “0”; asking about frequency of being checked or given a ticket for use of drugs / medication in countries with no active enforcement in this area; or ORU reporting crash experience as a Moped driver, in a country where Mopeds are treated legally as motorcycles and the sample of ORU does not include Moped drivers.

The resolution of such issues in the local surveys was handled in a case-by-case manner, generally preferring the inclusion of problem items, unmodified, for the sake of easier international comparisons. However, the survey team in Israel, with a relatively larger number of items they judged to be irrelevant or incongruent response options, chose to remove them (a total of 28 out of 281 ‘variables’) from the questionnaire.

Contextual data

While the main objective of the SARTRE 4 survey is to analyse the opinions, attitudes and declared behaviour of European drivers, some additional data about the countries involved in the survey have also been gathered. The sets of data include details about: the area and population of the country, length of roads, vehicle fleet structure, the most important traffic regulations, selected performance indicators, effects of enforcement and penalties for some violations, finally about road accidents and their consequences. The data are collected by each partner and come mainly from national statistical offices and police. Other data include national legal systems, research results and opinions developed by experts. The work on contextual data began with an overview of data from the PIN project (ETSC), data from CARE and IRTAD databases, the Internet and “State of art” reports funded by the European

Union. All the data were verified and supplemented by partners. In addition, another dataset was created with qualitative information on preventive measures implemented in the last 6-8 years. This has enhanced the ability to interpret the survey results and provided an accurate description of national preventive policies. Contextual data are given in the appendices.

Report overview

This report is divided into four main parts. One section is dedicated to each of the three types of road users and the fourth section focuses on the comparison of those groups.

The first section, about car drivers, was coordinated by Ilona Buttler and is divided into four chapters about attitudes, speeding, driving while impaired and use of intelligent transport systems respectively. This first section holds a specific place in data analysis because it includes some follow-up comparisons with SARTRE 3 data.

The second section, coordinated by Hardy Holte, concerns users of powered two wheelers. It is the first time that so much effort is dedicated to the study of motorcyclists' attitudes and reported behaviours at the European level. That is why six chapters have been devoted to the presentation of results concerning powered two wheelers. The topics studied are: speeding, driving while impaired, risk perception and motives for driving a powered two wheelers, use of safety equipment, injury accidents and the elaboration of motorcyclists' profiles.

The third section, coordinated by Gian-Marco Sardi, is also new in the SARTRE history and presents results about other road users. The section includes three chapters about motivations, pedestrians and cyclists respectively.

The fourth section, coordinated by Julien Cestac, focuses on road users' comparisons regarding four topics: attitudes, environment, driving while impaired and speeding.

The report ends with a general conclusion, coordinated by Julien Cestac, Patricia Delhomme and Sonja Forward. This part highlights some main results obtained in this pan-European survey and gives recommendations for improving road safety and for promoting environmentally-friendly mobility.

Car driver

Chapter 1.1

Description of Car Drivers Group

Ilona Buttler (ITS, Poland)

Introduction

Published in 2010, the European Commission's new road safety policy orientation (EC, 2010b) aims to halve the number of road deaths in the European Union by 2020 and reduce injuries. Whether this ambitious goal can be achieved depends on the effective implementation of a number of preventive measures and a successful cooperation of EU, national and regional authorities. However, what is equally important is the contribution of ordinary road users. The same people use road traffic in different roles when they drive and ride (e.g. a car, motorcycle or bicycle), walk or use public transport. However, due to its high prevalence and therefore its high impact on traffic safety, driving has always been perceived as a special way to use traffic. This suggests that the focus of prevention should still remain on car drivers, their opinions, needs and declared behaviour. The success of the EU's new road safety programme will depend on how well we can address these issues.

In 2010 the population of the EU-27 was estimated at 501.1 million (Eurostat, 2011). When asked if they drove a car about 7 in 10 EU citizens (69%) responded positively (Gallup Organization, 2010). This suggests that today some 345 million people are driving a motor vehicle on the roads of the European Union. Individual country results showed considerable differences in the proportions of drivers and nondrivers: the survey shows that among countries participating in the SARTRE 4 survey the highest number of drivers is in Slovenia (82%), Finland (81%), Sweden and Cyprus (80%) with the lowest in Hungary (49%), Poland (53%) and Greece (54%).

The present chapter reports the principal results of SARTRE 4 regarding demographic variables (such as gender and age as well as variables that cover aspects of an individual's life situation and living conditions, occupation, personal situation, education, place of living), driving experience (type of vehicle, number of kilometres travelled per year) and involvement in road accidents and collisions among drivers. This group includes people who hold a driving license and have driven a car within the last 12 months.

Method

The data were analysed in three steps:

1. Description of the driver population studied under SARTRE 4. The focus here was on identifying the differences and similarities between the countries. This is why we used basic descriptive statistics.

2. Wherever possible, we checked the driver population for any changes in the variables over the last eight years. We used the results of SARTRE 3 (24007 drivers) and SARTRE 4 (12507 drivers). To assess the changes, we used tests identifying the significance of the differences for two independent samples which matched the scale of the variable (t of Student, χ^2 and

Mann-Whitney's U).

3. We also looked at the links between the variables and tried to find independent factors. For this part of the analysis we primarily used Pearson correlation then factor analysis.

The chapter presents selected results only. This is why they should be seen as a reflection of a trend rather than an accurate description of the scale of the problem.

Demographic characteristics of the driver population

Age

The age of a driver has an important effect on a number of road safety variables. It is often linked with the type of car, the number of kilometres travelled, driving style and involvement in car crashes (OECD, 2006; ETSC, 2011a). In SARTRE 4, the drivers were grouped into six age groups (See the age structure of the drivers in the countries, Figure 1).

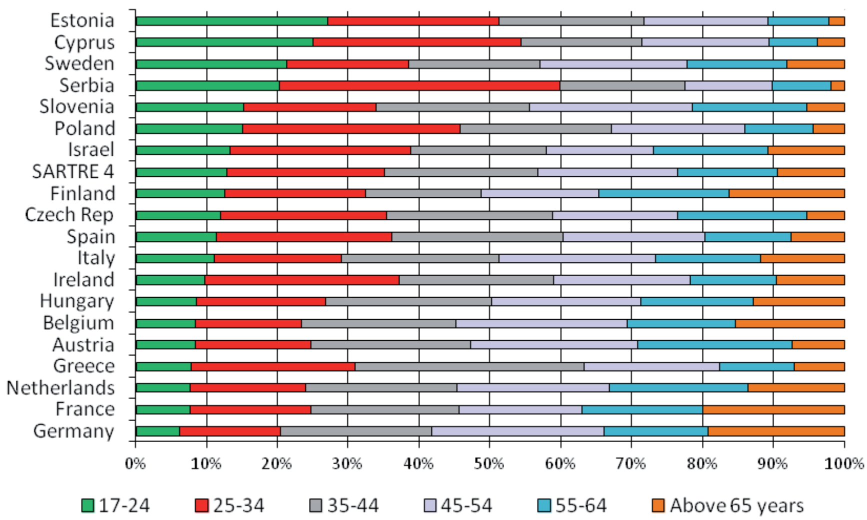

Figure 1: Age structure of the driver population in the countries surveyed (Source: SARTRE 4).

The age structure of the SARTRE 4 driver population was as follows:

- drivers aged 17-24	- 12.9 %
- drivers aged 25-34	- 22.2 %
- drivers aged 35-44	- 21.6 %
- drivers aged 45-55	- 19.7 %
- drivers aged 56-64	- 14.1 %
- drivers aged 65 and more	- 9.5 %

The average driver age for whole SARTRE 4 group is 4.79 (*M= 42*[4]), but there are differences between countries. The average driver age is the highest in France at 48.27 (*M= 47),* Germany at 48.12 (*M= 48*) and the Netherlands at 46.69 (*M= 46*). The average age is the lowest in Serbia at 34.97 (*M= 31*), Cyprus 35.71 (*M= 31*) and Poland at 38.56 (*M= 35*).

It is difficult to say now whether the results can be confirmed in reality. There is nothing to serve as a benchmark of reliability. A recent Eurobarometer road safety study (Gallup Organization, 2010) looked at the entire population and was only able to establish that 63% of 18-24 year-olds, 80% of 25-54 year-olds and 61% of over 54 year-olds answered that they drove a car.

When analysing road safety, experts tend to study two extreme age groups. It is commonly believed that the youngest and oldest drivers – each for different reasons - cause the highest risk in road traffic (OECD, 200 ; ETSC, 2011a; Loughran, 2007). The share of these drivers in overall population varies from country to country. The highest percentage of young drivers is in Estonia (27%), Cyprus (24%) and Sweden (1%) and the lowest in Germany (6%), France and the Netherlands (about 8%). The highest number of drivers aged 65 and more is found in France (20%), Germany (19%) and Finland (16%) and the lowest in Serbia (less than 2%), Estonia (2%) and Cyprus (about 4%).

The 2010 driver population is only slightly younger (by 4 months) from the SARTRE 3 population and the difference is statistically significant *(t= 2.24, p= 0.025. df= 35874*).

Table 1: Percentage of drivers from different age groups in the overall driver population (Source: SARTRE 3 and 4).

	Age class					
	17-24	25-34	35-44	45-54	55-64	65+
SARTRE 3	11.5%	21.8%	22.2%	19.2%	15.2%	10.2%
SARTRE 4	12.9%	22.2%	21.6%	19.7%	14.1%	9.5%

What was surprising was the share of elderly drivers in the driver population. In recent years the population of those aged 65 and more was estimated at 17.4% of the EU-27 population and Eurostat (2011) forecasts suggest that society will continue to age[5]. As we analysed the demographic changes in the driver population, we expected older drivers to be a growing group because older people now keep their licenses longer, drive more miles and make up a bigger proportion of the population than in past years. However, when we look at the last two age groups, we saw that in 2010 older drivers made up a smaller proportion of all drivers. In SARTRE 4 survey, 9.5% of drivers were aged 65 and more. The differences between the countries are greater than in the case of young drivers. The share of drivers aged 65 and more grew the fastest in Italy (+6.2%), Germany (+5.8%), France (+5%) and the Netherlands (+3.5%) but fell in Ireland (-5.5%), Sweden (-3.8%) and Poland (-2.4%). More in-depth studies are needed to establish why a higher number of elderly people does not translate into a higher share of the driver population. It may be that these people stopped driving because they no longer feel confident behind the wheel or the costs of driving have gone up and the elderly can no longer afford it.

4 - M (Median) - the score found in the middle of the set of values. i.e. one that has as many cases with a larger value as with a smaller value.

5 - Due to the progressive decline to low levels of fertility and lower mortality rates the number of people aged 60 and above in the EU is now rising by more than two million every year, roughly twice the rate observed until about three years ago (Eurostat. 2010).

Gender

In all of the 19 countries involved in SARTRE 4 the percentage of women in the population is more than 50% (average 51.3%; UNECE Statistical Division Database). The results collected during SARTRE 4 show that in general the share of women in the 2010 driver population is slowly approaching 45% but as usual the situation differs from country to country. The highest number of women in the driver population is in Estonia (62%) but the results should be treated with some caution because eight years ago the situation was quite different (only 37%), see Table 2. In Sweden, Netherlands, Ireland and Finland women account for more than 50% of drivers. At other end of the scale we have countries such as Serbia, Poland and Hungary with men continuing to account for 60-70% of drivers.

Table 2: Percentage of women in the population of drivers in the countries surveyed (Source: SARTRE 3 and 4).

	SARTRE 4		SARTRE 3		Change
	Male	Female	Male	Female	2010-2001
Serbia	72.8%	27.2%			
Poland	65.9%	34.1%	76.8%	23.2%	11.0%
Hungary	64.2%	35.8%	66.6%	33.4%	2.4%
Czech Rep.	57.2%	42.8%	63.9%	36.1%	6.8%
Greece	57.1%	42.9%	75.0%	25.0%	17.9%
Spain	56.9%	43.1%	59.4%	40.6%	2.5%
Germany	56.8%	43.2%	55.1%	44.9%	-1.7%
Italy	56.4%	43.6%	48.5%	51.5%	-7.9%
Israel	56.3%	43.7%			
Slovenia	55.9%	44.1%	57.1%	42.9%	1.2%
Belgium	55.8%	44.2%	52.6%	47.4%	-3.2%
Cyprus	55.3%	44.7%	49.3%	50.7%	-5.9%
SARTRE	55.0%	45.0%	58.8%	41.2%	3.8%
Austria	51.7%	48.3%	52.2%	47.8%	0.5%
France	51.1%	48.9%	54.3%	45.7%	3.2%
Finland	49.9%	50.1%	60.5%	39.5%	10.6%
Ireland	49.8%	50.2%	57.3%	42.7%	7.5%
Netherlands	47.9%	52.1%	58.0%	42.0%	10.1%
Sweden	46.3%	53.7%	51.6%	48.4%	5.3%
Estonia	36.0%	64.0%	63.4%	36.6%	27.4%

The results confirm that the number of women drivers is growing and the change (by 3.5%) is statistically significant ($\chi^2 = 47.806;\ p=0.00$). The biggest increase in female drivers within the last eight years was recorded in: Estonia (27.4%), Greece (17.9%), Poland (11%) and Finland (10.6%) but there are also countries with a decrease in the population of women drivers over the last few years: Italy (-7.9%), Cyprus (-5.9%) and Belgium (-3.2%).

The growing share of women drivers is usually attributed to the changing role of woman in society. There is much to suggest that with more women driving, road traffic may become safer. Studies show that female drivers hold more positive attitudes toward traffic regulations and safety. They have committed fewer traffic offenses and have been involved in accidents less often than men (exposure controlled for). Similar differences are evident regarding male and female accidents in the home and workplace. What is interesting is that the differences have persisted for years (see ERSO, 2011a). This does not seem to confirm the concerns of some specialists claiming that as more and more women drive, they may adopt the “male” style of driving leading to an increase in accidents involving women.

Level of education

Education has been key to the social and economic development of the European Union and its member states. There is a major need for well-qualified workers in all of Europe - and this demand will continue to rise. SARTRE 4 looked at how these general trends are reflected in the driver population, if at all (see Figure 2). Drivers were asked to choose one of four education options: No education, Primary education, Secondary education and Further education.

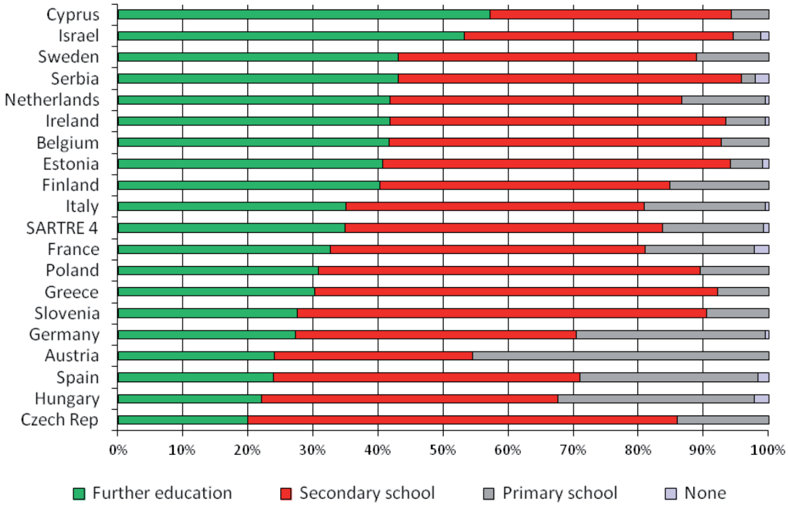

Figure 2: Level of education in the driver population in the countries surveyed (Source: SARTRE 4).

As expected, in all countries the percentage of drivers with secondary and further education outweighed the percentage of people with primary and no education. This is consistent with the trends in the overall population. The highest number of people with further and secondary education in the driver population is in Cyprus (57.2%), Israel (53.3%), Sweden (43.2 %) and Serbia (43.1%). Driver populations in Austria (46 %), Hungary (32 %) and Germany (30 %) have the highest share of people with primary education or lower. Over the last eight years the level of education among drivers has risen (see Table 3) and the change is statistically significant (*The Mann-Whitney's U test; Z= -17.074, p= 0.00*).

Table 3: Level of education in the driver population in the countries surveyed (Source: SARTRE 3 and 4).

	Level of education			
	Further education	Secondary school	Primary school	None
SARTRE 3	28.6%	47.8%	23.2%	0.5%
SARTRE 4	34.9%	48.9%	15.5%	0.7%

The change is particularly significant among drivers with education levels above the secondary level. Education levels increase the fastest among young drivers and female drivers. The changes in levels of education differ greatly from country to country with the biggest shifts recorded in Sweden (15.5% more drivers with education above the secondary level), Cyprus (14.3%), Poland (13.2%) and Belgium (13%). However, in the same period the percentage of drivers with the same education has dropped slightly in Spain (-3.9%), Germany (-1.8%) and Hungary (-1.1%).

The change may be the result of an improving level of education in the population. In most of Europe's economically highly developed countries the percentage share of employed persons with a university or technical college degree is already higher than the share of workers that have no more than a basic school education (Hoßmann et al., 2008). However, the changes in levels of education may very well be the result of struggling economies in recent years. With rising car and fuel costs people with poorer education are likely to have a lower income making it difficult for them to use a car.

Marital status

Concerning the marital status, the drivers were asked to choose one of five options (Single, Living as married, Married, Separated or Divorced, Widowed) which best fits their personal situation. Figure 3 shows the results for the countries participating in SARTRE 4.

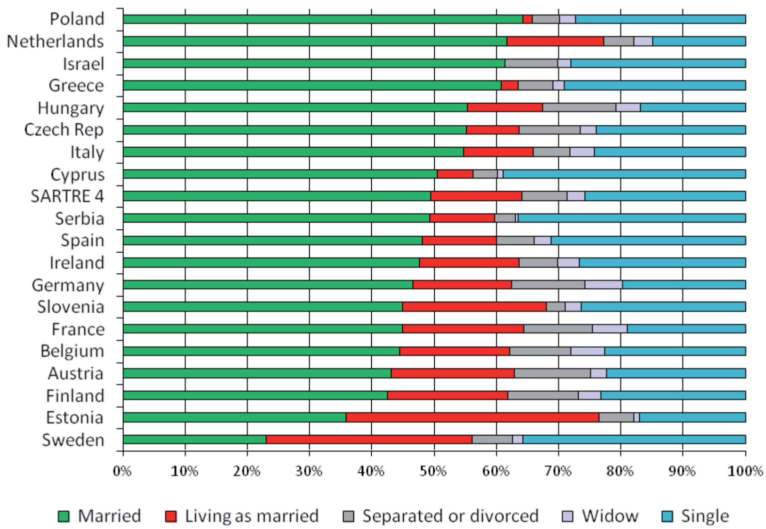

Figure 3: Marital status in the driver population in the countries surveyed (Source: SARTRE 4).

In SARTRE 4, 49.5% of the drivers say they are married, another 14.6% say they were living as married and 25.7% are single. Important variations are observed between countries. The highest percentage of married drivers is in Poland (64%), the Netherlands and Israel (about 61%) and the lowest in Sweden (only 23%), Estonia (36%) and Finland (42%).

Comparison with the results of the last two SARTRE surveys revealed that the percentage of drivers in traditional marriages is falling with more drivers living single or with a partner (see Table 4).

Table 4: Marital status of the drivers surveyed (Source: SARTRE 3 and 4).

	Marital status				
	Married	Living as married	Separated or divorced	Widowed	Single
SARTRE 3	57.1%	10.5%	6.2%	3.5%	22.8%
SARTRE 4	49.5%	14.6%	7.3%	2.9%	25.7%

The changes shown in the Table are statistically significant ($\chi^2_{(4)}$= *256.129; p= 0.00*). In the 2010 driver population there are more single drivers or drivers living with a partner. This change took place primarily at the cost of married drivers. The highest percentage drop in the number of marriages was recorded in Estonia (-19.3%), Slovenia (-15.7%), Hungary (-15.7%) and Sweden (-15.2%). While the first two countries balanced the drop in marriages with a comparable increase in partner relations, in Hungary the difference was picked up by a higher number of people divorced or separated and in Sweden by people who choose to be single. Only one country (Italy) saw an increase in married drivers in the period in question.

As we can see from the SARTRE 4 responses:

- 51.8% of men and 46.5% of women are married,
- nearly 36% of all drivers for various reasons stay single (the percentage in 2002 SARTRE 3 was 32.5%).
- people living in major cities and especially those with higher education are less likely to get married and live with a partner instead.

There is much to suggest that the changes in driver population follow those recorded in the general population. Since the early 1970s European Union countries have seen a drop in marriages and a higher number of divorces (marriages have become less stable). These changes are attributed to the ageing of the population and the marked increase in female employment rates. Since the 1960s more women have become economically active and have entered paid employment outside the home, particularly in the public sector, rather than working on the land or in a family enterprise as in the past (Eurostat, 2011a).

It is difficult to determine now how these changes can affect safety. While some research suggests that staying unmarried and being involved in car accidents is positively related[6]. Our results seem to confirm these findings to a certain degree. The drivers who are singles or those in the relationship (living as married) get involved more frequently in injury accidents and damage only accidents, and these differences are statistically important (especially between the single drivers and married ones), but concern only men.

6 - E.g. Whitlock et al. (2004) established that after taking age, sex and other variables into account never married people had twice the risk of serious driver injury as married people.

Living area

According to the UN State of the World Population 2007 report, for the first time in history in the middle of 2007 the majority of people worldwide were living in towns or cities. In the same report, Europe in 2007 is said to have 72% of the European population living in urban areas (EC, 2009). The data should be treated with some caution though. The urban-rural classification of population in internationally published statistics follows the national census definition which differs from one country or area to another. SARTRE 4 also used a descriptive form to identify the place of residence (rural/village, small town, suburban/city outskirts, urban/city/large town) and it may very well be that some of the categories were given different meanings in different countries (see Figure 4).

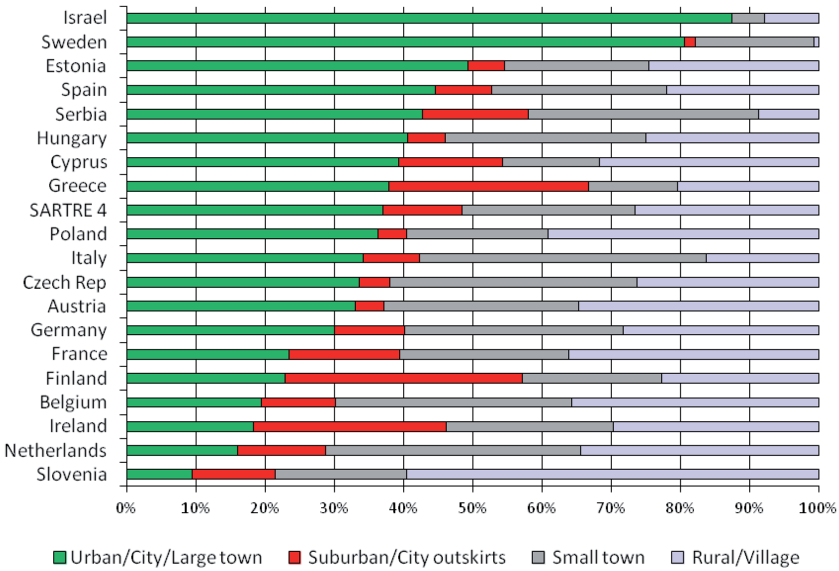

Figure 4: Living area of drivers from the countries surveyed (Source: SARTRE 4).

In SARTRE 4, 37% of drivers live in large towns and 11.5% live in suburban areas (city outskirts), 25% live in a small town and 26.5% in rural areas (village). These results are quite consistent with those for the overall population, but obviously there are some major differences between the countries. For example in Israel 87% of all drivers live in major cities and 81% in Sweden compared to a mere 9% in Slovenia.

When compared, the results of SARTRE 3 and SARTRE 4 show a trend similar to that in the overall population with people moving to urban areas (Table 5). The differences between the surveys are statistically significant (*Mann-Whitney U test; Z= -9.465. p= 0.00*).

Table 5: Drivers surveyed by their place of residence (Source: SARTRE 3 and 4).

	Living area			
	Urban/city/large town	Suburban/city outskirts	Small town	Rural/village
SARTRE 3	29.6%	15.1%	27.1%	28.1%
SARTRE 4	37.0%	11.5%	25.0%	26.5%

The change is probably in part caused by urban sprawl and the inclusion of new areas into cities. But another possibility is that some of those migrating to cities are doing it for economic reasons. Irrespective of the causes, these trends should be seen as an important factor which will determine future road safety policies. In 2008 nearly 44% of all road deaths happened in urban areas (EC, 2010a) and the number has been steadily growing in recent years. Unfortunately, the European Union and the majority of member states have not been able to develop a consistent urban strategy. The proposals set out in the *Action Plan on Urban Mobility. (*COM(2009) 490 final) and *Towards a European road safety area: policy orientations on road safety 2011-2020 (*COM(2010) 389 final) do very little to address these problems. But in fact the scale of the problem and how the trends are evolving suggest that urban road safety deserves more attention.

Occupation

SARTRE 4 studied the drivers' employment (see Figure 5). The respondents had 12 options to choose from. To help with the analysis, the options were grouped into four general categories:

- Employed (manual worker, white collar/office worker, middle management/trainee and executive/top management),
- Self-employed (farmer, fisherman, farmer/fisherman, professional lawyer/accountant, owner of business/shop, craftsman, proprietor),
- Not employed (retired persons, housewives, not otherwise employed, students),
- Unemployed.

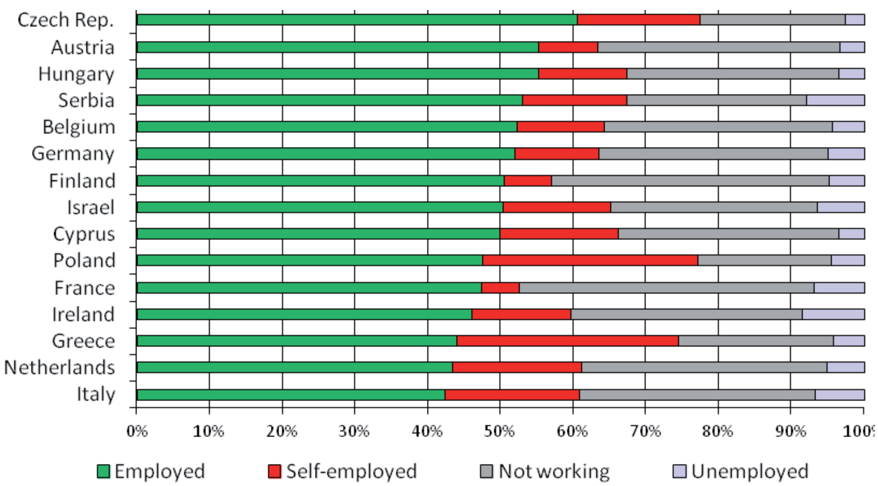

Figure 5: Type of occupation of the drivers in the countries surveyed (Source: SARTRE 4).

Most of the drivers are employed (52%) which together with self-employed drivers (14%) adds up to 66% of drivers in employment. This figure is similar to the percentages in the overall population (64.2%) (Eurostat, 2011b). There are, however, differences between the overall population and driver population in jobless figures. In the overall population in 2010, it was 9.7% compared to 5.5% among SARTRE 3 drivers. This can be easily explained with an economic rationale – it costs to have a car and not everyone can afford it. What is interesting is the group of drivers who do not work which accounted for more than 28% of the driver population in 2010. This group includes pensioners (14% of overall driver population), students (9%) and people who for different reasons stay home (6%). The highest number of pensioners among those not working is in France (30% of overall driver population), Finland (26%) and Austria (24%). In some countries, however, students are the biggest group (Cyprus

– 19%, Serbia – 16%, Sweden – 15%) or those not working (e.g. Ireland– nearly 18% of overall driver population).

When compared, the results of the last two SARTRE surveys show that the changes in employment structure are statistically significant ($\chi^2_{(3)}$= 86.156; p= 0.00, see Table 6).

Table 6: Type of occupation of the drivers surveyed (Source: SARTRE 3 and 4).

	Occupation			
	Employed	Self-employed	Not working	Unemployed
SARTRE 3	54.6%	13.9%	27.3%	4.1%
SARTRE 4	51.7%	14.4%	28.4%	5.5%

The difference between the two SARTRE surveys confirmed the trends in the general population that is to say there is a growing number of jobless drivers and self-employed drivers.

Car driving experience

While the previous sections addressed some demographic features, SARTRE 4 also asked questions about car drivers' experience. The respondents were asked about the number of years they have been driving, the frequency of driving and kilometres travelled annually.

One of the most popular and so far most successful attitude- and behaviour-oriented road safety policies is to target young and inexperienced drivers. This is because for years they have been considered a high risk group. Figure 6 shows driving experience for the SARTRE driver population. The countries are arranged by the share of drivers with less than two years of car experience.

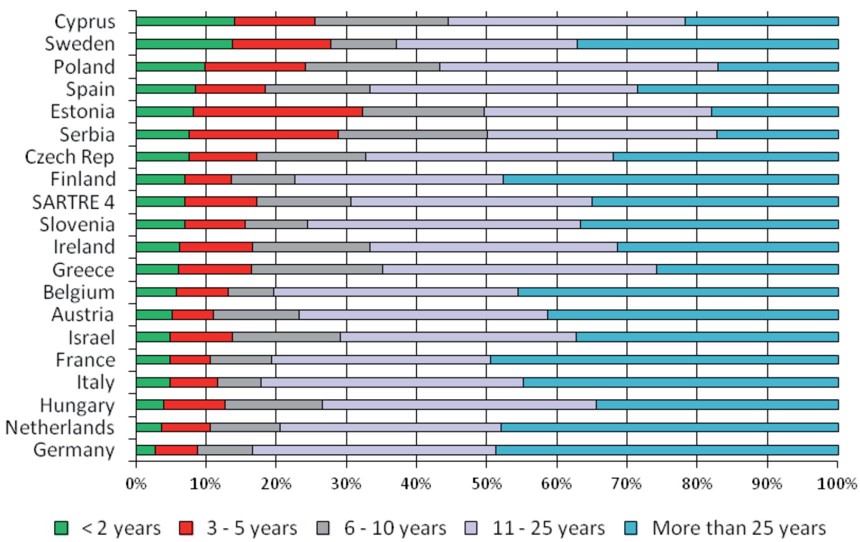

Figure 6: Years of driving in the driver population of the countries surveyed (Source: SARTRE 4).

In SARTRE 4, seven percent of the drivers have less than two years of car experience, 10% from 3 to 5 years, 13% from 6 to10 years, 34 % from11 to 25 years and nearly 35% of the respondents have been driving for more than 25 years. The highest number of inexperienced drivers (less than 2 years) is in Cyprus (14%) and Sweden (13.8%), the lowest in Germany (2.8%) and the Netherlands (3.7%). The typical inexperienced driver is usually a woman[7], a person aged 17 to 24, employed, single, having at least secondary education and living in a city. Every twentieth driver from this group has been involved in at least one road accident and every fifth in one or more damage accidents over the last three years. However, contrary to what could be expected, the numbers declared by this group are lower than those in the more experienced groups. When compared, the results of the last two SARTRE surveys show that car experience distribution has not changed significantly *(t= 0.831; p= 0.406 ; df= 36042*) in the last eight years (see Table 7).

Table 7: Percentage breakdown of car experience (Source: SARTRE 3 and 4).

	Car experience class				
	<= 2	3-5	6–10	11-25	>25
SARTRE 3	7.3%	9.5%	14.1%	36.4%	33. 2%
SARTRE 4	7.0%	10.2%	13.2%	34.9%	34.7 %

It is expected that improved driver learner training methods and the demographic changes will continue to reduce the risks caused by inexperienced drivers in the years to come. However, it is also clear that the majority of drivers (more than 90% of the population) are not part of the education system any more and the success of the next road safety action programme of the European Union will depend on those road users.

Car driving frequency

Recent years have seen a growing focus on more effective ways to control the development of car usage and encouraging people to use alternative modes of transport (bicycles, public transport, walking). The purpose of the modal shift is to reduce the negative effects of growing motorization, primarily CO2 emissions, noise, public space occupancy, road accidents and their consequences. SARTRE 4 investigated how often drivers drive their cars (see Figure 7). The results could serve as a point of reference for evaluating the relevant policies.

7 - A trend observed in the last few years is that women (51.5%) outweigh men in the group of drivers with a short driving experience.

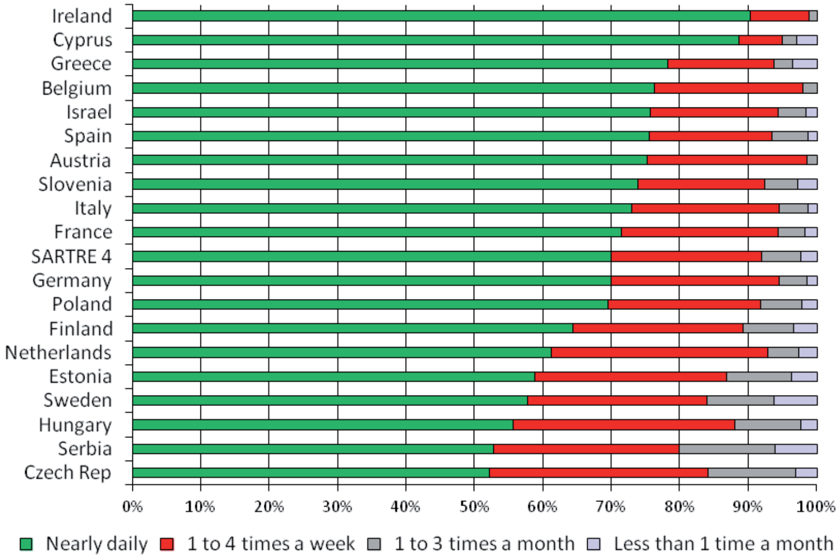

Figure 7: Frequency of car usage in the driver population in the countries surveyed (Source: SARTRE 4).

Nearly 70% of the drivers use their cars nearly daily, 22.1% between 1 and 4 times a week, 5.6% between 1 and 3 times a month and 2.3% less than once a month. Drivers from Ireland drive most often (more than 90% admit to driving nearly every day) followed by Cyprus (89%). What is interesting is that even in the Czech Republic (where in relative terms the least drivers said they drove every day) it is still more than 50%. The typical driver using their car every day is a male, a person aged 25-54, in employment, married, with secondary and higher education and more than 11 years of car experience. This suggests that this group is likely to have firm opinions on the usefulness of cars in everyday life who are not quite willing to change their longstanding habits. Unfortunately, SARTRE 3 did not look at the frequency of car usage.

Kilometrage

In SARTRE 4, respondents were also asked how many kilometres they had driven in the last 12 months. This is an increasingly important question in the light of the recent discussions about the causes of the clear road fatality reduction in European Union countries in the last nine years. One of the more popular hypotheses links the fatality reduction with economic factors and assumes that the economic crisis and lower incomes have caused many drivers to drive less. This has had an indirect effect on better safety. The results from SARTRE 3 and 4 do not confirm these hypotheses. To obtain more detailed and clear information, the answers were divided into six categories (up to 5 000 km, 5 – 10 000 km, 10 – 15 000 km, 15 – 20 000 km, 20 – 30 000 km, 30 000 and more, see Table 7).

Table 7: Number of kilometres driven annually in the driver population in the countries surveyed (Source: SARTRE 3 and 4).

km	<5000	5000-- <10000	10000-- <15000	15000-- <20000	20000-- <30000	>= 30000
SARTRE 3 2001	23.7%	18.3%	18.2%	12.2%	13.0%	14.5%
SARTRE 4 2010	25.9%	25.5%	17.4%	12.4%	10.4%	8.3%

The average SARTRE 4 driver reports an average of 15424 km driven in the previous year (*M= 10000 km)* which is comparable to SARTRE 3 (this is less by about 300 km, *t= 1.600 ; p= 0.11; df= 36250)*. The average yearly performance differs substantially from country to country. The lowest average can be seen in Sweden (about 12068 km/person/year), Germany (13098 km) and Austria (13585 km), the highest - in Israel (21983 km/person/year), Serbia (18986 km) and Poland (18475 km). The Figure 8 shows driver responses broken into six categories.

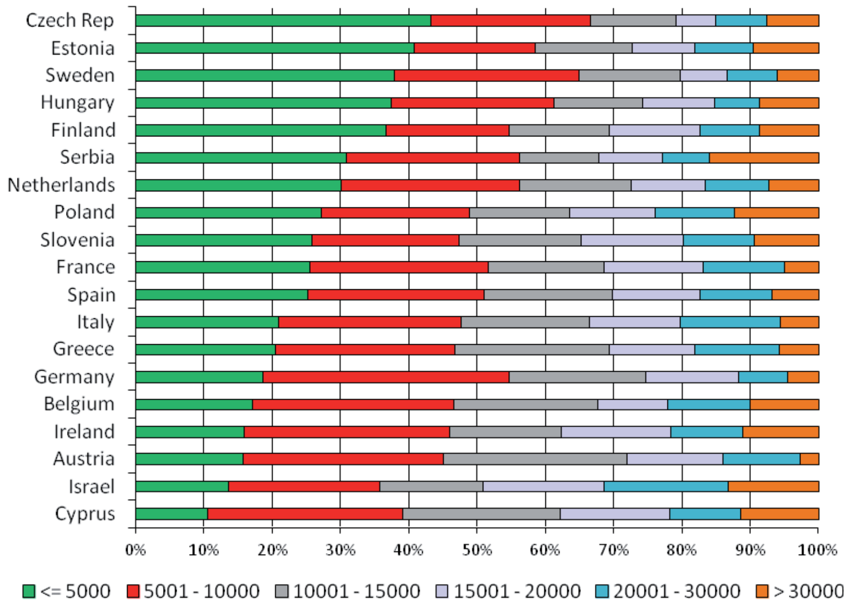

Figure 8: Number of kilometres driven annually in the driver population in the countries surveyed (Source: SARTRE 3 and 4).

More than 51 of the drivers admitted that they travelled up to 10000 km in a year, 30% said they travelled between 10000 to 20000 km and 19% said they drove more than 20000 km. It is difficult to say how reliable the information is. It seems that drivers asses kilometres travelled based on actual kilometres travelled (people who drive little tend to overestimate the distance and those driving a lot underestimate the distance), but the answers also depend on how the question was asked or the period it referred to. Moreover, countries use different methods to calculate the average kilometrage with some not running such studies at all. So, the declared annual kilometrage should be treated with some caution.

Involvement in injury accidents and damage only accidents

In 2010, 30 926 people died on the roads of the European Union which is 3 926 more than anticipated in 2001 (ETSC, 2011). While the target set in the Common Transport Policy has not been met (50% reduction of people killed in road accidents between 2001 and 2010), the number of killed in 27 member states went down by 44% which has been the biggest progress in reducing road deaths in history.

SARTRE asked drivers whether in the last 3 years they had been involved in injury accidents and damage only accidents. Table 8 presents the results from the last two SARTRE surveys.

Table 8: Percentage of drivers involved in injury accidents and damage only accidents in the last 3 years (Source: SARTRE 3 and 4).

	Number of injury accidents			Number of damage only accidents			
	More than 1 accident	1 accident	0 accident	More than 4 damage accidents	2 - 4 damage accidents	1 damage accident	0 damage accident
SARTRE 3	0.9%	4.2%	94.9%	0.3%	1.2%	20.3%	78.1%
SARTRE 4	1.1%	4.8%	94.1%	0.2%	4.8%	16.6%	78.4%

The differences between the two surveys are statistically significant (*Injury accidents: t= -2.039; p= 0.041; df= 35449; Damage only accidents: t= 2.159; p= 0.031; df= 35448*) although the changes are minor. The results are somewhat surprising. As we know from European Commission's data (CARE, 2011) 14 from 16 countries participating in SARTRE 3 and SARTRE 4 have improved their road safety performance. Despite the positive road safety developments, drivers said they had been involved in a similar number of injury accidents and damage only accidents just as 8 years ago. Poor memory is a possible reason (the question covered the last three years) and/or different cognitive/social distortions (cf. Wahlberg et al., 2010). Another possibility is some inaccuracy of accident data (e.g. underestimated slight injuries, different accident definitions in different countries).

There are certain differences between the countries participating in SARTRE. Figure 9 shows changing accident numbers between 2001 and 2009 (CARE database, 2011) and driver responses in driver populations from different countries[8]. As an example, the Netherlands has achieved the biggest injury accident reduction (-45.1%) but the number of drivers reporting to have been in a injury accident went down by 3.3% only. The values for France are -38.1 % and -0.9% respectively. Swedish drivers are on the other end of the scale claiming that they have been involved in fewer injury accidents compared to eight years ago and that despite the country's 13% increase in injury accidents between 2001 and 2009. There are similar discrepancies in almost all driver responses. Finland and Hungary are the only exception because driver responses are consistent with accident statistics.

8 - The analyses only looked at results from 16 participating in SARTRE 3 and 4 (excluding Cyprus, Israel and Serbia).

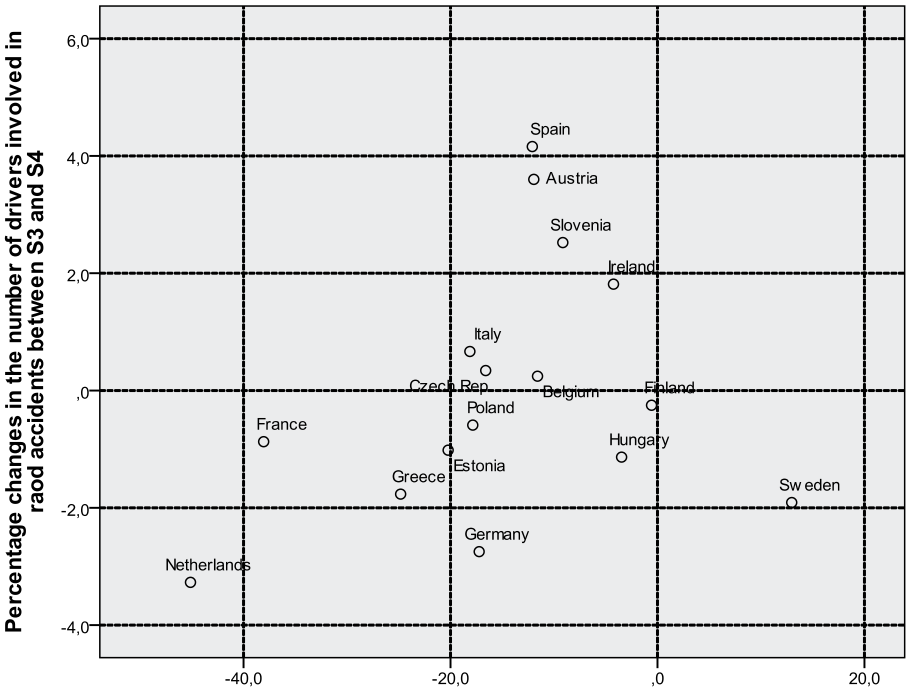

Figure 9: Percentage changes in the number of injury accidents between 2001 and 2009 and the number of drivers from the different countries involved in injury accidents (Source: CARE, 2011, SARTRE 4).

Drivers were also asked about involvement in damage only accidents. These were reported as increasing by German (by 9%), Polish and Finnish drivers (about 5%) and as decreasing by Austrian drivers (by about 7%). There is no certainty that this information is reliable due to a lack of reliable damage only accidents data.

Changes in the driver populations in the countries

The first part of the chapter analysed the results of the last two SARTRE surveys outlining the trends within the population of European drivers. There were similar analyses for the individual countries. The table 9 shows a summary of this work. The numbers represent the significance of the differences and the colours identify levels of confidence for the differences between two SARTRE surveys in the particular country.

Table 9: Cumulative results of the significance of varying results between two SARTRE surveys by variables and by countries.

Country	Age	Level of education	Personal situation	Living area	Car experience	Km driven	Car engine size	No accident	No collision
Austria	0.00	0.00	0.00	0.79	0.03	0.03	0.00	0.09	0.00
Belgium	0.07	0.00	0.00	0.70	0.03	0.99	0.30	0.85	0.13
Cyprus	0.00	0.00	0.00	0.00	0.14	0.00	0.45		
Czech Republic	0.18	0.00	0.04	0.90	0.01	0.00	0.51	0.34	0.01
Estonia		0.00	0.00	0.05	0.00	0.88	0.00	0.09	0.00
Finland	0.32	0.00	0.18	0.13	0.01	0.00	0.29	0.71	0.04
France	0.01	0.18	0.00	0.03	0.00	0.01	0.00	0.62	0.01
Germany	0.00	0.82	0.02	0.23	0.00	0.00	0.08	0.01	0.01
Greece	0.39	0.02	0.01	0.00	0.05	0.42	0.74	0.14	0.95
Hungary	0.44	0.47	0.00	0.48	0.30	0.33	0.00	0.13	0.07
Ireland	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.95	0.00
Italy	0.03	0.00	0.00	0.00	0.00	0.68	0.01	0.65	0.31
Netherlands	0.00	0.67	0.00	0.00	0.00	0.18	0.00	0.01	0.36
Poland	0.03	0.00	0.00	0.10	0.45	0.00	0.00	0.27	0.18
Slovenia	0.53	0.26	0.00	0.00	0.00	0.82	0.00	0.06	0.18
Spain	0.82	0.49	0.00	0.00	0.00	0.02	0.00	0.00	0.09
Sweden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.03

Statistical significance level below 0.001 0.01 0,05

In the last eight years, the changes in most of the countries have been so substantial that in fact we might be dealing with two different driver populations.

The objective of this analysis is to identify groups of highly inter-correlated variables that can be averaged into factors. These factors will have the property to preserve most of the data available from the sample while being much smaller in number. The actual decomposition of data into factors was made by principal component analysis (PCA). From the geometric perspective the solution of PCA is invariant upon rotation; so we have a choice to rotate the solution to our liking. We have chosen the varimax rotation which maximizes the variance of factor loadings for each item (*varimax* rotation) making the identification of factors easier. When selecting the factors the scree plot test was used, a method proposed by Cattell (1966). Five factors were identified during the analysis which explain 60.1% of the variance.

Factor analysis is a descriptive analysis and does not provide us with significance or any other measure of the certainty of results. Consequently, it is important to emphasize that the ultimate criterion of validation of the factors is the presence of a logically coherent description of factors and common sense. We started the process of defining the factors with those factor loadings whose value is higher than 0.7. Then we proceeded to conditionally include other variables into factors which have factor loadings greater than 0.4.

Table 10: Matrix of components where variables with the highest factor loadings vs. other factors.

	Component				
	1	2	3	4	5
Age	0,87	-0,205	0,016	-0,089	0,209
Marital status	0,825	0,088	-0,017	0,016	-0,167
Any children	0,757	0,181	-0,034	0,016	-0,171
Car driving experience	0,834	-0,147	0,002	-0,095	0,294
Occupation	-0,002	-0,679	-0,082	0,053	0,147
Car frequency use	0,011	0,596	-0,173	0,073	0,085
Engine size	0,072	0,448	0,072	-0,022	0,424
Estimation of kilometres driven	-0,033	0,566	-0,057	0,104	0,304
Habitation area description	0,001	-0,037	0,819	0,028	0,046
Town size	0,009	-0,053	0,796	0,017	-0,002
Count of injury accident	-0,019	-0,009	-0,005	0,81	-0,01
Count of damage accident	-0,063	0,065	0,031	0,798	0,037
Gender	0,021	-0,083	-0,008	-0,017	-0,838
Achieved level of education	-0,179	0,357	0,329	-0,09	-0,289

We identified the following five factors (see Table 10) which capture most of the information contained in the 14 underlying variables they are defined on:

- Factor I: Age (Age, Martial status, Children, Car driving experience),
- Factor II: Car usage (Occupation, Car frequency use, Engine size, Estimation of kilometres driven),
- Factor III: Living area (Area of living, Town size),
- Factor IV: Involvement in car accidents (Count of injury accident, Count of damage accidents),
- Factor V: Gender.

One variable not included in these factors is to be either excluded from the analysis or analysed separately.

Conclusions

The picture of a typical driver emerging from the SARTRE 4 results is the following: male, aged about 42, married, in employment. He lives in a city, drives his car almost daily and travels about 10 000 km annually. In the last 3 years, he has not been involved in a car accident or collision. In the last eight years (since the last SARTRE 3 survey), the population of drivers has changed substantially (mostly consistent with the demographic change in overall population) but the “typical driver” characteristics has not really changed. What is clearly surprising is that older drivers (aged 65 and more) represent a relatively small proportion of all drivers. However, there is much to suggest that the ageing of society will be reflected in the years to come.

Understanding the demographics of the driver population helps to review the current road safety policies. Road safety specialists tend to focus on high risk groups and ways to change their behaviour which is considered the key to better safety. While this strategy has improved road safety significantly, the data show that nearly 80% of the driver population are not covered by direct educational actions. These groups need special programmes to raise their awareness of road safety.

Another problem that needs to be addressed is international mobility. With no border control within the Schengen zone or lenient visa requirements hundreds of people seek opportunities across national borders for study, work and life (Eurostat, 2011). What this means for road safety is that in the years to come, road users in the same setting will represent a variety of habits, attitudes and behaviour. These differences will be further reinforced by migrants from non-EU countries[9]. There is much to suggest that harmonisation across the European Union may take years and will require a change of opinion of not only the representatives of member state governments but of the drivers as well. The next chapters of the report will analyse the main differences between opinions and declared behaviour of drivers from different countries.

9 - This problem was not analysed in SARTRE 4 but some reports show that most European countries will be able to achieve population growth or even simply stability only on the basis of immigration (Hoßmann et al., 2008). According to Eurostat, EU-27 Member States are host to some 20 million non-EU-nationals and about 5 million non-nationals have acquired EU citizenship since 2001. As a result, these changes should be reflected in new programmes.

Chapter 1.2

Car Drivers’ General Attitudes, Beliefs and Reported Behaviors

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Introduction

In all European countries, the official accident statistics that usually rely on police reports (IRTAD, 2011) play an important role in road safety policies. Governments use the number of fatalities or injured casualties as a method to analyze the current road safety situation and also to define prospective goals for road safety in their countries. Although the number of road fatalities and injuries are the ultimate indicators of road safety, the other factors such as road users’ attitudes and behaviors can help to quantify the road safety status of a country (SARTRE 3, 2004). This is particularly true, since specific attitudes and behaviors might have a significant impact on the future development of road accidents in the respective countries (Özkan et al., 2006). This is why the SARTRE 4 survey aims at contributing to the completion of the picture by assessing subjectively experienced aspects of road safety while still relating theses aspects to car drivers’ accident involvement.

Specifically, this chapter covers five fields of interest. First, car drivers concern about road safety and in particular their relative concern with respect to other fields of concern is reported. This section also links the car drivers’ personal concern to objective road safety indicators and incorporates an analysis of how the European car drivers perceive the concern of their governments towards the field of road safety. In section two the perceived accident risk of car drivers is analyzed and put into relation to objective indicators of road safety while in section three the perceived accident causes are analyzed. This is of great importance since it allows to infer which relevant accident factors are over- or underestimated by the population. In section four, aspects of personal driving style, namely the frequencies of risky driving behaviors, are analyzed and related to reported accident involvement. Here, the comparisons between countries are of particular importance, since the SARTRE survey is one of the few studies allowing for a detailed comparison of reported risky behavior for a large number of European countries. Finally, car drivers’ attitudes towards the introduction of stricter penalties for speeding and drink-driving offences are reported and also set into relation to the results of the last SARTRE survey eight years ago.

Method

All analyses presented are based on the common dataset containing n= 12.507 car drivers, that was described in detail in Chapter 1.

Within the descriptive analysis, for each item under investigation, the percentage of respondents exceeding a defined response threshold (for example car drivers involving at least ‘sometimes’ in a certain behavior) is reported for each country. Missing answers are not taken into account, but it was ensured that for every item under investigation no country had a percentage of missing answers exceeding 5%. In order to account for the variability in sample size of the various countries, mean values for the whole sample are calculated from the individual percentages of each country.

For each item, first, the descriptive statistics are presented and obvious differences between countries are discussed. Analytic statistics concerning the relations between variables are covered within the same section. In order to be able to identify temporal trends, wherever possible, comparisons to data from the previous SARTRE 3 survey are drawn by indicating the absolute difference in percentage between both editions. The changes are then tested by performing appropriate parametrical or non-parametrical tests, applying a significance criterion of $\alpha = ,05$. To investigate statistical relations between different variables, Pearson correlations and logistic regressions were computed. In order to ensure good readability, for each analysis a discussion of the findings will already be included within the results section while the conclusion section will summarize the most important effects and developments.

Results

Concern about road safety

In order to evaluate the relative concern about road safety, all interviewees were asked to judge how concerned they were about road accidents on 4-point Likert scale (very, fairly, not much, not at all). In order to be able to set the responses in relation to other prominent sources of concern, the same was asked for the issues rate of crime, pollution, standard of health care, traffic congestion and unemployment.

In the 2010 SARTRE survey, on average 82,6% of the European car drivers were ‘very’ (42,3%) or ‘fairly’ (40,3%) concerned about road safety. In comparison to 2002 (SARTRE 3) this corresponds to a decrease of 3,3% of at least ‘fairly’ concerned car drivers, while the amount of car drivers reporting to be ‘very’ concerned decreased by 2,4%. Figure 1 shows the frequency distribution of the respective response categories for each country and indicates the percentage changes in respondents indicating to be ‘very’ concerned about road safety. Israel, Estonia and Ireland show the largest proportion of car drivers that are ‘very’ concerned about road safety. Estonia and Sweden are the only countries indicating a significant absolute increase in concern about road safety as compared to the SARTRE 3 study. The very large increase in Sweden (+27,4%) apparently compensates a very low concern that was found in the previous study where only 11,9% indicated to be ‘very’ concerned about road safety. With less than 20% of the car driver sample indicating to be ‘very’ concerned about road safety, the lowest absolute concern is reported in the central European countries of Germany, Austria and the Netherlands, while Finland (-17,3%), the Czech Republic (-16,0%) and Poland (-15,4%) report the largest decreases in concern.

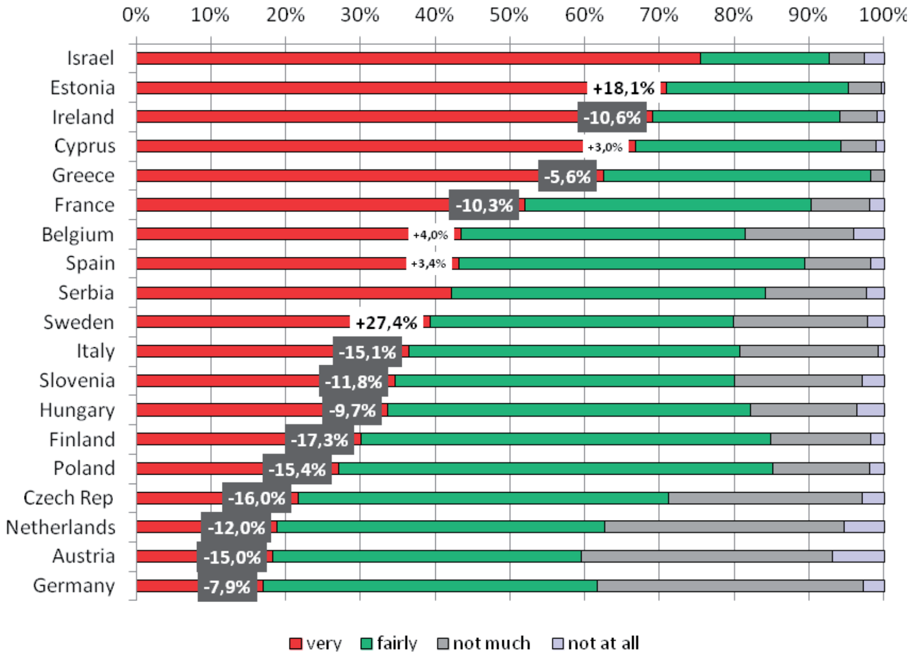

Figure 1: Concern about road safety. Frequency distribution and changes in percentage of "very concerned" from SARTRE 3 to SARTRE 4 (significant changes in bold).

In order to be able to evaluate the relative importance of road safety with respect to other fields of concern, just as in SARTRE 3, five other sources of concern were assessed. Table 1 gives an overview of each of the assessed types of concern for each country by indicating the mean percentage of 'very' and 'fairly' concerned respondents and the average ranks in relation to the other assessed sources of concern. Despite an absolute decrease in concern about road safety, for almost 50% of the countries, road accidents are still the most important source of concern. Unemployment, crime, pollution and health care are of about equal concern with a large variability between countries: For example, unemployment plays an important role in those countries that have been heavily hit by the economic crises (Ireland, Spain, Italy, and Greece). In contrast, car drivers in countries like Hungary and the Czech Republic seem to be most concerned about health care issues. Traffic congestion seems to play a minor role in contrast to all other topics. Still, it has to be considered that a lower rank for road safety does not imply a low importance of road safety. This can for example be seen in the case of Greece where respondents report a high concern about most issues per se.

When investigating the development over the last eight years, people seem to have increased concern about unemployment with a plus of 2,5% being 'very' or 'fairly' concerned. For 'very' concerned this increase was even larger with a plus of 4,5%. Considering the impact of the recent economic crises this finding is not of a surprise. At the same time some car drivers seem to be less concerned about crime rate ('very' or 'fairly': -6,9%; 'very': -6,2%) and pollution ('very' or 'fairly': -6,9%; 'very': -4,6%) while health care ('very' or 'fairly': -0,8%; 'very': +/- 0) and traffic congestion ('very' or 'fairly': +1,7%; 'very' +1,5%) evoke about the same amount of concern.

Table 1: Proportion of respondents indicating that they are 'very' or 'fairly' concerned about each of the topics. For each country the rank of each item with respect to the others is indicated.

	road accidents		unem-ployment		rate of crime		health care		pollution		traffic congestion	
	fairly+	rank	fairly+	rank	fairly+	rank	fairly+	rank	fairly+	rank	fairly+	rank
Estonia	95%	1	91%	3	91%	4	92%	2	87%	5	66%	6
Cyprus	94%	1	88%	3	89%	2	81%	5	80%	6	88%	3
Israel	93%	1	73%	5	83%	2	68%	6	81%	3	80%	4
France	90%	1	86%	2	74%	5	85%	3	83%	4	63%	6
Poland	85%	1	65%	6	73%	4	81%	2	70%	5	81%	3
Finland	85%	1	75%	4	78%	3	71%	5	82%	2	38%	6
Serbia	84%	1	84%	2	81%	3	77%	4	73%	6	77%	5
Belgium	82%	1	73%	4	77%	2	70%	5	74%	3	68%	6
Slovenia	80%	1	78%	2	60%	4	53%	5	74%	3	48%	6
Ireland	94%	2	96%	1	89%	4	93%	3	76%	5	75%	6
Spain	90%	2	95%	1	83%	4	89%	3	80%	5	72%	6
Italy	81%	2	87%	1	73%	5	79%	3	77%	4	56%	6
Greece	98%	3	99%	1	98%	4	99%	1	86%	6	98%	5
Hungary	82%	3	78%	5	82%	4	84%	1	82%	2	64%	6
Sweden	80%	3	76%	4	87%	2	89%	1	75%	5	55%	6
Czech Rep	71%	3	62%	5	74%	2	83%	1	71%	4	55%	6
Netherlands	63%	4	55%	5	73%	1	69%	2	68%	3	50%	6
Germany	62%	4	71%	2	70%	3	47%	5	76%	1	46%	6
Austria	60%	4	64%	3	70%	2	43%	5	72%	1	41%	6
Mean	**83%**	**2,1**	**79%**	**3,1**	**79%**	**3,2**	**76%**	**3,3**	**77%**	**3,8**	**64%**	**5,5**

To investigate whether concern about road safety was related to the objective level of road safety of a country, a correlation to road fatalities per one million inhabitants (in 2009) was calculated. This correlation was not significant (r= .072, p= .770). For further investigation, the corresponding scatterplot was visually inspected (Figure 2). The medians of the variables were used to establish four quadrants distinguishing low vs. high concern and low vs. high road safety. Assuming that a particular amount of concern in the car driver population might be essential for the acceptance and effectiveness of road safety policies and measures, the Eastern European countries of Poland, the Czech Republic and Slovenia show the problematic combination of a relatively high fatality rate combined with a comparably low amount of concern within the population. In comparison, for example the South-Eastern countries Greece, Serbia and Cyprus show comparably high fatality rates but at the same time this is also reflected in a larger proportion of car drivers being 'very' concerned about the issue of road safety.

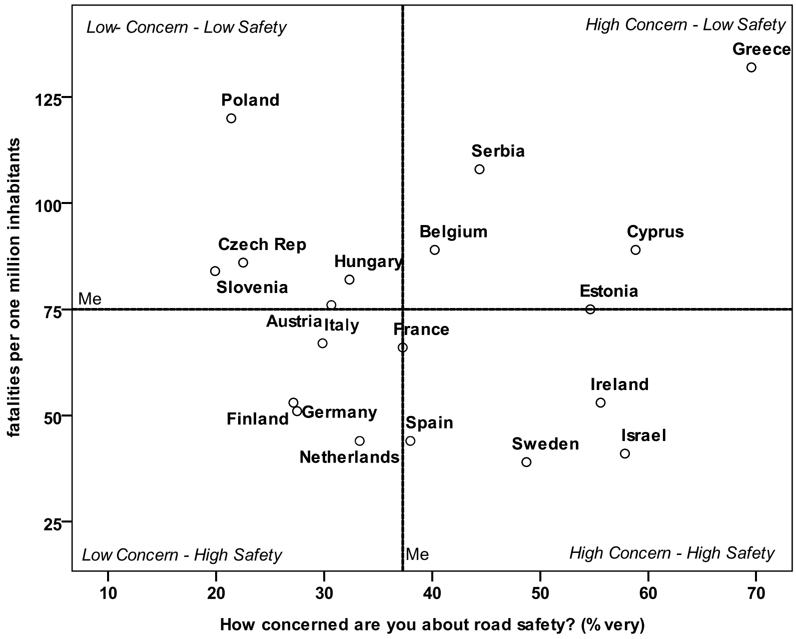

Figure 2: Personal concern about road safety vs. fatality rate. The dashed lines indicate the medians of concern and fatality rate.

For the evaluation of politic action, next to the objective indicators of road safety, also the amount of concern that people think the government dedicates to a certain topic might be of interest. Further, this information might be used as an indicator of how actions taken during the 3rd Road Safety Action Programme were perceived within the member stated. On average 10,4% of the European car drivers believe their government to be 'very' and 41,8% 'fairly' concerned about road safety.

Figure 3 indicates the relation between the proportion of car drivers that are 'very' or 'fairly' concerned about road safety themselves and the proportion that believe that their government is 'very' or 'fairly' concerned about road safety. Over the 19 participating countries there is a significant negative correlation between these proportions ($r(19)= -,493$; $p= ,032$) indicating that a high perceived governmental concern goes along with a lower personal concern and vice versa. This is particularly true for the Netherlands, Germany and Austria where car drivers show the least concern about road safety but attribute a very high amount of concern to their government. On the other hand, the largest discrepancies between own and governmental concern can be observed for the countries of Estonia, Slovenia, Israel and Greece. Depending on the cause of this discrepancy, in these countries the government should either increase their efforts towards road safety and/or make their efforts more visible.

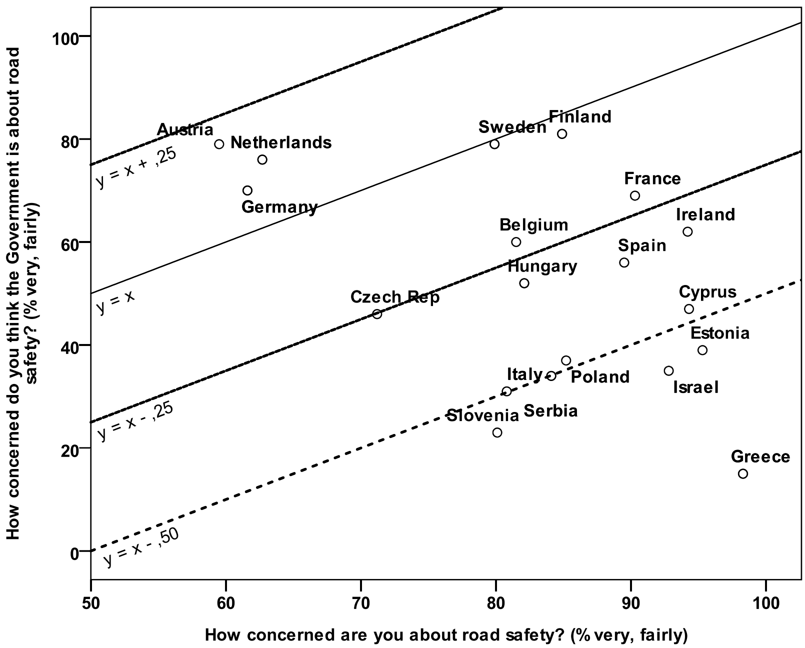

Figure 3: Personal concern vs. perceived governmental concern about road safety. The diagonal lines indicate the difference in the percentages between individual concern and governmental concern.

Perceived Road Safety

Next to the individual and perceived governmental concern about road safety, SARTRE 4 also assessed how car drivers judged the level of road safety in their country and its development over recent years.

When asked about the danger of certain transport modes, car drivers across Europe consistently attribute the highest risk to motorcycling. On average 88,6% see motorcycling as 'very' or 'fairly' dangerous, while car driving and bicycling are considered as about equally dangerous (M= 65,2% and M= 64,3%). Walking (M= 35,5%) and in particular public transport (M= 17,1%) are seen as the least dangerous transport modes.

Next to the perceived risk of various transport modes a general perception of road safety was assessed. When asked about how safe the roads in their countries were, 58,1% of car drivers indicated the roads to be 'very' (10,0%) or 'fairly' safe. Here large differences between countries appeared. While above 90% of Dutch, Austrian, German or Swedish car drivers indicated the roads to be at least 'fairly' safe, less than one third of Slovenian, Hungarian, Polish and Greek did so.

When correlating the general perception of road safety in the investigated countries with their fatality rate a strong negative correlation could be observed (r(19)= -,717; p= ,001; Figure 4). Therefore, the population of car drivers in Europe apparently has a very good perception of road safety in their countries. Still, it is interesting that the perception of a low level of road safety (often corresponding with a high level of concern about road safety) does not seem sufficient to change car drivers' behavior in a way to improve road safety. This might happen because car drivers fail to sufficiently link their own behavior to road safety. Further, the data show that not only there are still large differences in objective road safety indicators as fatality rate but these differences also exist in the minds of European car drivers. Interestingly, there is no difference in the perceived level of road safety between those drivers that have been involved in a car accident over the last three years and those that have not (t(12237)= ,642, p= .521).

In order to investigate whether the objective improvement in road safety was also subjectively perceived by the car drivers, the item "How much do you agree that our roads have become safer over the last 10 years?" was assessed. On average 55,2% 'very' (13,8%) or 'fairly' agreed. Still, large differences between countries emerged. While in Sweden, Austria and Spain about 80% of car drivers sensed an at least 'fairly' improvement, less than one third of car drivers from Hungary, the Czech Republic and Greece did so.

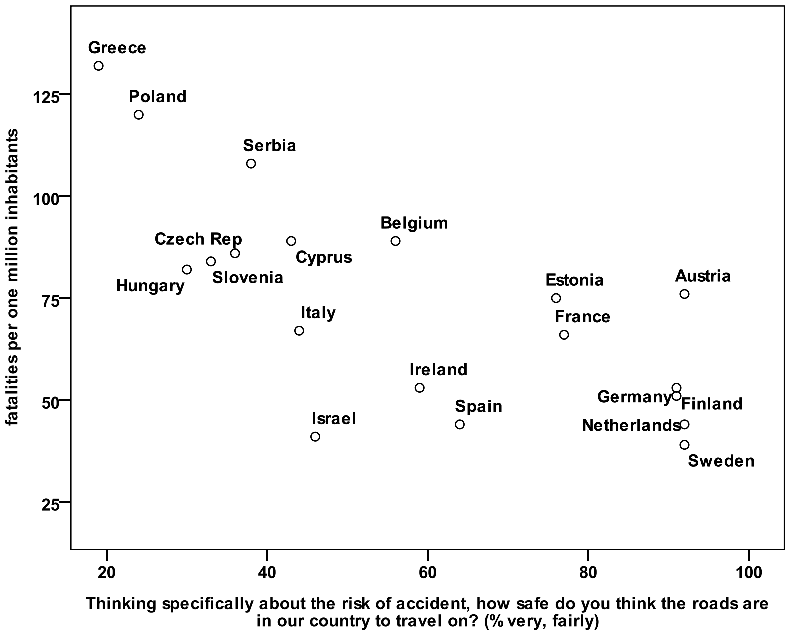

Figure 4: Perceived road safety vs. fatality rate.

Perceived Accident Causes

The probability of changing driver behavior is likely to be higher if the addressed issue is in fact perceived as a relevant cause of accidents by the drivers themselves (Christ et al., 1999). To assess this, respondents were asked to judge how often six typical factors known to be related to accident involvement (alcohol, drugs, fatigue, inexperience, phone use, and aged people driving) were the cause of car drivers being involved in road accidents. Table 3 indicates the absolute and relative attributed importance of the named accident causes for each country while Table 4 shows the changes for those items that were already assessed eight years before. It is obvious that, out of the causes assessed, alcohol is still perceived as the most important accident cause as it is ranked first in all countries except Italy, where in contrast drugs are considered most relevant. In total, drugs are considered as the second most important accident cause. It stands out that in Italy and Spain, with 96% and 94% indicating drugs to be at least 'often' causative of car accidents, drugs are seen as a major problem for road safety. This corresponds well to the fact that according to roadside surveys performed within the EU-project DRUID, in relation to other countries, Italy and Spain showed a comparably high prevalence of driving under the influence of illicit drugs like cocaine (Spain: 1,5%; Italy: 1,2%; Average: 0,4%) and THC (Spain: 6%; Italy: 1,1%; Average: 1,3%) (see Hagenzieker, 2011). Still, at the same time, Italy showed a prevalence of drunk driving (8,6%; Average: 3,5%) that was clearly above average, while this cause is only ranked second by the Italian car drivers in the SARTRE survey. On the other hand, although Poland showed a low rate of psychoactive substance use in driver population, Polish car drivers ranked alcohol first and drugs second with regard to perceived accident causation. It seems likely that driver perception of the causes of road accidents does not only depend on the real risk but also to a large extent on the media coverage of an issue.

When comparing the current figures for alcohol and drugs to those of the SARTRE 3 assessment, it can be seen that for drugs there is a mean increase of 12% in attributed accident causation, whereas of all countries only Greece and France are facing a decrease. In contrast, the mean attribution of accidents to alcohol and fatigue is relatively stable, with significant changes for some of the countries. Rather surprisingly the usage of a handheld phone has decreased in perceived relevance for accident causation by 4% to an average of 50%. This is the case, although during the same time the number of mobile phone subscriptions the EU has almost doubled (Eurostat, 2011) and therefore the use is likely to have increased substantially as well.

In SARTRE 4, the dispositional factors inexperience and aged people driving were assessed for the first time. Those dispositional factors are on average judged as less relevant than the rather situational factors discussed before. Greece and Cyprus are the only countries where elderly drivers rank among the Top 3 accident causes.

Table 3: Percentage indicating certain factors to be at least 'often' the cause of car drivers being involved in road accidents. For each country the rank of each factor is indicated in the column "rk".

	alcohol		drugs		fatigue		inexp.		phone		elderly	
	o+	rk	o+	rk	o+	rk	o+	rk	o+	rk	o+	rk
Belgium	89%	1	77%	2	67%	3	51%	4	47%	5	39%	6
Serbia	90%	1	65%	2	64%	3	60%	4	50%	5	48%	6
Sweden	89%	1	78%	2	78%	3	47%	4	47%	5	41%	6
Estonia	97%	1	90%	2	81%	3	69%	4	51%	6	51%	5
Slovenia	92%	1	71%	2	65%	3	61%	4	43%	6	49%	5
Ireland	85%	1	83%	2	68%	3	64%	5	65%	4	29%	6
Israel	89%	1	87%	2	76%	3	49%	5	68%	4	30%	6
Poland	90%	1	76%	2	72%	3	51%	5	54%	4	38%	6
France	71%	1	64%	2	58%	3	46%	6	50%	4	47%	5
Spain	95%	1	94%	2	64%	3	39%	6	58%	4	48%	5
Cyprus	85%	1	69%	2	55%	6	64%	4	56%	5	68%	3
Czech Rep	80%	1	56%	3	67%	2	51%	4	35%	5	35%	6
Hungary	94%	1	69%	3	77%	2	64%	4	54%	5	42%	6
Greece	89%	1	60%	3	53%	4	51%	6	53%	5	61%	2
Germany	73%	1	52%	4	61%	2	60%	3	38%	5	28%	6
Netherlands	85%	1	64%	4	70%	2	64%	3	62%	5	41%	6
Austria	77%	1	56%	4	64%	3	67%	2	45%	6	51%	5
Finland	83%	1	57%	4	58%	3	65%	2	27%	6	34%	5
Italy	90%	2	96%	1	69%	3	48%	6	52%	5	56%	4
Mean	**87%**	**1,1**	**72%**	**2,5**	**67%**	**3,0**	**56%**	**4,3**	**50%**	**4,9**	**44%**	**5,2**

Table 4: Changes from SARTRE 3 to SARTRE 4 in the proportion of respondents indicating certain factors to be at least 'often' the cause of car drivers being involved in road accidents. Significant changes (χ^2 test) are indicated in bold type.

	alcohol	drugs	fatigue	phone	Mean
Estonia	+0%	+21%	+19%	+32%	+18%
Netherlands	+2%	+27%	+5%	+7%	+10%
Ireland	-5%	+23%	+9%	-2%	+6%
Hungary	+8%	+26%	-1%	-8%	+6%
Cyprus	+13%	+19%	+14%	-2%	+11%
Poland	-3%	+22%	+1%	+3%	+6%
Slovenia	+1%	+17%	+7%	-8%	+4%
Sweden	-4%	+4%	+0%	-9%	-2%
Austria	-6%	+18%	-7%	-5%	+0%
Spain	+14%	+12%	-9%	-5%	+3%
Czech Rep	-1%	+20%	+2%	-9%	+3%
Finland	-3%	+3%	-8%	-10%	-5%
Belgium	-1%	+7%	-8%	-8%	-2%
Italy	-4%	+11%	-6%	-12%	-3%
Germany	-10%	+7%	-12%	-12%	-7%
Greece	-3%	-18%	-12%	+4%	-7%
France	-20%	-23%	-14%	-28%	-21%
Mean	**-1%**	**+12%**	**-1%**	**-4%**	**+1%**

Personal Driving Style

It has been shown previously, that traffic violations and a risky driving style are related to accident involvement and that clear differences in driving style between different European countries exist (Özkan et al., 2006; Parker et al., 1995). In the present study four items were included, assessing behaviors that were expected to be typical for risk-taking in road traffic: following behavior, passing a traffic light that is amber, giving way to pedestrians, handheld phone use. Of these, only the first three items could be compared to the previous SARTRE edition.

The behavior that is on average at least 'sometimes' performed by the highest proportion of respondents is driving through a traffic light that is amber (53,1%; see Figure 5). This rate on average increased by 3,5% as compared to SARTRE 3. A span between almost 75% for Cyprus and about 33% for Israel reflects fairly large differences in reported behavior between countries. Sweden, Austria and Finland show a considerable increase in the reported frequency of passing an amber traffic light.

The second most frequently reported behavior, with an average of 39,4% indicating to show this behavior at least 'sometimes', is to follow a preceding vehicle too closely (see Figure 6). This is also the aspect of personal driving style that showed the largest change compared to SARTRE 3 with an increase of 5,9%. It is striking that the proportion of drivers that report to at least 'sometimes' follow too closely has at least by trend increased for all countries except Hungary.

The average proportion that reported at least 'sometimes' to make or answer a call with a handheld phone was 33,4%. Here also a very large span between countries could be observed (Figure 7). The fact that Sweden with 62,5% shows the highest rate of mobile phone use, does not come as a surprise, since this is the only European country where using a handheld phone while driving is not prohibited by law. Therefore, it seems rather surprising that the difference to the closely following countries like Cyprus and Greece, that all prohibit the use of a handheld phone, is not of larger magnitude. In the Netherlands and Hungary, where there exist considerable fines (€140 and €110,-), less than 15% of the drivers report to at least 'sometimes' use their handheld mobile phone while driving. This could be interpreted as a hint towards the effectiveness of a considerable monetary fine with regard to mobile phone use. Since mobile phone use was not assessed in any of the previous SARTRE editions, the temporal development could not be investigated.

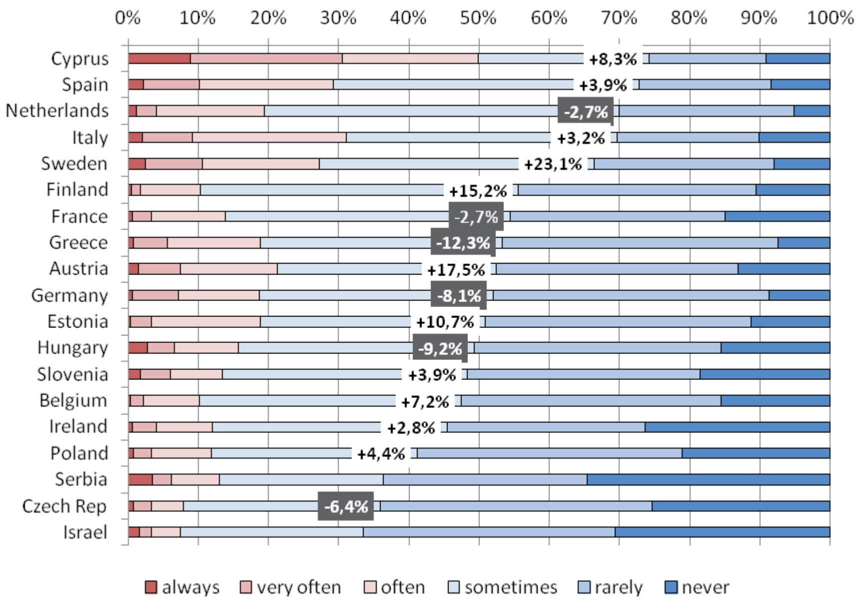

Figure 5: Frequency distribution and changes since SARTRE 3 for the item "When driving a car, how often do you drive through a traffic light that is amber?".

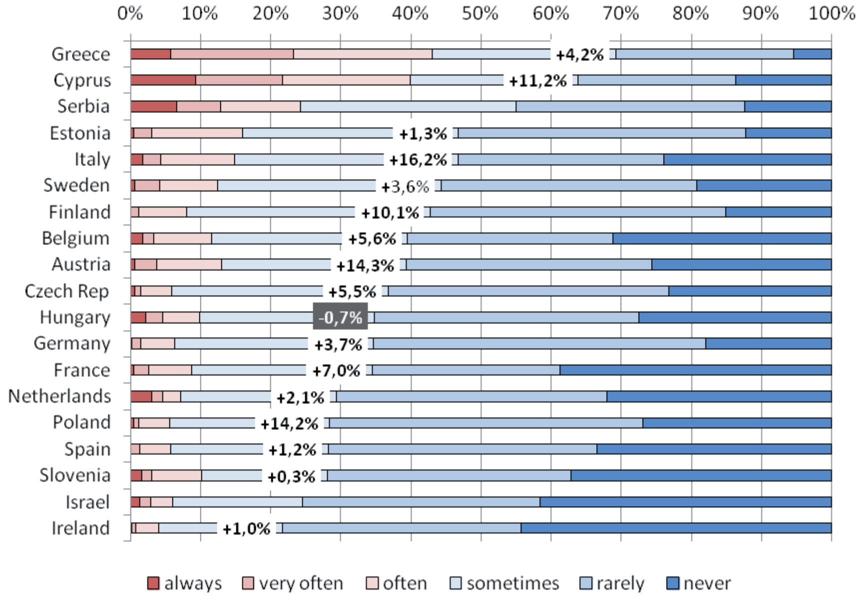

Figure 6: Frequency distribution and changes since SARTRE 3 for the item "When driving a car, how often do you follow the vehicle in front too closely?"

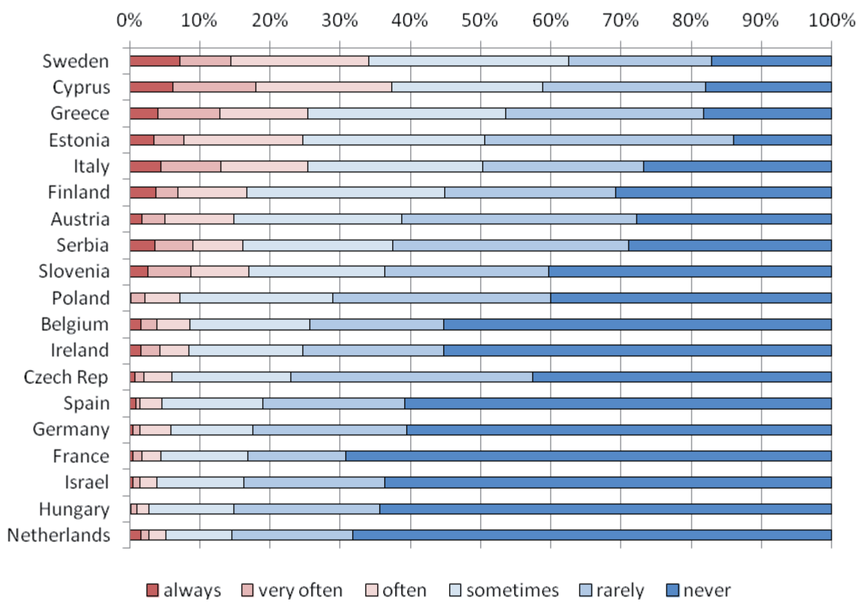

Figure 7: Frequency distribution for the item "When driving a car, how often do you make/answer a call with a handheld phone?"

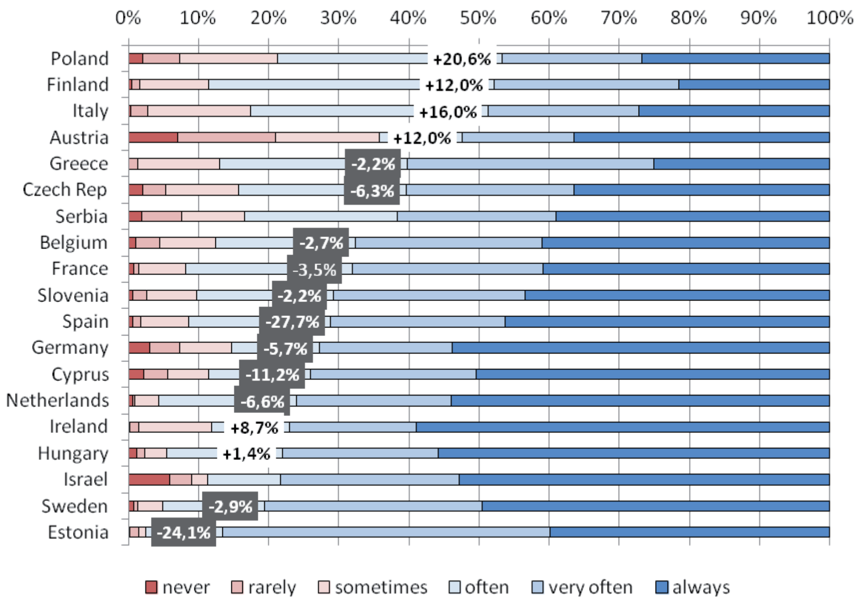

Figure 8: Frequency distribution and changes since SARTRE 3 for the item "When driving a car, how often do you give way to a pedestrian at pedestrian crossings?"

For the item "When driving a car, how often do you give way to a pedestrian at pedestrian crossings?" a frequency of 'often' or less was considered as rather risky driving behaviour. With a mean of 32,7%, this item was ranked fourth with regard to the other risky driving behaviors. In relation to SARTRE 3 this proportion on average decreased by 1,4%. Therefore, this is the only behavior where a trend towards more defensive driving could be observed. When comparing the single countries (Figure 8), Polish, Finish, Italian and Austrian car drivers seem to show a comparably low willingness to stop at pedestrian crossings. At the same time, this willingness has decreased significantly in those countries.

Using the complete sample, a binary logistic regression was conducted to investigate the relation between the four indicators of risky driving style and accident involvement (injury or damage) during the last three years, while considering gender and age as possibly relevant mediating factors (Cox & Snell R^2= ,030). The results are presented in Table 5. It was shown that all four behaviors significantly predict accident involvement with the use of a handheld phone and driving through amber carrying the largest odds ratios (ExpB).

Table 5: Results of binary logistic regression analysis with indicated behaviors as independent and accidents as dependent variable. All df= 1 and p< ,001.

Behavior	B	Wald	Exp(B)	lower 95%-CI	upper 95%-CI
Follow too closely	,080	14,79	1,083	1,040	1,129
Give way to pedestrians	-,081	19,22	,922	,889	,956
Drive through amber	,138	42,17	1,148	1,101	1,197
Use handheld phone	,137	52,91	1,146	1,105	1,189
Gender	,131	8,09	1,141	1,042	1,249
Age	-,013	63,72	,987	,984	,990

The relation between risky driving behavior and accident involvement based on the proportions of drivers indicating a risky driving behavior is also displayed in Figure 9. This figure in addition includes the differences for age and gender. It can be seen that for all four behaviors there are effects of age (Kruskal-Wallis-Test: all $\chi^2 > 95$; p< ,001) and gender (all $\chi^2 > 12$; p< ,001). Younger drivers as well as male drivers seem to be more prone of performing risky driving behavior than older drivers and female drivers. This is well in line with established findings from the literature concerning risky driving behavior (Rhodes & Pivik, 2011).

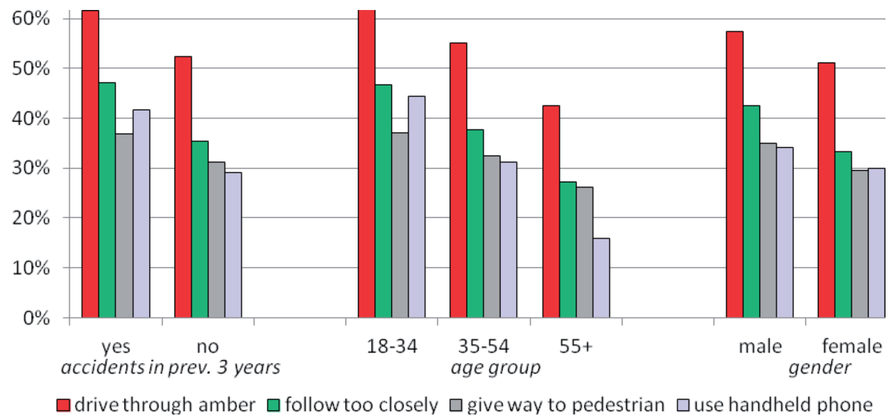

Figure 9: Proportion of respondent indicating a rather risky behavior in relation to accident involvement, age and gender.

In order to calculate an integrated measure of personal driving style and therefore to be able to compare this integrated measure between countries, the three items “drive through amber”, “follow too closely” and “give way to pedestrians” were integrated into one factor by calculating the average of all three items for each participant. All were coded so that ‘6’ indicated a rather risky behavior and ‘1’ indicated rather considerate driving. The usage of a mobile phone was excluded from the analysis. On the one hand, because, as opposed to all other countries, in Sweden this behavior is allowed, which would have combated the reliability of this item as an indicator of a risky driving. On the other hand since this item had not been assessed in the SARTRE 3 edition, an integrated measure would not have been comparable.

For the average of all countries there is a slight but significant increase in the frequency of risky driving behavior (SARTRE 3: M= 2.30, SARTRE 4: M= 2.38; t(36467)= 8,54; p<,001; Figure 10). The countries that show the highest relative increases are Austria, Italy and Poland while only Spain, the Netherlands and the Czech Republic show a considerable improvement in personal driving style. Interestingly, Spain is the country showing the largest reduction in risky driving style, while at the same time also being the country with the largest reduction in fatalities between 2000 and 2009. From a theoretical viewpoint it would be interesting to explore whether these two developments might be causally linked (see Figure 11 for an exploratory analysis: correlation r(17)= -.390, p= .122).

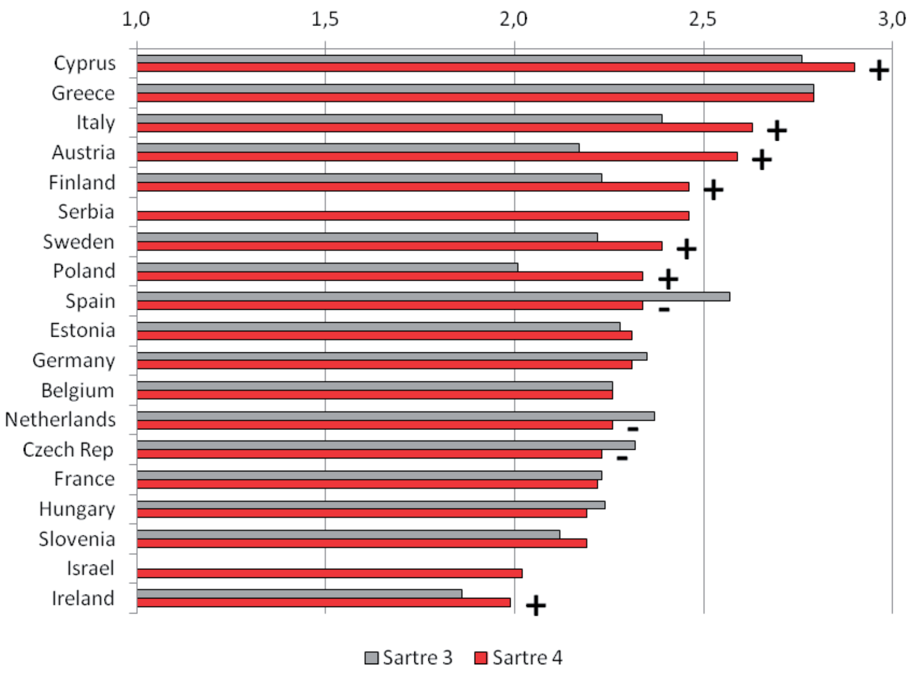

Figure 10: Integrated measure of a risky driving style (drive through amber, follow too closely, stop at pedestrian crossing). Larger numbers indicate a more risky driving style. Plus and minus signs indicate significant changes in relation to SARTRE 3 (t-Test, p< ,05).

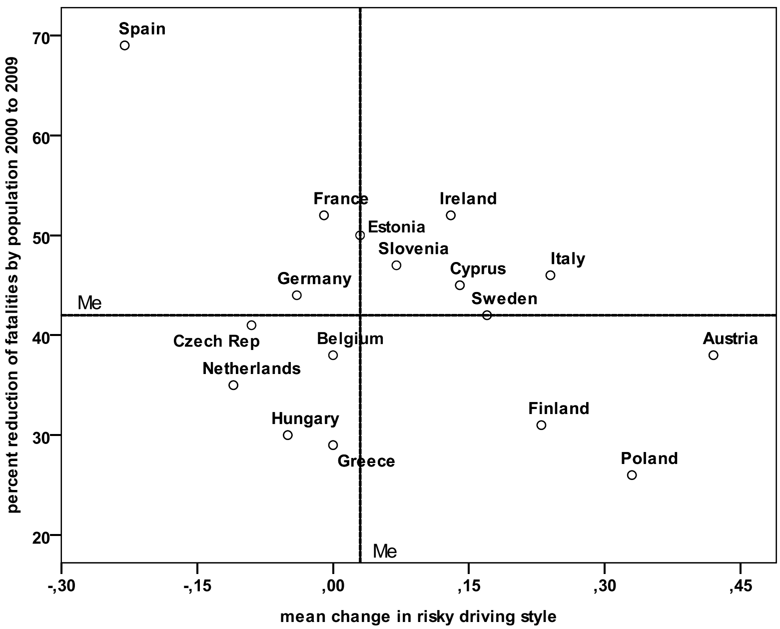

Figure 11: Average change in driving style versus reduction of fatality rate.

Attitudes concerning Penalties for Traffic Offences

For five typical traffic offences (speeding, drink-driving, not using restraint systems, not wearing a helmet on a motorcycle, using a handheld phone while driving) it was assessed how much the respondents agreed to the implementation of much more severe penalties. More than three quarters of the car drivers 'strongly agreed' or 'agreed' concerning drink-driving (84%) and helmet use (78%). For alcohol even in the countries with the lowest agreement, more than 70% agree on an increase of penalty severity for drink-driving. For handheld phone use (63%) and the use of restraint systems (62%) the agreement was somewhat lower, while only about half of the car drivers agreed to the implementation concerning speeding offences (52%).

In the current chapter only those items concerning speeding and drink-driving are analyzed in detail, since these are the only two items that were already assessed eight years before, so that they can be compared between the two SARTRE editions (Table 6).

When considering the changes over the last eight years, it is obvious that for both offence-types, the agreement with more severe penalties has decreased, especially so for speeding where an average decrease of 11% could be observed. These decreases are of a large magnitude for the countries of Finland (-40%) and France (-34%). In SARTRE 3, Finland was ranked first with 80% agreement. The large reduction in Finland might have to do with the harmonization of speeding penalties in 2009 and the introduction of section control in 2010. In France, in between 2002 and 2010 the number of speed cameras was rapidly increased, which in turn might also have led to less agreement with more severe penalties.

Table 6: Percentages of respondents that either 'strongly agree' or 'agree' to the statement "Penalties for speeding/drink-driving offences should be much more severe". Significant changes from SARTRE 3 to SARTRE 4. are indicated in bold type.

	speeding		alcohol		Mean
	agree+	S4-S3	agree+	S4-S3	
Hungary	72%	-0%	92%	-1%	82%
Cyprus	71%	+0%	88%	-1%	80%
Israel	66%		91%		78%
Serbia	71%		84%		77%
Ireland	66%	-3%	85%	-6%	76%
Estonia	56%	+9%	93%	+12%	75%
Czech Rep	57%	-21%	88%	-3%	72%
Greece	60%	-7%	79%	-12%	69%
Spain	54%	-5%	80%	+3%	67%
Netherlands	42%	-7%	92%	-3%	67%
Poland	48%	+2%	85%	-1%	67%
Finland	40%	-40%	91%	-3%	66%
Italy	50%	-17%	74%	-16%	62%
Germany	43%	-2%	81%	-5%	62%
Sweden	37%	-2%	86%	-7%	61%
Austria	49%	-3%	73%	-6%	61%
Belgium	38%	-22%	75%	-7%	57%
France	33%	-34%	79%	-14%	56%
Slovenia	32%	-26%	77%	-9%	55%
Mean	52%	-11%	84%	-5%	

Conclusion

In addition to the detailed results presented above, the conclusion aims at highlighting the most important findings and transferring them into recommendations for joined actions of policy makers and road safety experts.

For European car drivers a slight overall reduction in concern about road safety could be observed. Despite this, among the ones assessed, it is still the top ranked concern and therefore road safety should play an important role in future European policy direction. When relating the amount of concern about road safety to the country specific fatality rates, some patterns occurred that might be worth to be considered by national policy makers. On the one hand there are countries as for example Poland, that despite a high fatality rate and despite this being perceived by the people, only have a very low level of concern within the population of car drivers. For these countries it might be important to raise concern about the national road safety situation. On the other hand, in countries as Cyprus and in particular Greece a comparably low road safety level corresponds to a very high level of concern. At the same time these countries also rank highest in the occurrence of risky driving behavior. Therefore, these countries might have to focus on the development of strategies to canalize the awareness of a road safety problem into an improvement of more safety adequate driving behavior.

When it comes to the perception of accident causes, two aspects seem most relevant. First, drugs seem to have been established as a serious problem for road safety in the car drivers' minds. Second, as opposed to what might have been expected from their increased use, handheld phones are even less regarded as potential accident cause than eight years before. At the same time people report substantial use rates during driving. Taken together, these findings suggest that the topic of distraction by mobile phones and possible also other devices should gain more attention in road safety work. This is especially true, because since the last SARTRE survey, a large amount of research has confirmed the negative effects of the use of mobile phones and other devices while driving (for an overview see Caird et al., 2008).

From the viewpoint of attitude research it is somewhat contradictory that despite large improvements in traffic safety, as indicated by a reduction in fatalities by 44%, almost all attitudinal indicators showed a tendency towards a slight increase in risky driving behavior and at the same time a reduction in the acceptance of more severe penalties. It is beyond the scope of this chapter to discuss the origin of these findings in detail, but it has to be kept in mind that the good efforts that were taken to improve road safety over the last eight years are no reason to sit back. In fact, the results presented in this chapter should be a trigger to consider how stagnation or even reduction in safety culture in some countries can be counteracted in due time.

Chapter 1.3

Car drivers' perceptions of speeding and speed enforcement

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Yaw Bimpeh (RSA, Ireland)

Introduction

To disregard the speed limit is considered to be the most frequently reported road traffic violation (Gras, et al., 2004; Stradling, et al., 1992). In general, speeding is not perceived to be a serious offence (Åberg, et al., 1989; Corbett, 1991; Hills, et al., 1993) and is not usually believed to play a major role in accident causation (Stradling et al., 1992). This is a cause of great concern since greater speed not only reduces the time available to avoid a collision it also makes the impact more severe. For instance, the likelihood of a pedestrian being killed in a collision with a vehicle is much greater if the speed is 70 km/h as compared to 30 km/h (Stigson & Kullgren, 2010). However, studies have found that drivers might be aware of the link between speeding and crash risk, the problem is that they do not believe that they themselves are at risk. This was demonstrated in a study by Brown and Cotton (2003) who found that drivers who speeded believed that they could do so but still drive safely. There is also evidence to suggest that speeding is related to beliefs which minimize the perception of risk (Brown & Cotton. 2003; Christensen, et al., 1999). Drivers speeding in an urban area believe that they are better adjusted to the speed of other drivers, get to the destination quicker and that it makes the journey more pleasant (Parker, et al., 1992; Wallén, Warner & Åberg, 2008). In addition to being influenced by attitudes, car drivers are also influenced by social norms. Drivers who deviate from the rules often believe that this is accepted by others and that their behaviour does not deviate from what is considered to be normal. One way to reduce speeding is various forms of sanctions, although it would appear that with regard to high offenders this has not always had the desired effect. Corbett (1991) found that the fear of being stopped by the police for speeding was lower amongst a group of high offenders as compared to low offenders. This can be explained using the 'deterrence theory' which advocates that a person will avoid a criminal act if they believe and fear that it will result in sanctions (Freeman, et al., 2006). The aim of this chapter is fourfold:

- To investigate European car drivers' attitudes to speeding and speed enforcement controlling for age and gender.
- To analyse the difference between SARTRE data from 2003 with the present study
- To examine the relationship between survey data and official statistics collected in the different countries
- To predict drivers intention to speed

Method

In this chapter car drivers' responses are presented focusing on frequency and controlling for the effect of age and sex. In this instance the term 'car drivers' refers to drivers who have a (full) driving licence and have driven a car in the last 12 months. For age groups the sample was divided into the following groups: 18-24, 25-34, 35-44, 45-54, 55-64 and 65 years and older. A comparison is also made between data from 2003 (SARTRE 3) and the present study. Contextual data is being analysed in order to determine possible links between survey data and general statistics from the different countries. Finally a number of analyses are carried out to determine important factors predicting drivers´ intention to speed. The key questions selected for further analysis in this chapter are as follows:

Four items measure *attitudes* towards driving 20 km/h over the speed limit in a residential area: makes driving more pleasant; take them to the destination quicker; increase the risk of being involved in an accident; lead to being stopped and fined by the police *(1= very to 4= not at all)*. One item considers the likelihood of their friends driving 20 km/h over the speed limit in a residential area. *(1= very to 4= not at all)*. One item measures *intention* "Over the next month, how likely would you be to drive at 20km/h over the speed limit in a residential area?" *(1= never to 6= always)*. Four items measure *descriptive norms* with regard to other drivers in general speeding on motorways, on main roads between towns on country roads and in built up areas *(1= never to 6= always)*. One item measures their *perceived likelihood of being checked* for speeding on a typical journey (*1= never to 6= always)*.One item deals with *number of fines and other penalties* for speeding during the last 3 years *(1= yes; 2= yes only fined; 3= fined and/or other penalty)*. One item asks if they are in *favour of more 30 km/h zones* in built up areas *(1= very to 4= not at all)*. One item asks if they believe that the *penalty for speeding* offences should be more severe *(1= strongly agree to 5= strongly disagree)*. Finally the respondents' age, gender, marital status, level of education, area of living, distance travelled and involvement in an injury-causing accident is included in the analysis. The following tests were used to analyse the data:

A *t*-test is used to analyse the differences between men and women together with Cohen's *d* to determine the size of the difference in the means (small 0.10; medium 0.30; large 0.80). An ANOVA is used to determine the differences between age groups. This test was also used to assess the difference between countries. When the ANOVA is used Eta Square establishes its magnitude (small 0.01; medium 0.06; large 0.14). The only exception is the use of a Chi-square test when the data is nominal. A *t*-test is used to assess the difference between data collected for SARTRE 3 and SARTRE 4. To determine the relationship between some of the variables Pearson's correlation coefficient is used. An assessment of important factors which affect the intention to speed in a residential area is based on a logistic regression. Hosmer-Lemeshow test (see Hosmer, Lemeshow, 2000).

Where appropriate some of the scores have been recoded such that a higher score always indicates a more positive stance towards the intention to unsafe behaviour.

Results

This section presents the principal results of SARTRE 4 regarding speeding and speed enforcement.

Speeding in a residential area

In the survey a number of questions addressed car drivers' attitudes towards driving 20 km/h over the speed limit in a residential area. Since the speed limit in most countries is 50 km/h this would then mean a speed of 70 km/h. The respondents had to indicate how much they agreed to each of the five statements. The first question asked if driving at this speed would make the driving more pleasant. Figure 1 presents the percentage who agreed "very" or "fairly" with the statement.

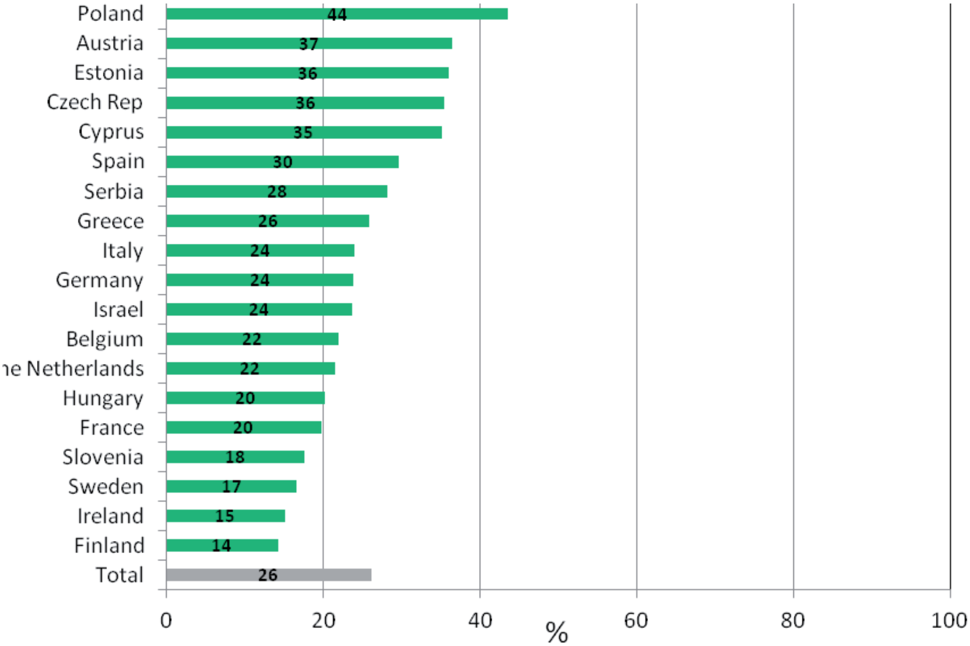

Figure 1: Percentage that agree «very» or «fairly» with that driving 20 km/h over the speed limit in a residential area makes driving more pleasant.

Drivers from Poland (M= 2.42; Sd= .81) argue most strongly that such speeding will make driving more pleasant and drivers from Finland (M= 1.60; Sd= .79) are least likely to agree with this statement. With regard to the effect of gender and age significant differences are found: 29% of the men stated that it was "very" or "fairly" pleasant to speed in a residential area compared to 23 % among the women (t= -7.46; p<0.001; d= -.1). The age group most likely to agree with speeding is those aged 18-24 and those least likely to agree is those aged 65+ (F= 4.871; p<0.001; Eta^2= .03).

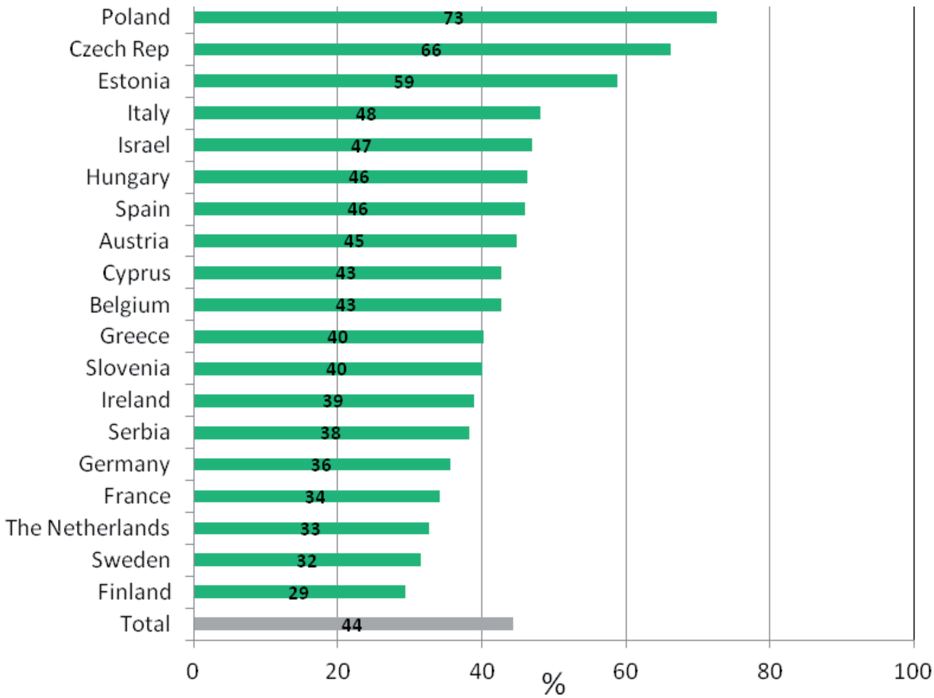

Figure 2: Percentage that agree «very» or «fairly» that driving 20 km/h over the speed limit in a residential area will take them to the destination quicker.

Drivers in general agree with the statement that speeding will take them to the destination quicker (see Figure 2). Drivers from Poland (M= 2.89; Sd= .82) are most in agreement with this and drivers from Finland (M= 2.01; Sd= .88) are those least likely to agree. Further analysis show that men and women are significantly different (t= -4.98; p<0.001; d= .1). Almost half of the male respondents (46%) agree "very" or "fairly" with this statement compared to 42% of the female respondents. For the different age groups it was the youngest group (18-24 years) who agree most strongly (60%) while just 30% of those aged 65 agree (F= 5.441; p<0.001; Eta^2= .03).

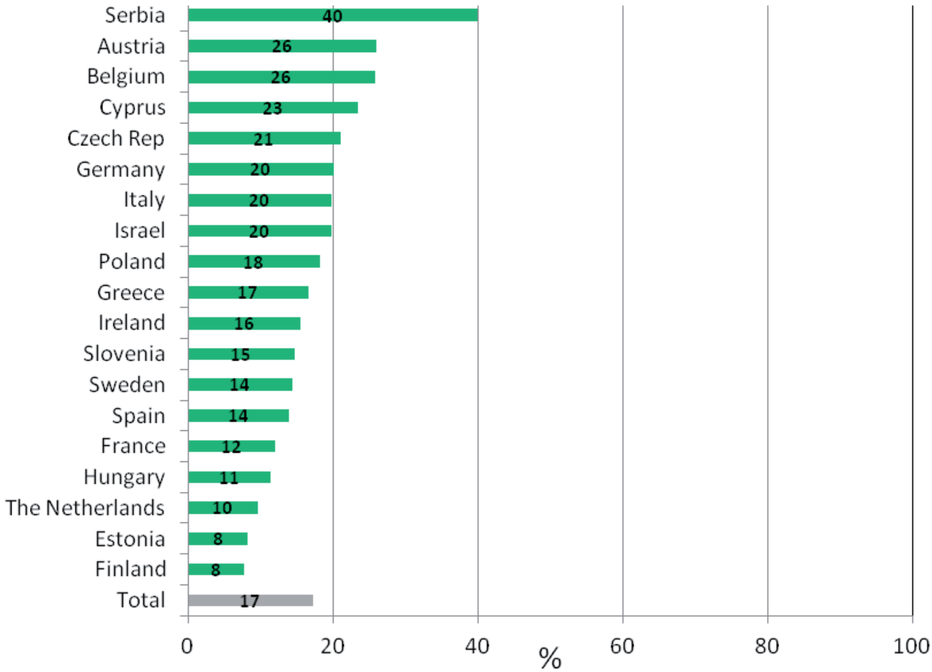

Figure 3: Percentage that agree «not much» or «not at all» that driving 20 km/h over the speed limit in a residential area will increase the risk of being involved in an accident.

Relatively few drivers would disregard the risk of being involved in an accident (see Figure 3). However, the country with the greatest proportion of sceptics is Serbia (M= 2.25; Sd= 1.08) where 40% do not believe that speeding increases the risk of accidents. In contrast drivers in Finland are more likely to believe that it will result in an accident (M= 1.48; Sd= .70). Males disagree significantly more than women (19% of the men and 15% of the women) (t= 7.80; p<0.001; d= .1) and there is a significant difference for drivers at different age groups (F=1.542; p<0.001; Eta^2= .01). However, young and middle-aged respondents (18-44 years) have a similar view as the men (18-20%) so the notable difference was between this group and those aged 45 and more. About 15% in the latter group do not believe that speeding in a residential area will increase the chances of being involved in an accident.

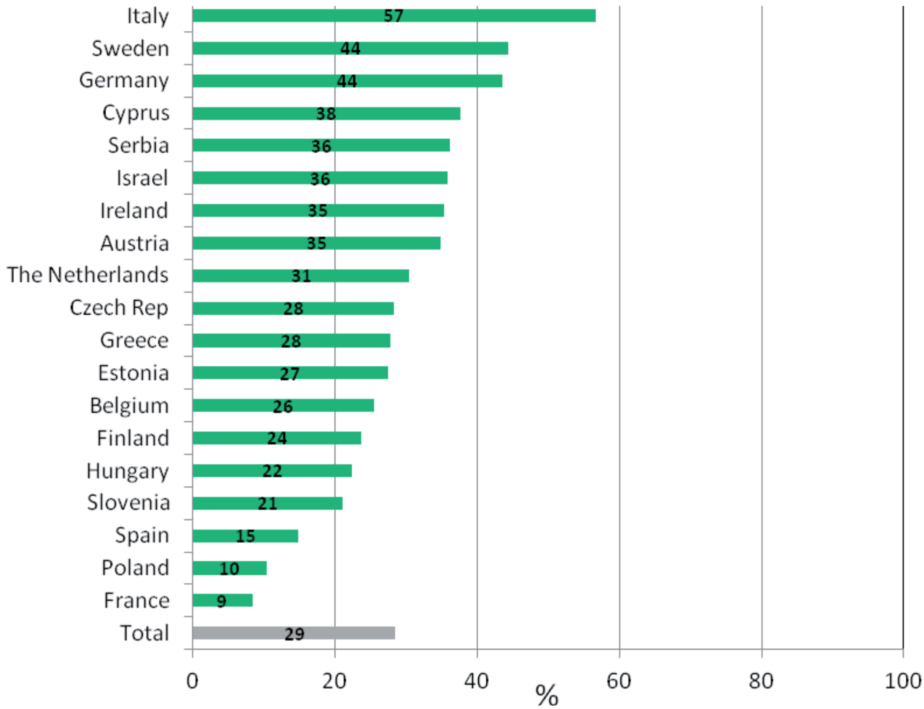

Figure 4: Percentage that does not believe that driving 20 km/h over the speed limit in a residential area would lead to them being stopped and fined by the police.

The perceived likelihood of being stopped by the police is greatest in France (M= 1.50; Sd= .69) and Poland (M= 1.69; Sd= .70), see Figure 4. In Italy however, more than half of the respondents believe that the chance is rather small (M= 2.57; Sd= .85). There is also a small but significant difference between men and women (females 28%; males 29%) (t= 2.54; p<0.01; d= .04). With regard to age no significant difference between the groups is found.

When the mean values from the different questions measuring their attitudes towards speeding were compared the results show that drivers are most likely to agree that it makes the journey faster (M= 2.35; Sd= .94) followed by more pleasant (M=1.95; Sd= .88).

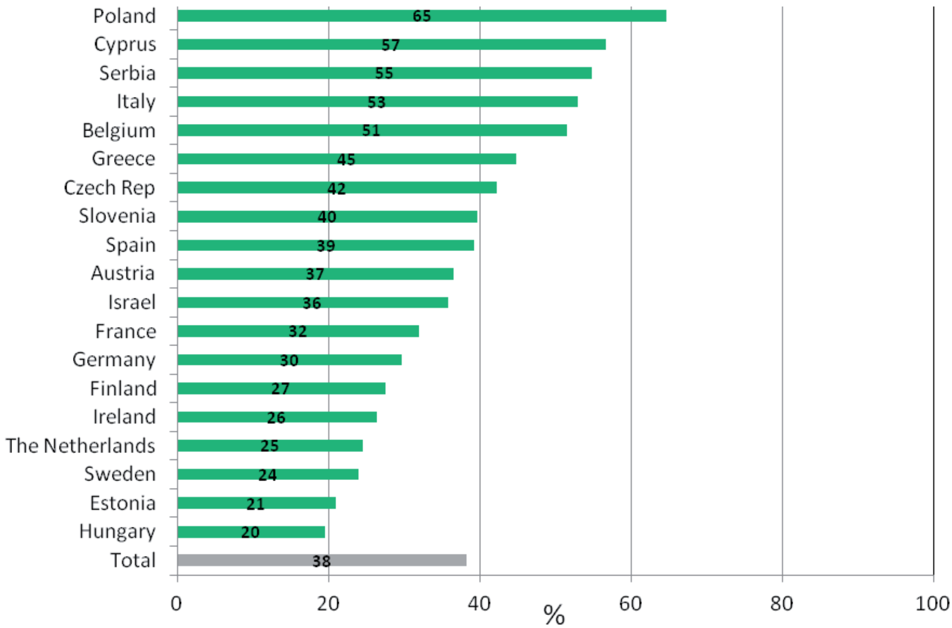

Figure 5: Percentage that agree "very" or "fairly" much with that most of their friends would drive 20 km/h over the speed limit in a residential area.

Figure 5 shows that drivers from Poland believe to a greater extent than others that their friends would speed in a residential area. Drivers from Hungary are those that are least likely to be of the same opinion. When their mean values are analysed similar results are presented. The highest value (i.e. believe friends will speed) is presented by drivers in Poland (M= 2.76; Sd= .81) followed by drivers from Serbia (M= 2.63; Sd= .88) and then Cyprus (M= 2.62; Sd= .89). Drivers in Hungary and Sweden are least likely to believe that their friends will speed (M= 1.81; Sd= .84 and M=1.92; Sd= .84 respectively).

A significant gender difference exists: 41% of the male respondents agree "very" or "fairly" with the statement while the same applies to 35% of the females (t= -7.13; p<0.001; d= -.1). Also a clear effect of age is found since the youngest age group (18-24 years old) is more likely to agree with the statement (48%) than drivers in the oldest age group (27%) (F= 6.04; p<0.001; Eta^2=.04).

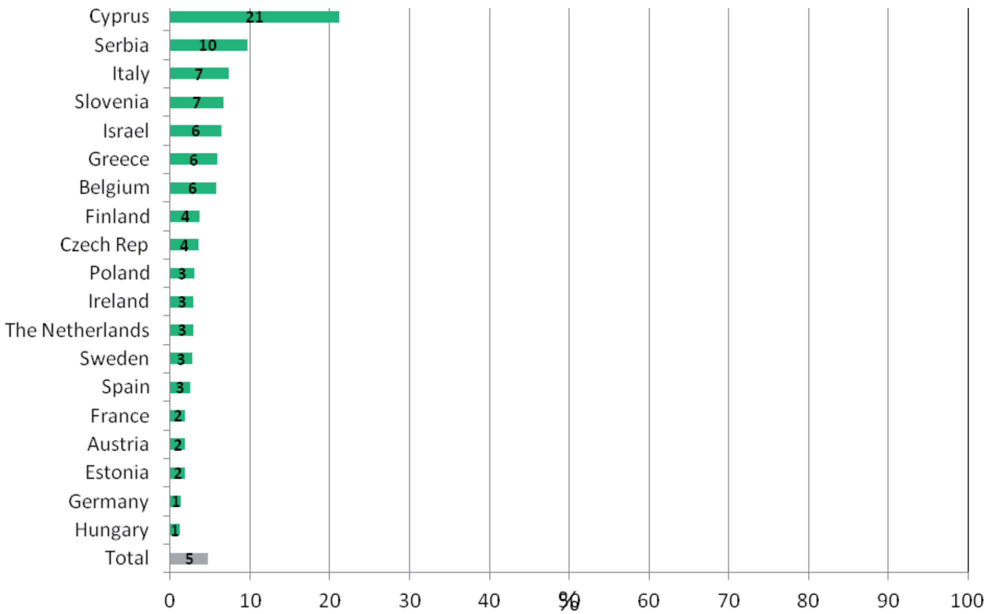

Figure 6: Percentage that answered "very often" or "always" when asked how likely it would be to drive at 20 km/h over the speed limit in a residential area the next month.

One question assessed car drivers' intention to speed by asking them if they were likely to drive at 20 km/h in a residential area within the next month. Car drivers from Cyprus are most likely to speed in this setting and drivers from Hungary least likely, see Figure 6. When their mean values are assed then the lowest value (i.e. less likely) is presented by Hungarian (M= 1.57; Sd= .84) drivers followed by drivers from Estonia (M= 1.69; Sd= .88). Drivers most likely to speed came from Cyprus (M= 3.16; Sd= 1.41), followed by Italy (M=2.66; Sd= 1.20) and then Serbia (M= 2.61; Sd= 1.25). Men are twice as likely to speed in a residential area within the next month (6 % and 3 % answered "very often" or "always", respectively) than women (t= 14.97; p<0.001; d= .3). There is also a clear effect of age in the data. The percentage that "very often" or "always" will drive as described in the scenario decreases from 10 % (age group 18-24) to 1% (65+) (F= 11.55; p<0.001; Eta^2= .07).

Drivers' perception of other drivers

The questions in this section deal with drivers' perception of how other drivers would drive. Since speeding is related to its context the questions were divided into different road types: motorways, main roads between towns, country roads and built-up areas.

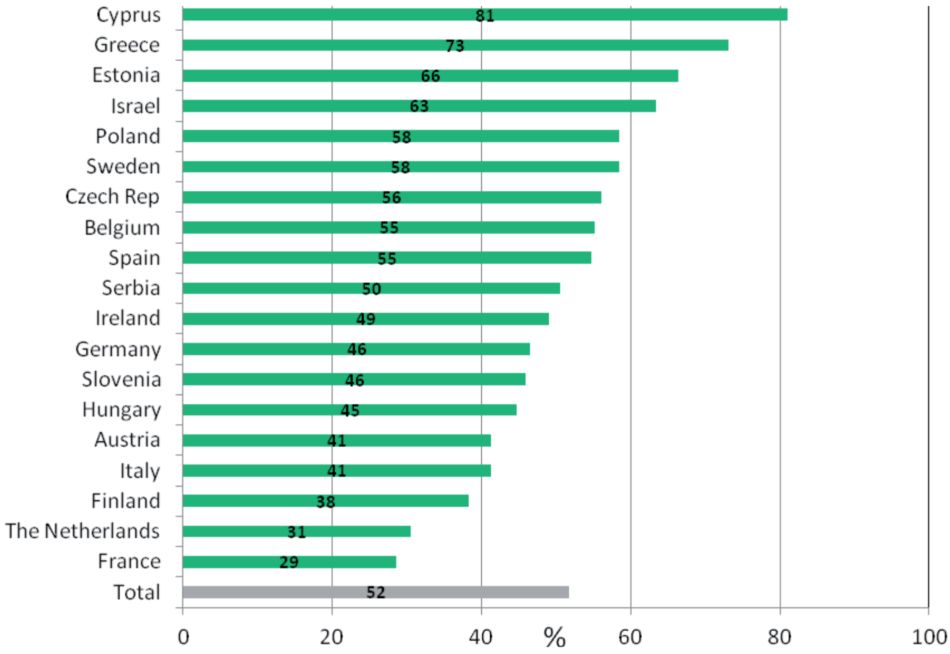

Figure 7: Percentage that think other car drivers "very often" or "always" speed on motorways.

Figure 7 shows that an overall majority of drivers believe that other car drivers speed on motorways. In Cyprus (M= 5.13; Sd= .96) and Greece (M= 4.92; Sd= 1.00) this figure is over 70 per cent. However, the same percentages in France (M= 3.95; Sd= .99) and Netherlands (M= 4.10; Sd= .84) are substantially less (29-30%). Women believe to a greater extent that other car drivers "very often" or "always" speeded on motorways (54%) compared to men (50%) (t= -3.62; p<0.001; d= -.1). The younger respondents also perceive other car drivers as speeding more frequently, e.g. 59% of the respondents aged 18-24 years compared to 45% of those aged 65 years or more (F= 2.89; p<0.001; Eta^2= .02).

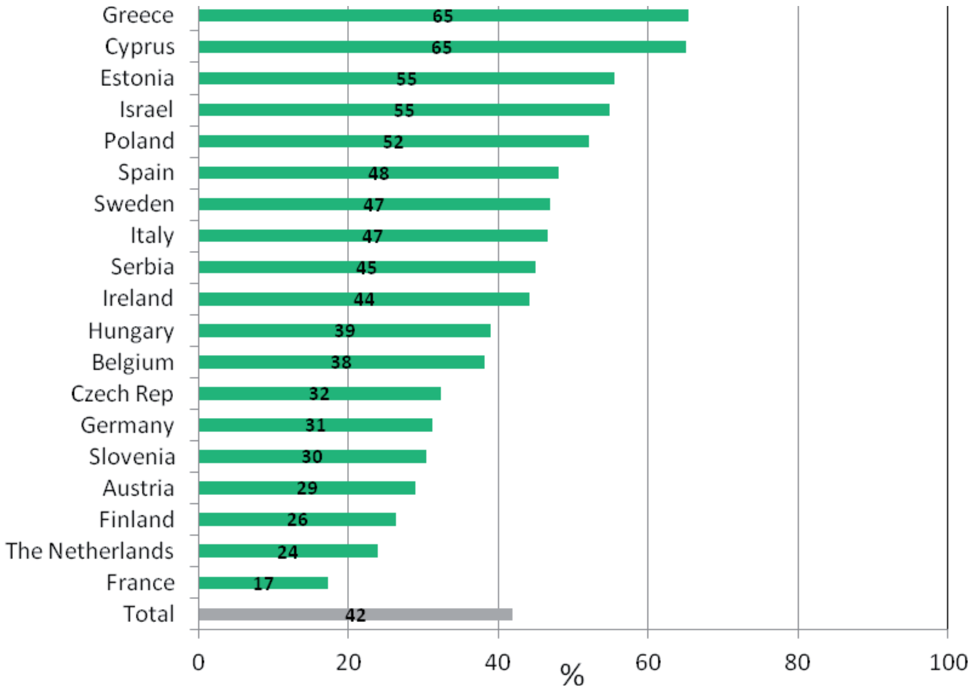

Figure 8: Percentage that think other car drivers «very often» or «always» speed on main roads between towns.

Concerning, the perception of speeding on main roads, it is fairly usual that respondents believe that other car drivers speed on main roads (Figure 8). This time car drivers from Greece (M= 4.76; Sd= .94) and Cyprus (M= 4.70; Sd= 1.00) are most likely to agree with the question and drivers from France (M= 3.82; Sd= .81) and the Netherlands (M= 3.99; Sd= .84) least likely. However, with regard to the mean values, Austria is the country with the lowest value indicating that they are the least likely group believing that others would speed (M= 3.81; Sd= 1.17). A small difference between men and women is found (t= -2.23; $p<0.05$; d= -.04) with men being more likely to believe that others would speed. With regard to age the same pattern could be seen as for the previous question. The youngest age group believe to a greater extent that others speed on a main road (44%), whereas the same applies to 36% amongst drivers aged 65+ (F= 2.00; $p<0.001$; Eta^2= .01).

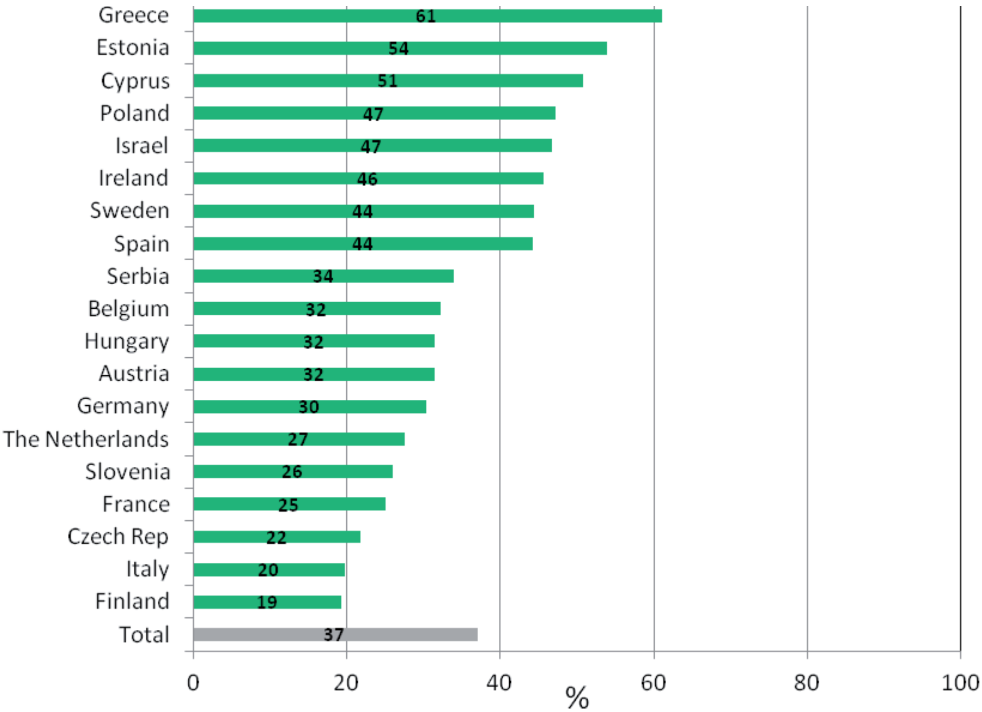

Figure 9: Percentage that think other car drivers «very often» or «always» speed on country roads.

Figure 9 shows that when compared to the other roads, fewer drivers believe that others speed on a country road. Greek drivers (M= 4.67; Sd= .93) are still at the top but this time drivers from Finland tend to disagree more than respondents from other countries (M= 3.66; Sd= .98). The results also found a small, but significant, gender difference (females 38 %; males 36 %) (t= -2.88; p<0.001; d= -.05). For the different age groups the difference is also significant. From the youngest to the oldest age groups, the proportion that answered "very often" or "always" decreased from 39 % to 30 % (F= 2.38; p<0.001; Eta^2= .02).

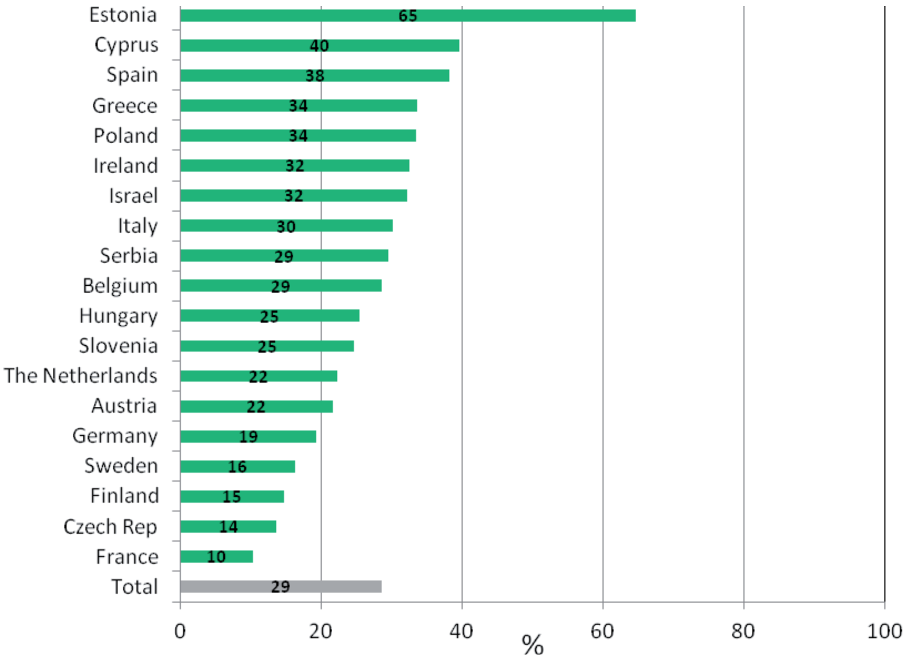

Figure 10: Percentage that think other car drivers «very often» or «always» speed in built-up areas.

A very large percentage of Estonian drivers (M= 4.81; Sd= 1.06) believe that other drivers speed in built up areas (see Figure 10). However, the same does not apply to French drivers (M=3.38; Sd= .94) and drivers from the Czech Republic (M= 3.33; Sd= 1.06) where only a small proportion believe that others will speed. No gender differences could be found, but the age pattern is similar as seen for the other road environments, with a decreasing percentage with increasing age. Close to 30% of the respondents aged 18-24 years believe that other car drivers "very often" or "always" speed in built-up areas compared to 25% in the oldest group ($F=1.48$; $p<0.01$; $Eta^2= .01$).

Drivers' expectations of speed enforcement and self-reported fines

The survey also included questions about speed enforcement and if they had received any penalties for speeding. Figure 11 shows the results from the question regarding how likely it is that they would be checked for speeding.

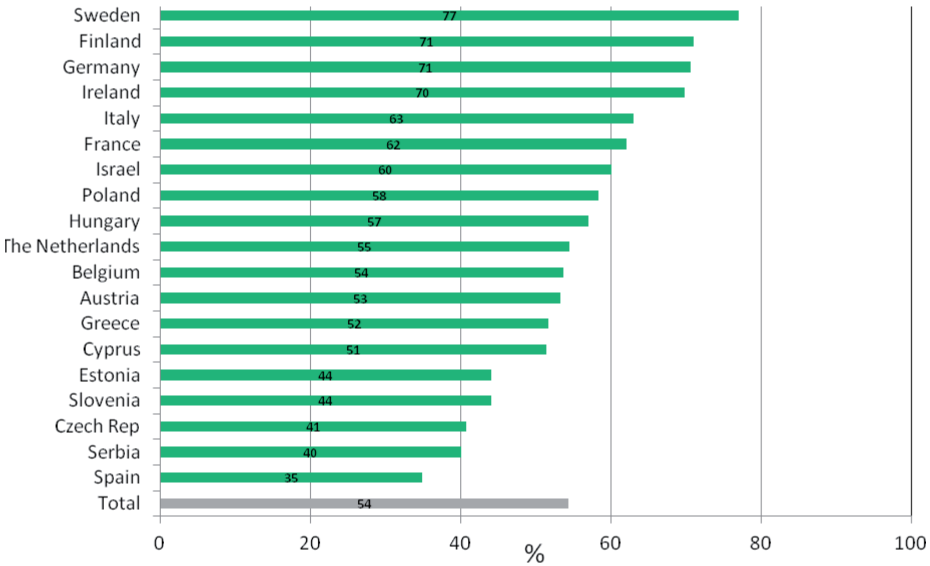

Figure 11: Percentage that answered «never» or «rarely» when asked how likely it would be to be checked for speeding on a typical journey.

More than half of the respondents do not perceive it as very likely that they would be checked for speeding on a typical journey. This applies in particular to Sweden (M= 4.87.13; Sd= .73), Finland (M= 4.67; Sd= .75) and Germany (M= 5.75; Sd= .85). In fact when only looking at mean values Ireland has the highest value (M= 4.89; Sd= .87). The same does not apply to drivers in Spain (M= 4.03; Sd= .14), Serbia (M= 4.22; Sd= 1.00) and Slovenia (M= 4.17; Sd= 1.08) who perceive the likelihood of being checked for speeding to be greater than other countries. Male respondents believe that it is more likely that they will be checked (52% answered "never" or "rarely") than women (58%) (t= 7.80; p<0.001; d= .1). Age has also a significant effect (F=2.98; p<0.001; Eta^2= .02). Respondents aged 18-44 years have a similar opinion (51-52 % answer "never" or "rarely") whilst the oldest group believe that it is less likely (e.g. 68% of the 65+ respondents answer "never" or "rarely").

The Figure 12 compares the results from SARTRE 3 conducted in 2002 with the present study regarding the likelihood of being checked for speeding on a typical journey. The asterisks denote a significant difference (p<0.05).

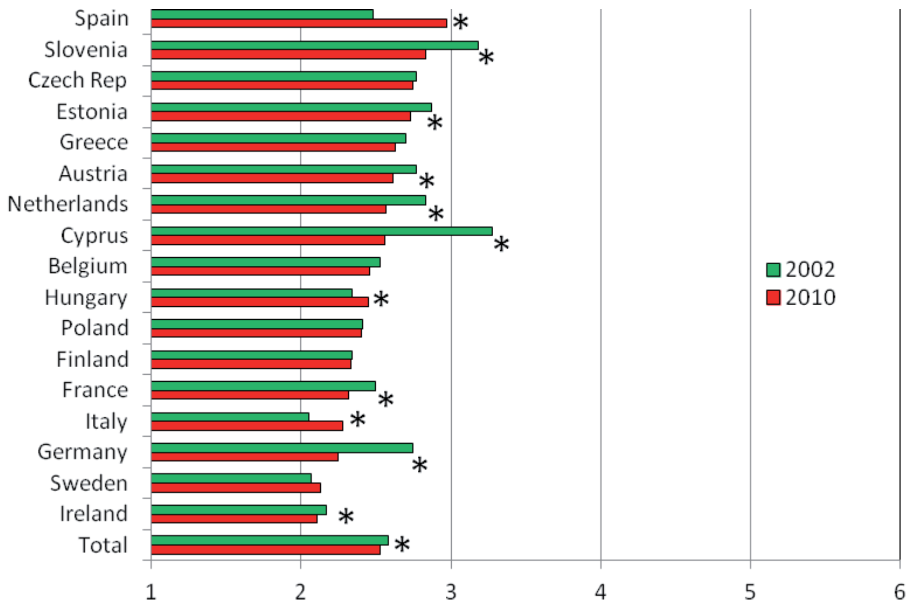

Figure 12: Perception of how likely it was that respondents would be checked for speeding on a typical journey. Comparison of data from 2002 with data from 2010.

About half of the countries significant changes had taken place (*t*-test; p<0.05), see Figure 12. In the same countries the chances of being stopped, in eight out of eleven cases, is perceived as less likely than before.

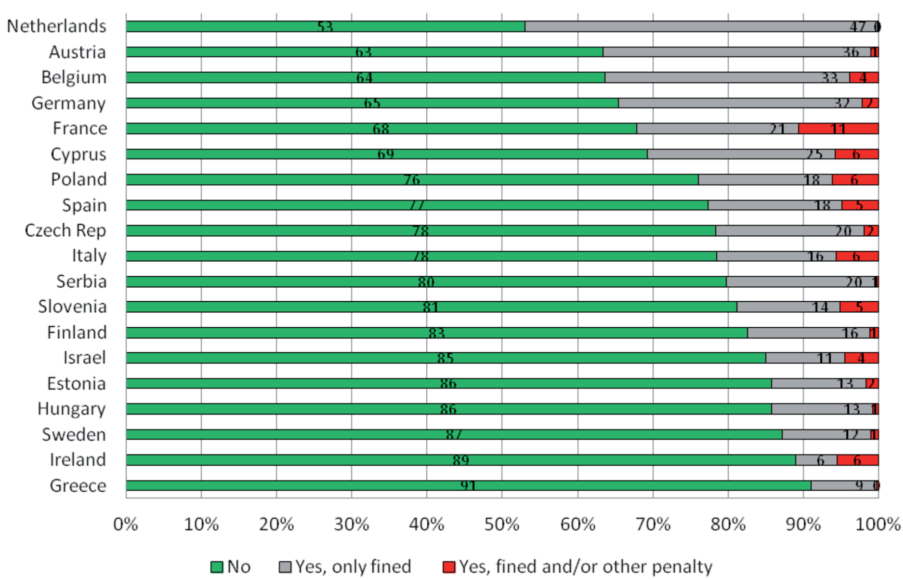

Figure 13: Fined and/or other penalty for speeding during the last 3 years (%).

The drivers had to indicate if they had been fined or received other penalties during the last 3 years for speeding, drivers in the Netherlands are most likely to have received a fined and drivers in Greece least likely (see Figure 13). Men have also been penalised more than women, 28% compared to 17% (χ^2= 231.00; p<0.001), and those aged 25-34 years more than the oldest age group (27% and 17% respectively) (χ^2= 73.09; p<0.001). Since drivers' perception of being checked for speeding might be influenced by whether they had received some form of punishment in the past, the correlation coefficient was calculated. Drivers who had been fined are more likely to believe that they would be checked, but the correlation is low (r= .17; p <0.01).

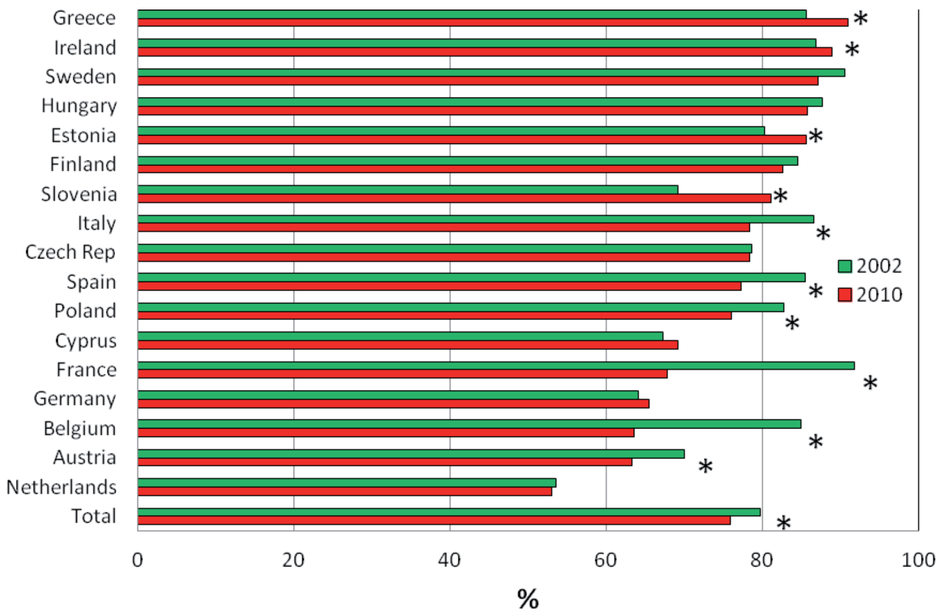

Figure 14: Drivers who had not been fined for breaking the speed limit during the last 3 years. Comparison of data from 2002 and 2010.

Figure 14 shows the proportion of drivers who had <u>not been</u> fined according to the two surveys. In about half of the countries, a significant change had taken place between 2002 and 2010. In four of the countries respondents had received fewer fines in 2010 and in six of the countries more fines in 2010 when compared with 2002. Overall, the percentage who had been fined had increased in 2010 compared to 2002.

Attitudes towards speed limits and enforcement

One part of the questionnaire included questions about speed limits in built-up areas and enforcement in general. In Figure 15 drivers' attitudes towards a 30 km/h zone in built-up areas is presented and the question was whether they were in favour of more zones having this restriction.

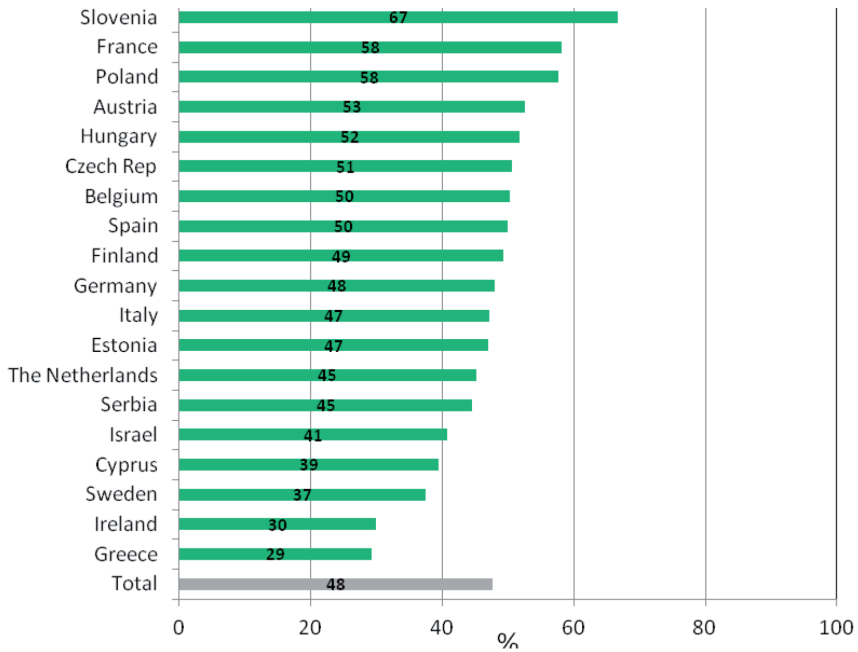

Figure 15: Percentage that were «not much» or «not at all» in favour of more "30 km/h" zones in built-up areas.

A fairly large proportion of drivers are opposed to an increase in the number of 30 km/h zones in built up areas. In eight of the countries this applies to 50% or more of the population. The countries most in favour of the 30 km/h speed restriction are: Sweden (M= 2.21; Sd= 1.02), Greece (M= 2.13; Sd= .87) and Ireland (M= 1.99; Sd= .97). Drivers least in favour comes from Slovenia (M= 2.80; Sd= .99). There are some significant differences between men and women and the different age groups. Over half of the men (53%) were "not much" or "not at all" in favour of more "30 km/h" zones in built-up areas, significantly more than women (40%) *(t*= 22.54; p<0.001; *d*= .3). The youngest age group (aged 18-24 years) tend to be less in favour of more zones (53%), in contrast to the oldest group (39%) (F= 3.33; p<0.001; Eta^2= .01). Drivers who intend to speed in a residential area are less in favour of more 30 km/h zones, but the correlation is low (r= .14; p<0.01).

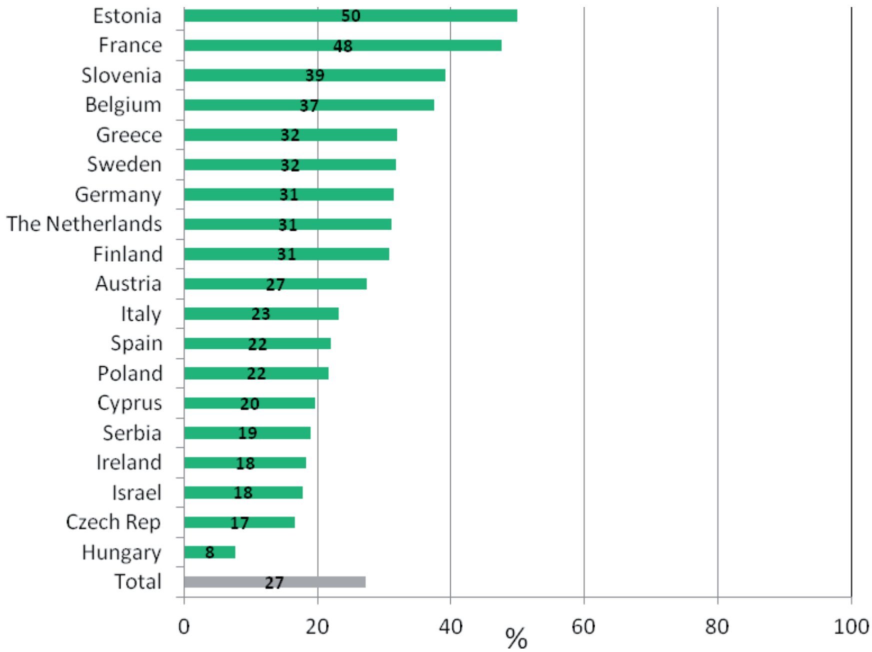

Figure 16: Percentage that disagreed/strongly disagreed with that penalty for speeding offences should be more severe.

Figure 16 shows drivers attitudes towards penalties for speeding and if these should be more severe or not. Around a quarter of drivers would not like to see more severe penalties for speeding. Drivers in Estonia (M= 2.95; Sd= 1.37) and France (M= 3.17; Sd= 1.37) are most likely to argue that penalties should not become more severe. In contrast, drivers from the Czech Republic (M= 2.35; Sd= 1.11) and Hungary (M= 1.92; Sd= 1.01) are most in favour of an increased fine. The latter also applies to women since 20% agree with the statement; the corresponding percentage among men is 32% (t= 23.49; $p<0.001$; d= .3). With increasing age drivers become significantly more positive towards increased penalties since only 18% disagree with the statement, which can be compared with 31% in the youngest age group (F= 4.85; $p<0.001$; $Eta^2=.02$). Consistent with previous findings drivers who had been fined are less likely to agree with the statement that the penalty should be more severe (r= .18; $p< 0.01$).

Survey data linked to contextual data

As part of the SARTRE project, official statistics from the different countries was collected. With regard to speeding information about speed limits, the number of speed tickets and how many speeding checks are carried out per population was compared with self-reported data. For instance, in 2008, the Netherlands, France and Cyprus had more than hundred yearly checks per 1000 population. In the Netherlands it was as high as 558, which can be compared with 17 in the Czech Republic. Different hypotheses were therefore tested, analysing if it was a relationship between numbers of issued tickets with three other results from the present survey namely; the percentage of drivers who had been charged with speeding; their perception of the likelihood of being charged, i.e. perceived susceptibility; and their intention to speed in a residential area. In order to carry out these tests the first task was to relate the number of speed tickets with the number of passenger cars and then to compare this with questions about how many times they had been stopped and fined, fined or punished in the past three years and the perceived likelihood of being charged. The results reveal only one significant relationship. Countries with at greater number of speed tickets per number of cars also have the largest percentage of drivers who report being fined in the last three years (Figure 17).

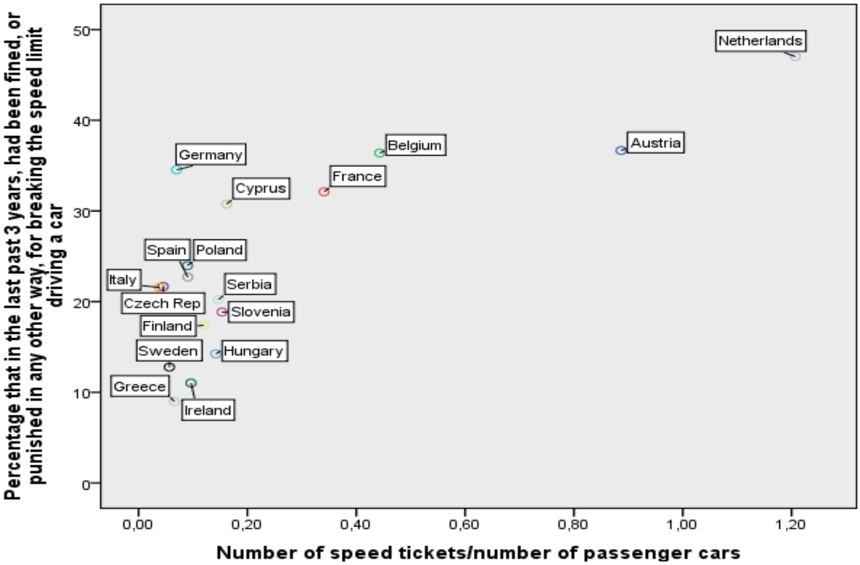

Figure 17: Tickets for speeding and percentage of subjects that the last three years had been fined or else punished for speeding.

A higher number of speed tickets per car are related to a significantly larger percentage of participants reporting fines or other punishments for speeding, r= .76; p<0.01. However, the relationship between the number of tickets, according to official statistics, and their perceived risk of being penalised is not significant. The exception is Italy where the chance of being stopped by the police is rather low. More than 50% of drivers did not fear a fine and at the same time they had a lesser chance of being stopped by the police. On the other hand, in both Austria and the Netherlands, on average about one speed ticket was issued for each car, but still the respondents did not perceive the chance of being stopped and fined for speeding in a residential area as very great. Furthermore, the results did not present any relationship between the number of speed tickers per car and drivers intention to speed in a residential area.

Important factors influencing drivers' intention to speed

In order to present a profile of drivers who intend to speed this section investigates the association between intention to speed and various factors. In the SARTRE 4 survey, 18 questions deal with the topic of speeding. One is used to classify the drivers as those who intend to break the speed limit, which in this instance is the dependent variable, and those who do not intend to break the speed limit. The other variables will be used as possible independent variables that predict the intention to speed. In addition, some demographic variables like age, gender, socio-economic status and the nationality of the respondent are included in the model.

The outcome variable is binary and based on the item in the questionnaire which relates directly to breaking the speed limit; 'Over the next month, how likely or not would you be to drive at 20km/h over the speed limit in a residential area?' There are six response choices to this question (never, rarely, sometimes, often, very often and always). Respondents to the question are recoded with 1 representing those who report they are likely to drive at 20km/h over the speed limit in a residential area at least sometimes and 0 representing those who report that they 'never' or 'rarely' intend to drive at 20km/h over the speed limit in a residential area. Drivers who report they are likely to drive at 20km/h over the speed limit in a residential area, at least sometimes, are referred to as speeding drivers.

The explanatory variables used in the model are: nationality of the driver, gender, age (a categorical variable with the following grouping: 17- 24, 25-34, 35-44, 45-54, 55-64 and 65+), marital status, level of education, living area, how likely they will be checked for speeding, speeding fine, attitudes towards speeding (four questions), descriptive norm (related to four different roads), kilometre travelled and involvement in an accident.

Logistic regression modelling is used to examine the association between the explanatory variable and intention to speed. This model is used to obtain estimated measures of association in terms of odds ratios. The strength of association is based on p-value. By convention, $p<0.05$ is accepted as evidence of association. The Hosmer-Lemeshow test showed a good fit of the model ($\chi^2_{(8)} = 4.3$, $p = 0.83$) and it explained 77% of the variance in intention to speed in a residential area (Table 1).

Table 1: Logistic regression for intention to speed (in brackets reference category).

	speeding	Odds Ratio	z	P>z	[95% Conf.	Interval]
Nationality		1.023	5.19	0.00	1.014	1.031
Gender (male)	female	0.810	-4.15	0.00	0.733	0.895
Age (17-24 yrs)	45-54	0.766	-2.71	0.01	0.631	0.929
	55-64	0.637	-4.17	0.00	0.515	0.787
	65+	0.422	-6.50	0.00	0.325	0.547
Education (primary)	further education	1.284	3.22	0.00	1.103	1.494
Area (rural/village)	Small town	0.866	-2.19	0.03	0.761	0.985
	Urban City/ Large town	0.814	-3.36	0.00	0.721	0.918
Checked for speeding residential area (never)	rarely	1.826	6.71	0.00	1.531	2.176
	sometimes	2.940	11.74	0.00	2.455	3.520
	often	2.823	9.75	0.00	2.292	3.478
	very often	2.579	6.18	0.00	1.910	3.481
	always	2.070	3.01	0.00	1.289	3.325
Speeding is pleasant (very)	not much agree	0.758	-2.44	0.02	0.607	0.947
	not at all	0.575	-4.67	0.00	0.456	0.725
Speeding is Quicker (very)	fairly	0.804	-2.72	0.01	0.687	0.941
	not much	0.654	-5.09	0.00	0.556	0.770
	not at all	0.609	-5.07	0.00	0.502	0.738
Speeding increase accident risk (very)	fairly	1.551	7.54	0.00	1.384	1.738
	not much	2.274	10.60	0.00	1.953	2.647
	not at all	3.042	8.51	0.00	2.354	3.930
Most friends speed in residential area (very)	fairly	0.708	-4.10	0.00	0.601	0.835
	not much	0.202	-18.83	0.00	0.171	0.238
	not at all	0.103	-21.62	0.00	0.084	0.126

speeding fine (no)	Yes, only fined	1.499	6.88	0.00	1.336	1.683
	Yes, only fined and/ or other	2.196	6.19	0.00	1.712	2.816
Will be stopped and fined by police (very)	not much	1.391	4.52	0.00	1.206	1.606
	not at all	2.030	6.11	0.00	1.617	2.547
Other drivers speed on motorway (never)	rarely	2.776	2.57	0.01	1.275	6.041
	sometimes	2.463	2.27	0.02	1.132	5.358
	often	2.301	2.10	0.02	1.058	5 .006
	very often	2.239	2.03	0.04	1.027	4.882
	always	2.541	2.32	0.02	1.155	5.593
Other drivers speed in built up areas (never)	rarely	1.864	2.15	0.03	1.057	3.286
	sometimes	2.044	2.49	0.01	1.164	3.590
	often	2.618	3.34	0.00	1.489	4.605
	very often	2.735	3.45	0.00	1.545	4.843
	always	2.619	3.16	0.00	1.441	4.761
Kilometre travelled	>7500 and <=10000	1.519	4.91	0.00	1.286	1.794
	>10000	1.751	7.51	0.00	1.513	2.027
Injury accident	Yes	1.467	4.02	0.00	1.217	1.768

z= z-score for test of effect in factor change; P>|z|= p-value for z-test; Odds ratio= factor change in odds for unit increase in predictor variable, holding all other variables constant.

Table 1 only includes variables with a significant contribution to the prediction of drivers' intention to speed and based on these results drivers who speed can be described as follows:

Drivers who intend to drive 20 km/h over the speed limit in a residential area are more likely to be male than female and with regard to age, they are aged between 17 and 44. They have a fairly good level of education and live in a small town or urban city. These drivers do not perceive the chance of being stopped by the police in a residential area as very great and the same applies to their own risk of being involved in an accident. Instead they have a positive attitude towards speeding in a residential area, believing that it is pleasant and that it takes them to their destination quicker. With regard to their perception of other drivers, they believe that other drivers will speed on a motorway and on urban roads. However, they are not more likely than non-intenders to believe that other drivers will speed on country roads or on main roads. Despite the fact that they perceive less risk of being stopped by the police, compared with non-intenders, they have actually been checked more during the last 3 years and have as a consequence received more fines. Finally, these drivers tend to use the car rather a lot, i.e. drive more than 10.000 kilometres per year and have been involved in at least one accident resulting in an injury.

The relationship between drivers' nationality and the odds of breaking the speed limit (self-reported intention) was also assessed. The reference category for nationality group is Austrian drivers (see Table 2).

Table 2: Logistic regression for intention to speed by nationality.

Nationality	Odds Ratio	z	P>z	[95% Conf.	Interval]
Austria (reference)					
Belgium	2.022	4.16	0.00	1.452	2.817
Cyprus	5.570	10.47	0.00	4.039	7.681
Czech Rep	0.996	-0.03	0.98	0.724	1.369
Estonia	0.537	-3.37	0.00	0.374	0.771
Finland	2.384	5.19	0.00	1.717	3.311
France	2.052	4.22	0.00	1.470	2.865
Germany	1.179	0.97	0.33	0.845	1.645
Greece	2.104	4.50	0.00	1.521	2.909
Hungary	0.823	-1.01	0.32	0.562	1.204
Ireland	1.672	2.90	0.00	1.182	2.366
Israel	1.645	2.75	0.02	1.154	2.345
Italy	4.455	9.27	0.00	3.249	6.110
Netherlands	1.935	4.25	0.00	1.428	2.622
Poland	1.650	3.21	0.00	1.215	2.239
Serbia	2.280	4.88	0.00	1.637	3.174
Slovenia	2.377	5.39	0.00	1.734	3.257
Spain	2.476	6.57	0.00	1.889	3.245
Sweden	2.078	4.05	0.00	1.459	2.960

+Controlling for all the other mentioned factors in Table 2.

The odds of breaking the speed limit (self-reported) can be divided into four main groups; the first shows countries where the chance increase by more than 200%, the second when the same is between 200 and 100%. In the third group the odds decreases, i.e. less than 100%, and the last group present countries with no significant effect:

Group 1 (>200%): Cyprus; Italy

Group 2 (100-200%): Belgium; Finland; France, Greece; Serbia; Slovenia; Spain; Sweden

Group 3 (< 100%): Estonia; Ireland; Israel; The Netherlands; Poland

Group 4 (not significant): Czech Republic; Germany; Hungary

Based on the results presented in Table 2, Cyprus and Italy are most likely to speed and the Czech Republic, Germany and Hungary least likely.

Discussion

This chapter presented an analysis of the data based on car drivers' responses to the SARTRE 4 survey. It aimed to explore the following areas: to investigate European car drivers' attitudes to speeding and speed enforcement controlling for age and gender; to analyse the difference between SARTRE data from 2002 and the present study; to examine the relationship between survey data and contextual data and to predict drivers' intention to speed.

European car drivers' attitudes to speeding and speed enforcement controlling for age and gender

Car drivers in Europe believe that driving 20 km/h above the legal speed limit would be pleasant and that it will take them to their destination quicker. However, they did not believe that it would result in an accident. These results are in agreement with several studies demonstrating that drivers tend to perceive speeding as rather pleasant and that the chances of getting involved in an accident is seen as rather small (e.g. Parker et al., 1992; Wallén, Warner & Åberg, 2008). The attitudes towards speeding did indeed vary across Europe. Drivers in Poland, Czech Republic and Estonia argued very strongly that speeding would make the journey quicker. In The Netherlands, Sweden and Finland fewer respondents agreed with this. In general drivers in Europe believed that they could be stopped by the police for speeding since as many as 71% agree with this. However, in this instance we could see some large variations across Europe since drivers in Italy deviated from this and the same applied to Sweden and Germany. In these countries a large proportion of drivers did not perceive great risks.

Only a small proportion of drivers would state that they intended to speed in a residential area within the next month. Indeed this is less than some other studies which indicated that this could apply to 1/5 of the population (Forward, 2009). One possible reason for this could be that the survey was conducted face-to-face and that drivers did not want to admit that they would speed. Another reason could be that drivers who took part in the survey, in the main, were conscious about traffic safety.

Drivers' perception of how other drivers would behave in traffic was also tested. In this study it was found that drivers believed that more than half of the total driving population would speed on a motorway, although fewer would argue that the same would be true on country roads and in built-up areas. This would then be in agreement with other studies showing that speeding is related to its context and that the perception varies according to where it takes place (Wallén, Warner & Åberg, 2008). When the differences among countries were examined we could see that Cyprus and Greece stand out since a large proportion believed that others would speed, at least on roads outside built-up areas. In the survey the respondents' perceptions of their friends was also assessed but in this case the question was even more specific and described driving 20 km/h over the speed limit in residential areas and the results showed that this was something a large proportion agreed with. In Poland, Cyprus, Serbia, Italy and Belgium this applied to over 50%.

The attitude towards reducing the speed limit to 30 km/h in built up areas was also assessed. A large proportion was opposed to this. A significant relationship was also found between the intention to speed and their views about speed reduction. Thus drivers who would drive 20 km/h over the speed limit, which in many countries meant 70 km/h, were less likely to be in favour of a 30 km/h speed limit. Since we know that the likelihood of surviving and accident as a vulnerable road users is much higher at this speed this is a rather disappointing result and it would appear that it needs to be explored further.

The survey also included a number of questions regarding drivers' expectation of being checked by the police for speeding, if they had been fined and if they supported more severe punishments. More than half of the driving population did not perceive the probability of being stopped by the police as very great. This would apply especially to drivers in Sweden, Finland and Germany. About a quarter of the drivers also reported that they had been fined. It was most common in the Netherlands followed by Austria and Belgium. A more severe punishment for speeding was something a quarter of the drivers approved of.

The results presented some differences between drivers who had been fined with those that had not. Drivers who had been fined perceived that it was more likely that they would be checked by the police. This could mean an increased feeling of being susceptible to this, something which could be linked to them avoiding the same act in the future (Freeman, et al., 2006). However, this group of drivers would not like penalties for speeding to become more severe, which could indicate that for them the penalties are already sufficiently severe. On a more negative note it could also indicate that they had not stopped speeding themselves.

Age and gender had a significant effect, although it was rather small. Unsurprisingly the younger age groups and men held a more positive attitude towards speeding, a more negative attitude towards speed enforcement and speed reduction in residential areas. They had also had received more speeding tickets than the older age groups and women. For gender the magnitude of the difference was greatest (i.e. d= .2) when it came to question about speed reduction, penalties for speeding and the intention to speed. For the different age groups the greatest difference was related to their intention to speed (i.e. Eta^2= .07). At age 18-24, 10% intended to speed which can be compared to 1% in the oldest age group.

Differences between SARTRE data from 2003 and the present study

The present study included some questions that were the same as a previous SARTRE study (SARTRE 3), enabling us to identify changes over time. The results showed that in about half of the countries a change had taken place with regard to their perceived likelihood of being stopped and checked by the police. In most of those cases the risk had increased. In Cyprus and Germany the differences were rather large, with substantially more perceiving a greater risk of being stopped in 2010 than 2003.

Drivers' experience of being fined during the last three years was also compared and the results presented some mixed results. In about half of the countries a significant change had taken place between the two periods. However, in some of the countries they had received fewer fines and in others more fines. In general, the percentage who had not been fined had decreased in 2010 compared to 2003.

The relationship between survey data and contextual data

Countries in Europe have different policies with regard to speed enforcement (i.e. number of tickets issued and number of checks carried out) and it was therefore interesting to assess if this in any way was related to drivers perception of being charged, if they had been charged for speeding and their intention to speed in a residential area. The results were only able to find one relationship - that between number of speed tickets and the percentage of drivers who had been fined for speeding. This would then indicate that the perceived likelihood of being caught or their intention to speed was not related to speed enforcement.

The prediction of drivers' intention to speed

A large number of independent variables were assessed to determine what factors predicted drivers' intention to speed in a residential area. From this we were able to describe in more depth a person who speeds. In accordance with other studies, drivers who speed perceived positive consequences as more likely than negative ones. It was therefore interesting to note that compared with non-intenders these drivers were more likely to have been checked by the police and fined. So despite this they still regarded the behaviour as positive. They also believed that the behaviour was rather widespread, especially when considering motorways and urban roads. This group of drivers tended to drive rather a lot and compared with drivers who did not intend to speed they were more likely to have been involved in an accident. The latter would be in agreement with other studies, which have found that if we consider the cause of road traffic accidents it is the law breakers who tend to be involved in more accidents (Parker, et al., 1995; Sullman, et al., 2002).

Finally the relationship between drivers in the different countries, controlling for other factors measured by the survey including demographic factors and the chances that they would break the speed limit, was also assessed. The results showed that drivers in Cyprus were most likely to speed followed by Italy. In contrast drivers in Estonia and Greece were the least likely to speed.

Conclusion

Drivers in Europe have a relatively positive attitude towards speeding, although this tends to be most common among young drivers and men. In general, they believe that speeding is rather widespread among other drivers, especially outside built up areas. This would then imply that speeding is regarded as a fairly normal behaviour. The attitude towards speed enforcement and speed reduction tends to be rather negative, although a fairly large proportion would not object to punishments becoming more severe. Some changes over time had taken place and in some countries the perceived risk of being stopped by the police had increased, and perhaps as a consequence of this, the percentage who had been fined had also increased. The relationship between the results from the survey and official statistics was rather weak, which could mean that police enforcement in general have little effect on driver behaviour. This could be because drivers do not feel that they themselves are at risk of being caught or indeed being involved in an accident. If this is the case then this would suggest the need for more effective methods to influence driver behaviour such as education and information.

Chapter 1.4

Alcohol, drugs and other factors affecting fitness to drive

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Introduction

In this chapter the survey data is examined with the intent of understanding the scale of the problem of alcohol, drug and other factors affecting fitness to drive and what counter measures the public may accept.

In particular we assess drivers' participation in potential unsafe driving behaviour. Namely;

- Driving under the influence of alcohol
- Driving under the influence of Drug
- Fatigue

Driving under the influence of alcohol or drugs is a factor in nearly 25% of crashes, claiming about 10,000 lives in Europe every year (EC, Fitness to drive). In the general driver population in Europe the prevalence of illicit drug use has been estimated to be 1–5% and the prevalence of licit drugs with an impairing effect on driving performance 5–10% (Walsh et al., 2004). Fatigue is also a factor in 10-20% of road accidents (EC, Fitness to drive).

In Europe alcohol is estimated to be used by 3.5% of the drivers, illicit drugs by 1.9% of the drivers, medicinal drugs by 1.4% of the drivers, drug-drug combinations by 0.39% of the drivers and alcohol-drug combinations by 0.37% of the drivers (DRUID study).

Methodology

Descriptive statistics are presented with results of driving under the influence of alcohol, driving under the influence of drug and fatigue across groups (nationality, gender and age). Hierarchical cluster analysis was also performed to identify groups of car drivers whose fatigue coping behaviour was homogenous. The results of the SARTRE 4 survey have been compared to the SARTRE 3 for some items in the questionnaire. For the purpose of analysis the participant countries have been grouped as Southern (Cyprus, Greece, Italy, Spain), Northern or Scandinavia (Finland, Sweden), Eastern (Czech Republic, Estonia, Hungary, Poland, Serbia, Slovenia) and Western (Austria, Belgium, France, Germany, Ireland, Netherlands).

We applied a logistic regression model to describe the relationship between several explanatory variables (or predictors) such as nationality, age, gender, marital status, level of education, living area and a binary dependent variable, i.e., the presence or absence of self-reported driving while over the legal limit at least occasionally and driver fatigue. An additional analysis for the fit of the model was performed using the Hosmer- Lemeshow test, in which observed data are compared with the predicted probabilities, given the selected model; low p-values indicate a large deviation and therefore a bad fit to the data ($p > 0.05$, good fit). The results of the logistic regression analysis are reported in Table 1 and Table 4.

1 - Alcohol

Drink driving behaviour

Over all countries, on average 69% of car drivers report not driven after taking even a small amount of alcohol. As shown in Figure 1, Italy and Cyprus top the lists, with the highest percentage of drivers report driven after taking even a small amount of alcohol.

A comparison of the four country groups shows a huge variation among participant countries in proportion of drivers who said they have driven after taking even a small amount of alcohol at least occasionally in previous month, with highest percentage in southern and western countries compare to the other groups (Southern countries= 46%, Northern countries= 10%, Eastern countries= 17% and Western countries= 35%). There are also 85% of car drivers over all countries who report not driven over the legal limit in the past month. However, 15% do admit to driving over the limit in the past month. Male car drivers are 2.6 times more likely to admit to driving over the limit in the past month compared with female drivers. Twenty eight percent of drivers who report driving over the legal limit in the previous month are between the ages of 25-34. Within the participating countries there is a definite problem with drinking and driving while over the legal limit. The pattern in the countries indicates this behaviour is reported more by males and decreases with age. The country comparison shows differences between countries among age groups.

There is wide variation in legal BAC limit among the participating countries. The Czech Republic and Hungary, both with a BAC limit for driving of zero, 88% and 95% of drivers report not driven over the legal limit in the past month respectively. In Estonia (96%), Poland (98%) and Sweden (98%), all countries with a limit of 0.2 g/l, over 95% of drivers report not driven over the legal limit. In the Netherlands (93%), Germany (90%), Slovenia (89), Greece (86) and France (81%), with a limit of 0.5 g/l, over 80% of drivers report not driven over the legal limit. By contrast, in Cyprus (34%), Italy (33%), Belgium (26%) and Spain (26%), all countries with a 0.5 g/l limit, quarter or more report driven over the 0.5 g/l legal limit at least occasionally in the previous month (Figure 2).

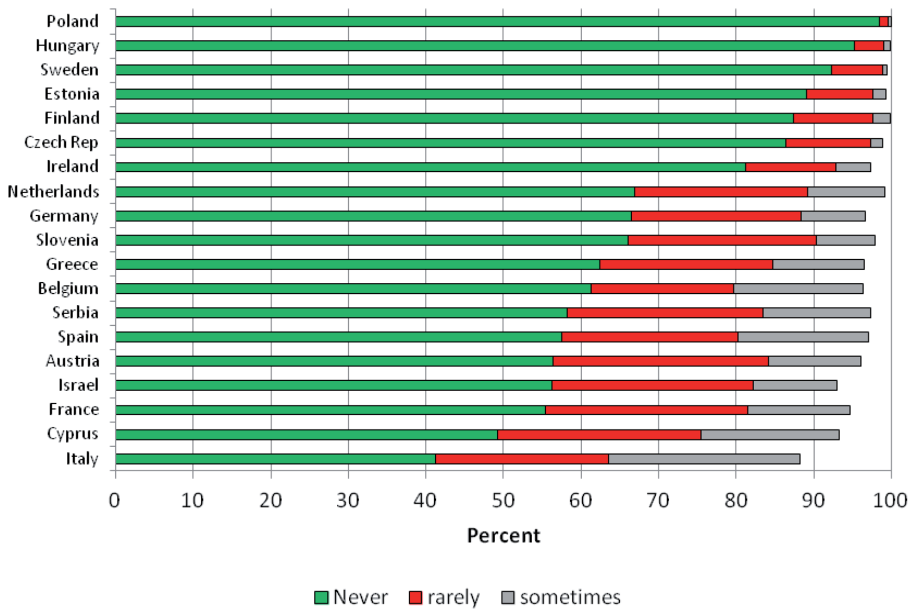

Figure 1: Frequency of Driving a Car after Having Drunk, Even a Small Amount of Alcohol in Past Month in %.

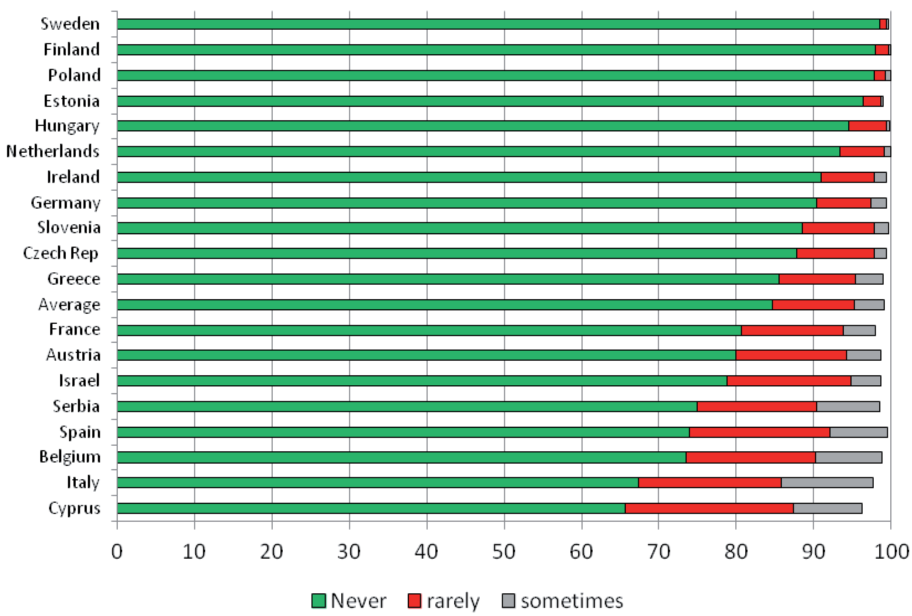

Figure 2: Frequency of Driving over the Legal Alcohol Limit in Past Month in %.

Opinions about the risk of driving under the influence of alcohol

Among car drivers, 94% of them believe that drinking and driving substantially increases the risk of an accident, while 77% believe that you will be stopped and fined by the police and 20% of drivers believe most of their friends will drink and drive. Only 9% of drivers believe they can drink and drive once they are careful. With regard to the effect of gender and age, we found significant difference (p= 0.0001) between males and females with 11% of the men stated that they believe they can drink and drive once they are careful compared to 6% among the women. The age group most likely to agree with drink and drive once they are careful is those aged 17-24.

A considerable proportion, 29% of drivers who declared behaviour of having consumed a little alcohol and drive, stated that they can drink and drive once they are careful compared to 6% of those who declared never or rarely consumed a little alcohol and drive. We found a significant association (p= 0.0001) between the declared behaviour of having consumed alcohol above the legal limit and believe that they can drink and drive once they are careful, with 40% of drivers who declared having consumed alcohol above the legal limit and drive, stated that they can drink and drive once they are careful compared to 7% of those who declared never or rarely consumed alcohol above the legal limit and drive.

The country comparison shows that the differences between countries are large. The lowest number of drivers who believe they can drink and drive once they are careful is found in participating countries such as Greece (2.2%), Hungary (2.6%), Sweden (3.1%), Finland (3.7%) and Ireland (4%). A group of 8 countries composed of the Netherlands (10.6%), Austria (10.7%), France (11.9%), Serbia (12.5%), Israel (13.1%), Italy (17.2%), Cyprus (17.5%), and Belgium (17.5%) are found to have highest number of car drivers who believe they can drink and drive once they are careful (Figure 3).

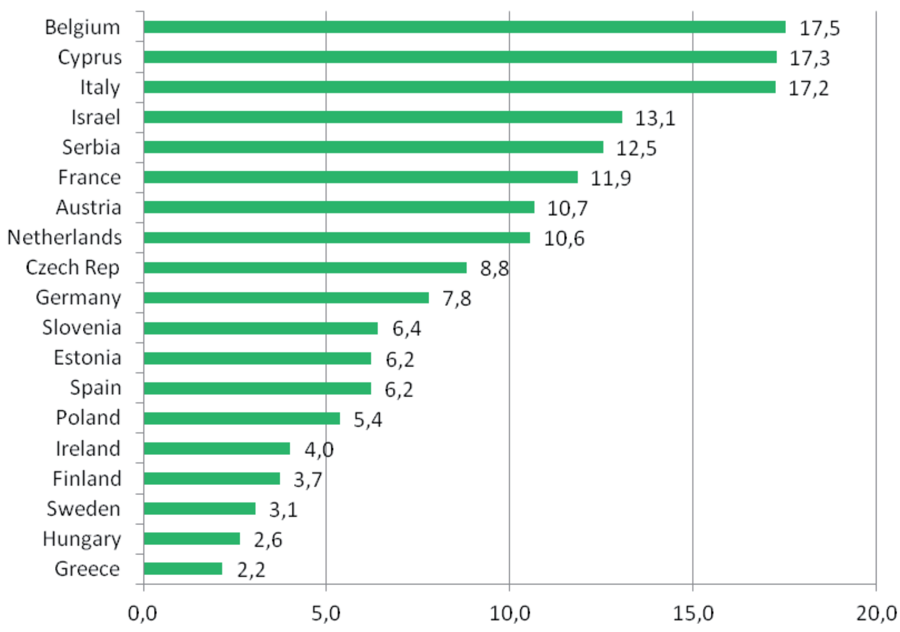

Figure 3: Percentage of car drivers who believe you can drink and drive if you drive carefully.

Drink Driving Knowledge and Attitudes

Among car drivers, 59% of them think that the alcohol limit should be less than present (i.e. no alcohol at all + less alcohol than at present), 46% think drivers should not drink any alcohol at all before driving. However 8% thought drivers are allowed to consume 3 to 4 units of alcohol before driving.

In the sample of car drivers, 30% think they should not drink any alcohol at all (i.e. 0 units) if they want to stay under the legal alcohol limit, another 60% think that they should not drink more than 1-2 units, 8% think they can drink 3-4 units and 2% of the sample believe that after 5 and more units they can still drive and being under the legal limit of BAC. As shown in Figure 5, the variance between is quite large. Although the majority of countries believe that the limit is 1-2 units, the percentage of drivers who answered that they should not drink any alcohol at all varies between 0% (Spain and Austria) up to 95% (Hungary).

In Hungary and Czech Republic where legal BAC limit for driving is zero, 95% and 74% of drivers respectively understand that they should not drink any alcohol at all when driving. In France (91%), the Netherlands (88%), Belgium (77%), Slovenia (77%), Italy (75%), Finland (74%), Austria (72%), Israel (71%), Spain (71%), Greece (69%) and Cyprus (66%), all countries with a 0.5g/l BAC limit apart from Germany, two thirds or more believe that they can drink 1-2 units before driving and still remain under the legal limit. In Austria with legal BAC limit of 0.5g/l, 26% think they can drive after 3 or more units and still being under the limit.

A strong support for no alcohol at all when driving is found in participating countries such as Poland (92%), Hungary (90%) and Ireland (67%). By contrast, in the Czech Republic 21% of drivers want the current BAC (0.0g/l) to be increased, in Italy 17% want the current BAC (0.5g/l) to be increased and in Cyprus 15% want the current BAC (0.5g/l) to be increased (Figure 5).

Comparing the SARTRE 3 and SARTRE 4 data we see that car drivers in support of a ban of alcohol when driving (no alcohol at all) have increased in Czech Republic (+20%-points), Hungary(+17%-points), Poland (+17%-points), Ireland (+10%-points), Slovenia (+9%-points), Estonia (+8%-points), Spain (+8%-points), Austria (+6%-points), Germany (+4%-points), Belgium (+3%-points), Greece(+3%-points) and Italy (+3%-points); less drivers are in support of no alcohol at all when driving on the road in the Finland (-8%-points), Sweden (-5%-points), the Netherlands (-3%-points), France (-3%-points) and Cyprus (-1%-points) (Figure 6).

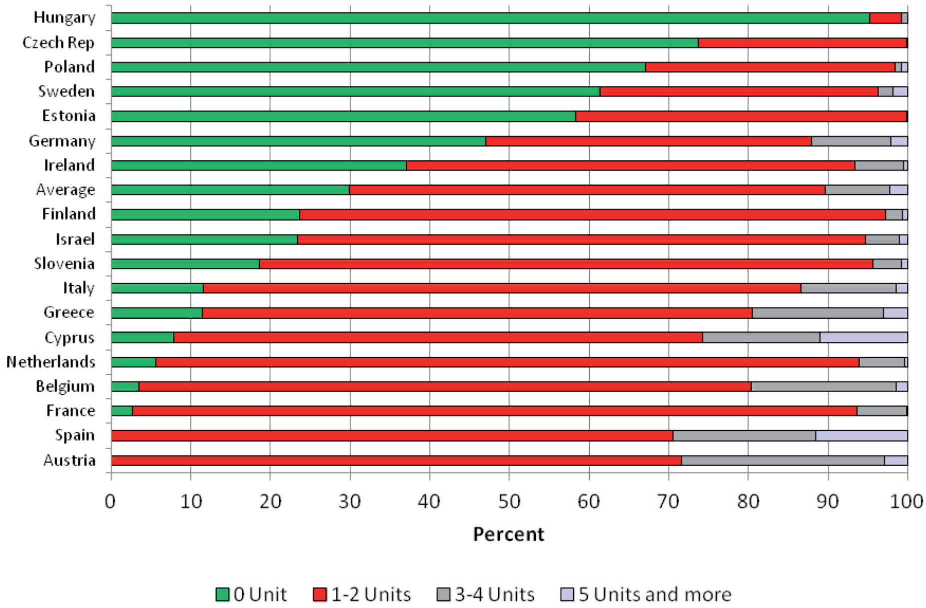

Figure 4: Number of Alcohol Units Which is Within Legal Limit for Driving.

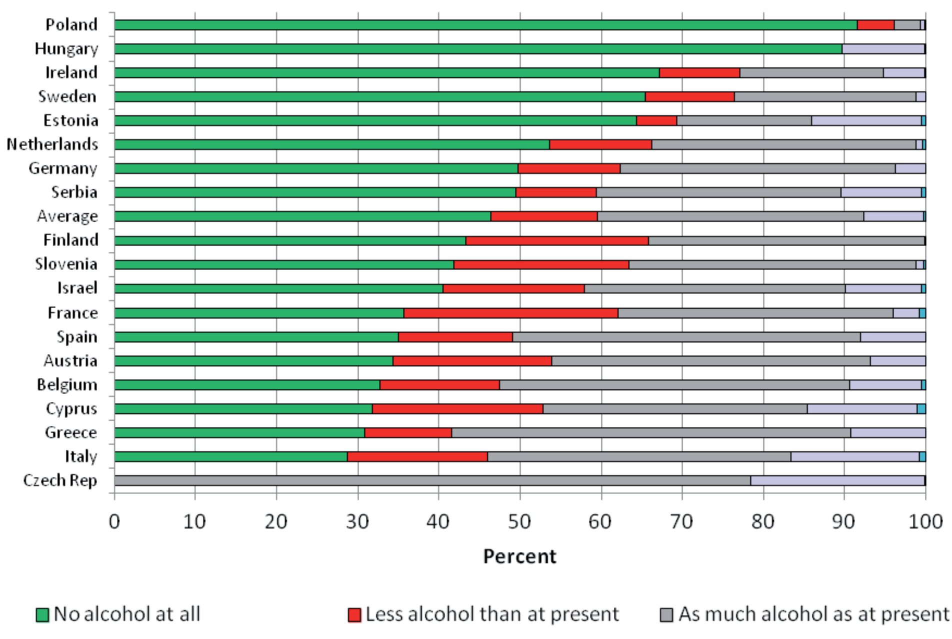

Figure 5: Support for the current BAC.

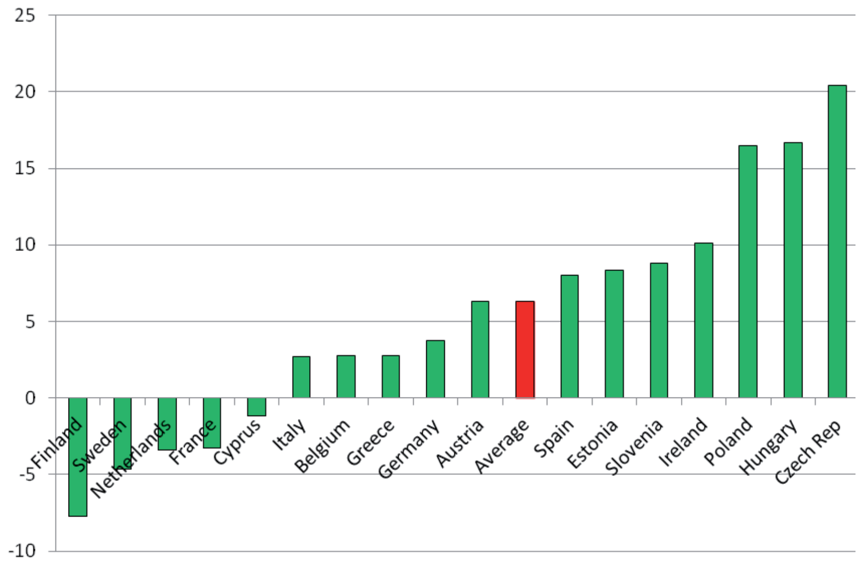

Figure 6: Percentage point change between SARTRE 3 and SARTRE 4 in support for a ban of alcohol.

Drink Driving Check Points

About 3 in 5 of the car drivers (58%) have not been checked for alcohol when they have been behind the wheel in the past 3 years. Further 23% only once, and the remaining 18% more than once (Question CD14). Gender profiling somehow evident, older females least likely to have been checked, males most likely to believe they would be.

In 2002, 71% of drivers were never checked and in 2010 only 58%, which could suggest more police activity. The highest number of alcohol road side checks are found in Finland and Estonia with more than 60% of drivers checked at least once; in Sweden and Czech Republic more than 50% of car drivers were checked at least once for alcohol; in Italy and Germany, both with random breath testing not allowed, on average 84% of drivers declare they have not been checked in the last three years (Figure 7). For countries where the legislation for random breath testing is enacted, on average 44% of drivers claimed they have been checked at least once.

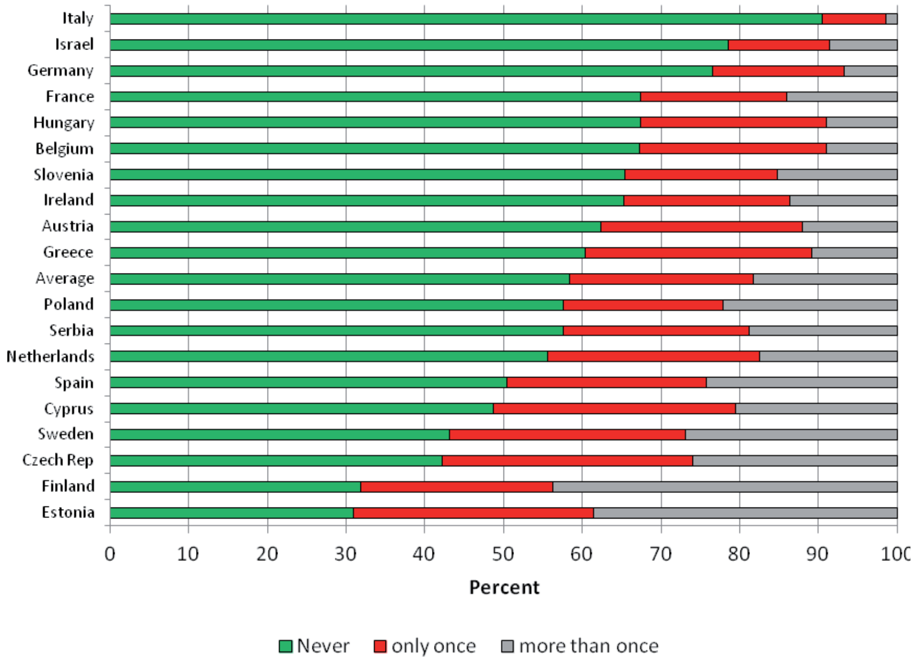

Figure 7: In the Past 3 Years, How Many Times Were You Checked for Drink Driving?

The estimate of the likelihood to be checked for alcohol

Overall, 70% of drivers believe will never (27%) or rarely (43%) be checked for alcohol. In Hungary (54%), Poland (47%) and Italy (46%), of the drivers are quite sure of not being checked for alcohol, while in Czech Republic (53%), Serbia (47%), Spain (47%) and Slovenia(46%) drivers feel they are more likely to be checked for drunk driving on a typical car journey (i.e."sometimes" or "often" or "always").

Opinions about measures to prevent drink-driving

Fifty-three percent of the drivers are very much in favour and another 23% are fairly in favour of having an alcolock in the car that prevents the driver from driving if over the legal alcohol limit. The variation across the countries is quite marked with 70% or more people very much in favour in Sweden and Ireland and only 41% and 40% in the Czech Republic and Austria respectively.

Alcohol-meter in the car for recidivist drivers

An alcohol-meter in the car for recidivist drivers is approved by 84% (i.e. "very" or "fairly") of the interviewed drivers. The support for alcohol-meter in the car for recidivist drivers is high in Sweden (96%), Finland (95%), the Netherlands (89%), Slovenia (89%) and Ireland (89%) and less than 70% support in Austria and Israel.

Penalties for drink driving offenses

The majority of the respondents support much more severe penalties for drink driving offenses (84%).

Factors affecting drink-driving behaviours

In this section we investigate the association between drink driving over the legal limit and various factors. In the SARTRE 4 survey 13 items deal with the topic of alcohol and drink driving. One of them is used to classify the drivers as those who drive under the influence of alcohol and those who do not drink and drive. The other variables will be used as possible independent variables that predict the dependent variable. In addition, some demographic variables like age, gender, socio-economic status and the nationality of the respondent are included.

The outcome variable is a dichotomized variable based on the item on the questionnaire which relates directly to drink driving over the legal limit. This is question CD11, which asks 'Over the last month, how often did you drive a car, when you may have been over the legal limit for drinking and driving?' There are six response choices to this question (never, rarely, sometimes, often, very often and always). For the purpose of our analysis these responses have been combined. The likelihood ratio test tests for combining alternatives of Question CD11 response with respect to the variables in the model (i.e. nationality, age gender, marital status, level of education, living area, CD09a, CD09b, CD09c, CD14, CD12, kilometer travelled) shows that we cannot reject the hypothesis that responses such as sometimes, often, very often and always to question CD11 are indistinguishable ($p<0.001$). Thus we can obtain more efficient estimates by combining them into binary variable. Respondents to question CD11 are recoded with 1 representing those who report driving while over the legal limit at least occasionally and 0 representing those who report never driving while over the legal limit. Drivers who reported driving while over the legal limit at least occasionally are referred to as drink drivers.

Model Fit

Logistic regression modeling approach is used to describe the association between the explanatory variable and drink driving (i.e. drivers who reported driving while over the legal limit at least occasionally). This model is used to obtain estimated measures of association in terms of odds ratios. The results of the model containing all explanatory variables described above are presented in Table 1. The strength of association is based on p-value. By convention, $p<0.05$ is accepted as evidence of association. The Hosmer-Lemeshow test showed a good fit of the model ($\chi^2= 9.95$, $p= 0.268$).

Table 1: Logistic regression model for drink driving over the legal limit.

Factors (reference category)	drink driving over the legal limit	Odds Ratio	z	[95% Conf.	Interval]
	country	0.99	-1.92	0.978	1.000
Gender (male)	female	0.532***	-8.48	0.460	0.616
Age (17-24)	25-34	1.218	1.65	0.963	1.540
	35-44	1.083	0.61	0.837	1.401
	45-54	0.988	-0.09	0.755	1.294
	55-64	0.944	-0.38	0.705	1.266
	65+	0.768	-1.53	0.547	1.077
You can drink and drive if you drive carefully (very)	fairly	1.018	0.09	0.682	1.520
	not much agree	0.468***	-3.93	0.320	0.683
	not at all	0.168***	-9.32	0.115	0.244
checked for alcohol (never)	Once	1.303***	3.33	1.115	1.522
	more than once	1.335***	3.30	1.125	1.585
Marital status (single)	living as married	0.670***	-3.68	0.542	0.829
	married	0.669***	-4.20	0.555	0.807

	separated or divorced	1.046	0.32	0.791	1.384
	widowed	0.547*	-2.29	0.326	0.917
level of education (Primary)	secondary	0.962	-0.40	0.796	1.162
	further education	0.986	-0.14	0.806	1.205
	None	2.319*	2.13	1.070	5.028
number of units of alcohol (0 units)	1-2	3.645***	11.28	2.912	4.564
	3-4	8.575***	15.70	6.557	11.214
	5+	8.855***	11.15	6.035	12.993
Area (Rural /Village)	Small town	1.221*	2.22	1.024	1.457
	Suburban/ City outskirts	0.985	-0.13	0.782	1.240
	Urban City/ Large town	1.242*	2.52	1.049	1.470
Kilometer travelled (<=3500)	>3500 and <=5000	1.556**	2.73	1.133	2.137
	>5000 and <=7500	1.471*	2.20	1.043	2.074
	>7500 and <=10000	1.775***	4.29	1.366	2.306
	>10000	1.927***	5.45	1.522	2.440
if you drink driving you be stopped and fine by the police (very)	fairy	1.015	0.19	0.863	1.194
	not much agree	1.228*	2.17	1.020	1.478
	not at all	1.116	0.53	0.745	1.674
drink driving increase the risk of accident (very)	fairly	1.817***	7.53	1.555	2.122
	not much agree	2.866***	6.54	2.091	3.930
	not at all	1.059	0.23	0.641	1.750
Involvement in injury accident	Yes	2.823***	9.22	2.264	3.521

* p<0.05, ** p<0.01, *** p<0.001

Interpretation of the results

The association between drink driving over the legal limit and various factors is interpreted in terms of odds ratio of the logistic regression model in Table 3. Although logistic modeling is applicable to cross-sectional studies, there is one important limitation in the analysis of such studies. This model cannot be used to predict individual risk for cross-sectional studies.

The odds of drink driving over the legal limit for women in comparison with men (self-reported) are multiplied by a factor of 0.53. This means that odds of drink driving over the legal limit for women decrease significantly by 47% when controlling for all the other mentioned factors (odds ratio= 0.532, p<0.001). In other words, women are less likely to drink and drive over the legal limit.

Age of drivers

The pattern in the participating countries indicates drink and driving over the legal limit is reported more by males and decreases with age (see Figure 8). The reference category for age group is the category of drivers aged 17 to 24. The odds of being drunk over the legal limit and driving (self-reported) decrease by 23% for 65 and over year olds compared with the reference category. For 45-54 year olds and 55-64 year olds the odds decrease by 1% and 5.6% respectively.

The group of drivers aged 25 to 34 have the highest odds for drink and driving over the legal limit. Their odds of driving over the legal limit are 22% higher than that of the 17-24 year olds (reference group). In other words, the group of drivers age 25 to 34 would be more likely than the other drivers to drink over the legal limit and drive. The association between age group and the dependent variable is significant ($\chi^2_{(5)}$= 86.99, p= 0.000).

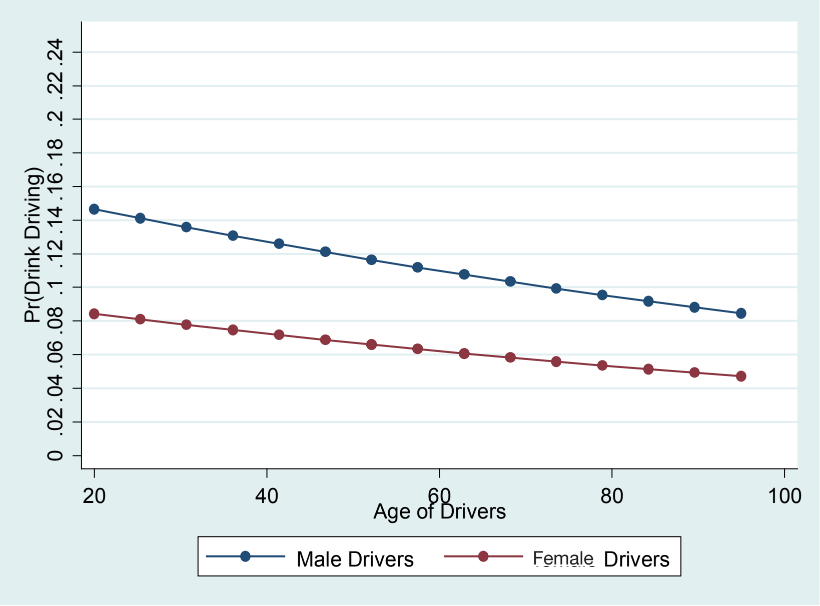

Figure 8: Predicted probability of drink driving over the legal limit (controlling for all the other mentioned factors).

Level of education and marital status

Socio-economic status is often an important risk factor for unhealthy behaviour. Here we used the level of education and marital status. Using drivers with a primary education as the reference category, we found that drivers with secondary and drivers with further education are not significantly different from drivers with a primary education in terms of odds of being drunk over the legal limit and driving. However, the odds of being drunk over the legal limit and driving (self-reported) increase by 132% for drivers with no education compared with the drivers with the reference category (odds ratio= 2.319, $p<0.05$).

Drivers living as married and married drivers are less likely to drink and drive over the legal limit compared with drivers who are single (odds ratio= 0.67, $p<0.001$). There are no significantly differences between single and separated or divorced with regards to being drunk over the legal limit and driving (self-reported). However, drivers who are widowed have the lowest odds of being drunk over the legal limit and driving (odds ratio=0.547, $p<0.05$) compared with drivers who are single. The association between marital status and the dependent variable is significant ($\chi^2_{(4)}$= 144, p= 0.0001).

Check by the police

Forty two per cent of the respondents have been checked by the police in the last three years. The fact of having been checked by the police for alcohol (CD14) is significantly associated with drink-driving over the legal limit. Drivers who have been checked in the last three years once have odds of being drunk over the legal limit that is 30% higher than for those never been checked (odds ratio= 1.303, $p<0.001$). Whereas, drivers who have been checked in the last three years more than once have odds of being drunk drivers that is 34% higher than for those never have been checked (odds ratio= 1.335, p<0.001). This can be interpreted that the police start a check on suspicion of a drink and drive case and do not use random sobriety checks. Note that 55% of the drink drivers and 39% of non-drinking drivers have been checked by the police in the last three years.

Drink driving knowledge and attitude

The survey of drink driving knowledge and attitude of drivers shows 30% of the drivers think they should not drink any alcohol at all (i.e. 0 units) if they want to stay under the legal alcohol limit, another 60% think that they should not drink more than 1-2 units, 8% think they can drink 3-4 units and 2% of the sample believe that after 5 and more units they can still drive and being under the legal limit of BAC.

Drivers who think that they should not drink more than 1-2 units are 3.7 times more likely to drink and drive over the legal limit compared with those who think they should not drink any alcohol at all (i.e. 0 units) if they want to stay under the legal alcohol limit (reference category). Drivers who think that they should not drink more than 3-4 units are 8.6 times more likely to drink and drive over the legal limit compared with the reference category (odds ratio= 8.575, p<0.001). Furthermore, the drivers who believe that after 5 and more units they can still drive and being under the legal limit of BAC are 8.9 times more likely to drink and drive over the legal limit compared with the reference category (odds ratio= 8.855, p<0.001).

The odds of drink driving over the legal limit for drivers who agree fairly that drink driving increase the risk of an accident with another road user in comparison with drivers who very much agree (reference category) are 1.817 (p<0.001). The odds of drink driving over the legal limit for drivers who not much agree that drinking driving increase the risk of an accident with another road user in comparison with the reference category increase significantly by 187% (odds= 2.866, p<0.001).

Kilometres travelled

The kilometer driven also has an influence on drink driving. The pattern in the participating countries indicates drink and driving over the legal limit is reported more by drivers driven more kilometers per year. The odds for drivers with moderate yearly kilometers travelled (i.e. between 3,500 and 5000) increase by 56% (odds= 1.56, p<0.01) compared with those driven less than 3,500. However, the odds for drivers with yearly kilometers travelled between 7,500 and 10,000 and over 10,000 increase by 78% (odds= 1.78, p<0.001) and 93% (odds= 1.93, p<0.001) respectively compared with those driven less than 3,500, controlling for all the other mentioned factors.

Injury Accident experience

The respondents who have been involved in an accident where someone was injured have 182% higher chance of drinking and driving over the legal limit compared with those with who have not been involved in an accident where someone was injured in the past 3 years.

Living area

Thirty seven per cent of respondents who report driving while over the legal limit at least occasionally live in urban cities or large towns. Drivers living in urban cities or large towns have 24% more chance to be a drink driver than drivers living in rural areas/village (odds ratio= 1.24, p<0.05). Whereas, drivers living in small towns the odds of being drunk driver is 22% higher than for those live in rural areas / village (odds ratio= 1.22, p<0.05). There is no significant difference between drivers living in suburban/ city outskirts and drivers living in rural areas/village regarding drink driving behaviour (odds ratio= 0.985, p= 0.90).

Nationality

The reference category for nationality group is the category of Austrian drivers. Serbia driver was dropped from nationality comparison due to collinearity. The odds of being drunk over the legal limit and driving (self-reported)increase significantly by 152% for Italy, 125% for Israel, 108% for Cyprus, 80% for France, 79% for Spain and 70.6% for Belgium compared with the reference category (see Table 2a). For Poland, Sweden, Finland, Estonia and the Netherlands the odds decrease significantly by 84%, 81%, 79%, 62%, and 62% respectively.

For the group of drivers from Germany, Greece, Ireland and Slovenia there are no significant difference between odds for drink and driving over the legal limit. Cyprus, Italy and Israel car drivers have the highest odds for drink and driving over the legal limit. The association between nationality and the dependent variable is significant ($\chi2_{(18)}$= 1000, p= 0.000).

Table 2a: Logistic regression model for drink driving over the legal limit+.

	Drink driving over the legal limit	Odds Ratio	Std. Err.	z	[95% Conf.	Interval]
Nationality	Austria (reference category)					
	Belgium	1.706**	0.296	3.08	1.214	2.397
	Cyprus	2.081***	0.395	3.86	1.435	3.019
	Czech Rep	1.218	0.259	0.93	0.803	1.847
	Estonia	0.375***	0.106	-3.47	0.215	0.653
	Finland	0.191***	0.061	-5.14	0.102	0.359
	France	1.801**	0.322	3.29	1.269	2.557
	Germany	0.778	0.166	-1.18	0.513	1.181
	Greece	1.158	0.230	0.74	0.784	1.710
	Hungary	1.204	0.331	0.67	0.702	2.065
	Ireland	0.863	0.185	-0.69	0.566	1.314
	Israel	2.247***	0.444	4.10	1.525	3.311
	Italy	2.524***	0.427	5.47	1.812	3.516
	Netherlands	0.375***	0.078	-4.73	0.250	0.563
	Poland	0.160***	0.060	-4.85	0.077	0.336
	Slovenia	0.77	0.154	-1.31	0.521	1.139
	Spain	1.793***	0.282	3.71	1.317	2.441
	Sweden	0.207***	0.082	-3.96	0.095	0.451

* p<0.05, ** p<0.01, *** p<0.001
+Controlling for all the other mentioned factors in Table 1, Serbia was dropped due to collinearity.

Analysis by Country Grouping

In order to explore if factors affecting drink driving are different in four country groups (northern, southern, western and eastern), a separate analysis was run for each group, controlling for all the other mentioned factors in Table 1 (see appendix 1-3). We also run another analysis with four groups in one model as explanatory variable using northern countries or Scandinavia (Finland, Sweden) drivers as reference category for the group comparison (see Table 2b).

Southern countries

The drivers from southern countries (i.e. Cyprus, Greece, Italy and Spain) are found to be 9 times more likely to drink and drive over the legal limit compared with Scandinavia (see Table 2b). This means that odds of drink driving over the legal limit for southern countries increase significantly by 800% when controlling for all the other mentioned factors (odds ratio= 9.37, $p<0.001$). In other words, Southern countries are more likely to drink and drive over the legal limit. They are more likely to be male than female and of any driving age. They are more likely to have no education and live in a small town. They are more likely to be single or separated than married. They do not believe that drink driving increase the risk of accident. They also have history of involvement in injury road traffic accident. In their opinion, they can drink five or more units of alcohol and still remain under legal limit. These drivers do not see that if you drink and drive you will be stopped and fined by the police. Even though they have been checked more than once for alcohol in the last 3 years (at the end of this chapter, see complementary Table a).

Western countries

The drivers from western countries (i.e. Austria, Belgium, France, Germany, Ireland and Netherlands) are 4.9 times more likely to drink and drive over the legal limit compared with Scandinavia.

Drivers from western countries who tend to drink and drive over the legal limit are more likely to be male than female and of any driving age. They are less likely to have further education. They are more likely to be single or separated than married. They do not believe that drink driving increase the risk of accident. They also have history of involvement in injury road traffic accident. In their opinion, they can drink five or more units of alcohol and still remain under legal limit. These drivers do not see that if you drink and drive you will be stopped and fined by the police. They have been checked more than once during the last 3 years (at the end of this chapter, see complementary Table b).

Eastern countries

The drivers from eastern countries (Czech Republic, Estonia, Hungary, Poland, Serbia and Slovenia) are 3.4 times more likely to drink and drive over the legal limit compared with Scandinavia.

Drivers from eastern countries who tend to drink and drive over the legal limit are more likely to be male than female and they are aged between 25 and 54. They are less likely to have further education. They are more likely to be single or separated than married or living as married. They do not believe that drink driving increase the risk of accident. They also have history of involvement in injury road traffic accident. In their opinion, they can drink three to four units of alcohol and still remain under legal limit. They seem to drive more millage per year. These drivers do not see that if you drink and drive you will be stopped and fined by the police. They have in fact been checked more than once in the last 3 years (at the end of this chapter, see complementary Table c).

Table 2b: Logistic regression model for drink driving over the legal limit+.

	Drink driving over the legal limit	Odds Ratio	z	[95% Conf.	Interval]
Country Grouping	Northern Countries (reference category)				
	Southern countries	9.37***	9.34	5.86	14.98
	Western countries	4.85***	6.61	3.04	7.75
	Eastern countries	3.35***	4.90	2.07	5.44

*** p<0.001, **+Controlling for all the other mentioned factors in Table 1.**

2 - Drug

Driving & Medication Use

More than 4 in 5 car drivers understand the dangers of taking medication that carries a "warning: it may influence your driving ability" when driving. However, 10% sometimes or often take such medication when driving. The highest proportion of respondents who sometime or often take such medication are found in France (26%), the Netherlands (18%), Italy (17%), Spain (14%) and Belgium (13%) and the lowest frequency are found in Greece (3%) and Slovenia (5%). There is no clear age effect (see Figure 9 & Figure 10).

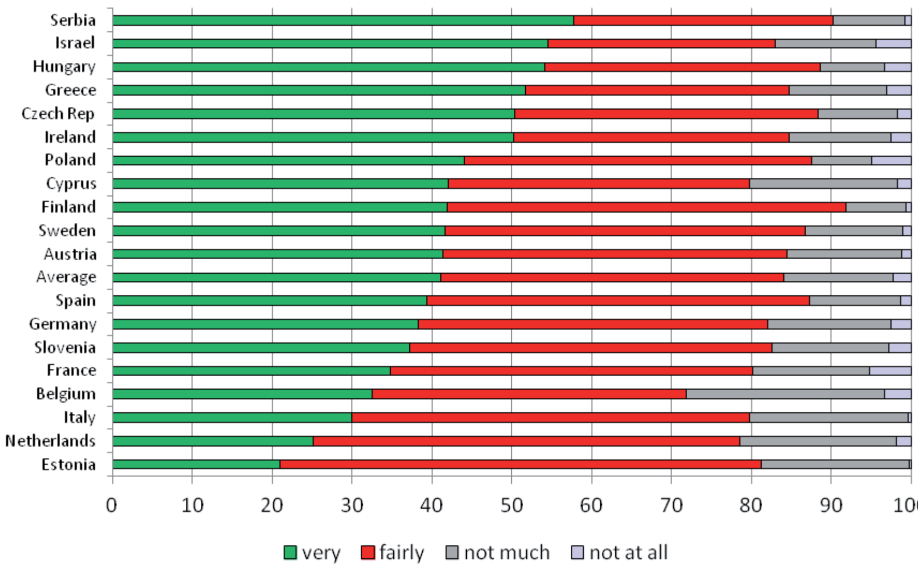

Figure 9: How Dangerous is it to Drive While Taking Mediation that Carries the Warning –May Influence your Driving.

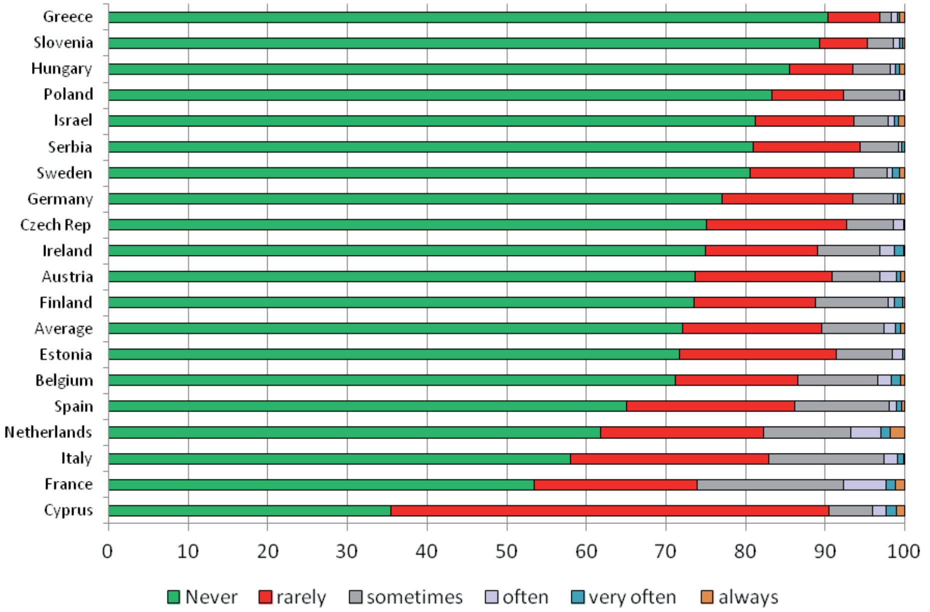

Figure 10: Frequency of Driving While Taking Such Medication in %.

Driving & Drug Use

Just 1% of the respondents said they have been checked for drug driving in past year and less than one percent has been punished for usage when driving. About 2% of respondents from Czech Republic have been fined for drug driving in the past year.

3 - Fatigue

Driving Whilst Fatigued

Experts claim that between 15 and 20% of all traffic accidents are caused by fatigue and that these accidents often result in disproportionately severe consequences (Åkerstedt, 2000; Horne & Reyner, 1999; Sagberg, 1999). Some researchers even state that in fact fatigue might be a more frequent accident cause than driving under the influence of alcohol or drugs (Åkerstedt, 2000). In line with this, Dawson and Reid (1997) showed that 17 hours of sustained wakefulness result in a comparable impairment of visuomotor performance as a blood alcohol concentration (BAC) level of .05%.

In order to prevent fatigue related accidents, the driver's ability to assess his own state and his ability to take the appropriate countermeasures is of crucial importance. For example stopping the car in order to take a nap can reduce fatigue and sustainably improve the driver's state. Therefore, next to the frequency of "fatigued driving" the present survey also assessed car drivers' behaviors to counteract fatigue. Research has shown that the most effective way to sustainably counteract fatigue is the consumption of caffeine in combination with a short nap of about 15 minutes duration. Other countermeasures such as cold air or listening to the radio do not result in any lasting effect (Reyner & Horne, 1998). The present study was particularly interested whether there are differences in coping behavior between European countries but also whether there are particular groups of car drivers that apply certain strategies in order to stay awake while driving.

One in four drivers (26.3%) report driven when at least 'sometimes' felt too tired to drive and 52% have taken a break from driving due to fatigue in the past 12 months. When asked what actions they take when they feel tired while driving, 79% of drivers report they 'sometimes' talk to a passenger, 78% open a window or lower heat or on air condition. Other key actions taken by drivers to fight fatigue are:

- Turn on radio or increase its volume (69%)
- Pull over and rest (66%)
- Take caffeine or energy drink (64%)
- Ask a passenger to take over driving duty (52%)
- Take a nap (26%)
- Talk on the phone (22%)

Driving whilst fatigued is prevalent among all the participating countries and is reported more by males and decreases with age. The country comparison shows that there differences between countries among age groups. In Cyprus prevalence of driver fatigue was almost 40% of the car driver population while in Slovenia, the Netherlands and Ireland and Germany less than 20% reported this behaviour. When investigating differences between countries, there is only a medium variability without any obvious influence of regional location within the EU (north vs. south; east vs. west), see Figure 11. Due to large differences in daylight between Northern and Southern Europe, which might be related to the evolution of fatigue, one might have expected a systematic influence

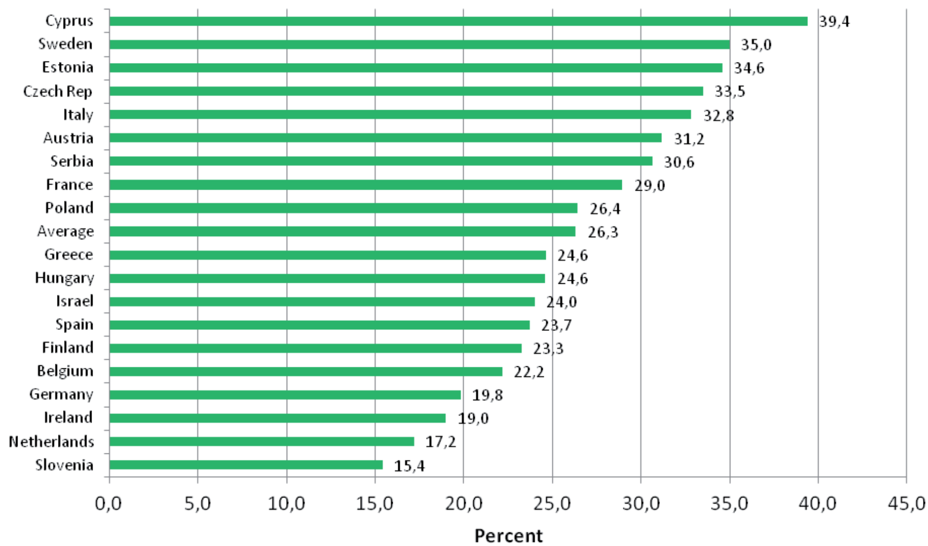

Figure 11: Prevalence of driver fatigue*.
* Drivers report driven when at least 'sometimes' felt too tired to drive.

Opinions about measures to prevent fatigue-driving

Three in four car drivers (76%) are in favour of having fatigue detection device that warn them to stop if they are too tired to drive. The variation across the countries is quite marked with 90% of drivers in favour in Ireland and only 60% in Austria.

Hierarchical cluster analysis fatigue coping behavior

A hierarchical cluster analysis was performed. The goal of this analysis was to identify groups of car drivers whose fatigue coping behaviour was as homogenous as possible within these groups but differed as much as possible between these groups. Due to restrictions in the calculation procedure, the analysis was performed with a random sample of 1,876 cases (15% of the total sample). With regard to the criterion of homogeneity (standard deviation) and content (interpretation) a four-cluster-solution was identified. Based on this solution a cluster center analysis was performed on the entire data set. With this analysis the clusters were optimized and the discriminant analysis revealed that 96% of the participants could be correctly classified.

Figure 12 illustrates the profiles of the four clusters by indicating the mean z-scores for each cluster and each item assessed. Table A describes the average characteristics of each cluster with regard to relevant attributes.

In sum, the four clusters identified can be characterized as follows:

Frequent cope show a high frequency of all countermeasures, especially those that have low to none or only shortly lasting effects. Females are slightly overrepresented in this group and with an average age of 39 years, the car drivers in this group are of rather young age. They further show a high frequency of fatigue driving incidents and report an above average annual mileage as well as an above average accident involvement.

Dysfunctional cope as the largest group of car drivers show an above average frequency of coping behavior that is known to have no long lasting effect on driver state. At the same time those behaviors that are more helpful but take more effort and time to be performed (break, sleep, switch driver) are reported less often. This group shows an age structure below average.

Functional cope show an opposite pattern to that of the dysfunctional copes. They mostly perform functional countermeasures that have been shown to have a lasting effect on driver state. While they drive the same amount of kilometers per year and report the same amount of fatigue as the dysfunctional cope, they are on average six years older and show a lower accident involvement.

Rare cope clearly show the lowest occurrence of fatigue driving and also the lowest frequency of all countermeasures. At the same time they drive the fewest kilometers per year and have the lowest rate of accident involvement.

From a safety perspective frequent and dysfunctional copes form the most problematic groups which are reflected in their rather insufficient or inappropriate use of countermeasures and by tendency also in the comparably high rate of accident involvement.

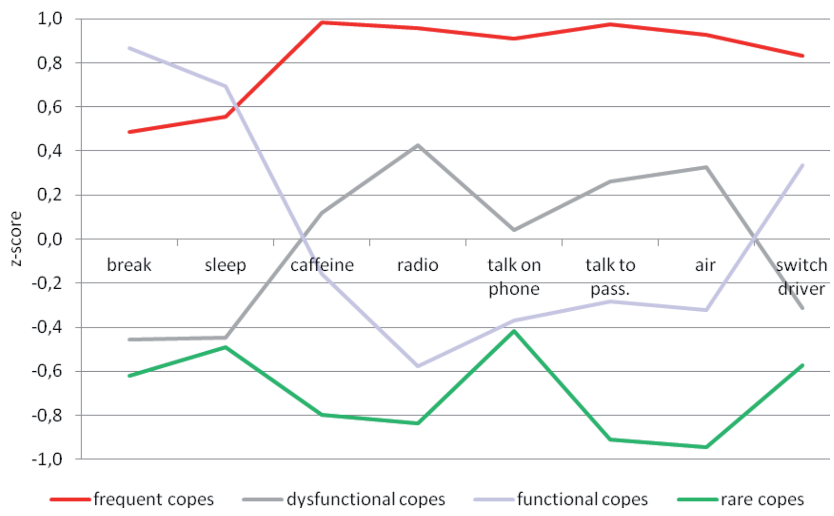

Figure 12: Profiles of the four identified clusters.

Table 3: Characteristics of the identified clusters.

	N	male	M (age)	M (km/ year)	accident prv. three years	driving too tired (s+)
frequent copes	2,013	51.3%	39.0	17,228	28.4%	36.1%
dysfunctional copes	4,304	54.8%	40.1	15,497	26.5%	27.7%
functional copes	2,739	56.8%	45.8	15,428	23.6%	26.7%
rare copes	2,945	57.1%	46.1	14,008	20.9%	16.2%

When investigating the number of car drivers within the four clusters for each country (Figure 13) a considerable variance between countries evolves. When summing up the frequent copes and the dysfunctional copes into one group that applies rather unsafe countermeasures when fatigued, in Cyprus, Austria and Estonia more than 70% of the car driver population belong to this group, while this is only the case for less than 40% in Belgium, Slovenia, the Netherlands and France. Interestingly, the Netherlands is the only country that reported a dedicated fatigue driving campaign within the timeframe since the last SARTRE edition.

In sum, the frequency of fatigue driving and the considerable occurrence of inappropriate coping strategies lead to the conclusion that at least in certain countries an improvement in awareness concerning the problem of fatigue driving may be necessary. This is particularly true for Cyprus, Austria and Estonia, that combine a relatively high rate of fatigued driving with comparably unsafe coping strategies. Educative campaigns, informing about correct behaviour when experiencing fatigue, may be an appropriate countermeasure.

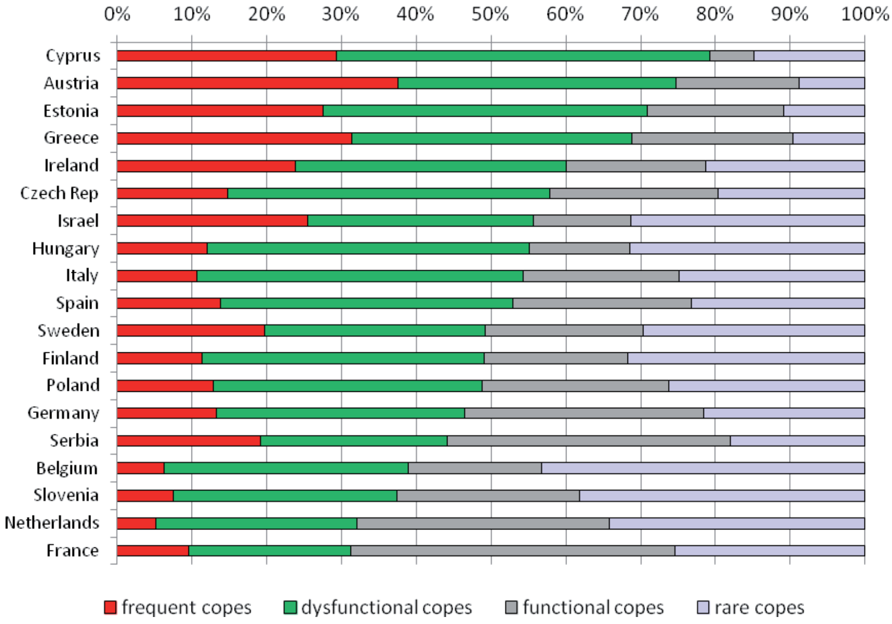

Figure 13: Proportion of car drivers belonging to each of the four clusters within each country.

Factors affecting driver fatigue

In this section we investigate the association between fatigue driving and various factors. In the SARTRE 4 survey, 11 items deal with the topic of driver fatigue. One of them is used to classify the drivers as those who drive whilst fatigued. The other variables will be used as possible independent variables that predict the dependent variable. In addition, some demographic variables like age, gender, socio-economic status and the nationality of the respondent are included.

The outcome (dependent) variable

The item on the questionnaire which relates directly to driver fatigue is question CD17, which asks 'In the past 12 months while driving, how often did you realize that you were actually too tired to drive?' There are six response choices to this question (never, rarely, sometimes, often, very often and always).

For the purpose of our analysis these responses have been combined. Respondents to question CD17 are recoded with 1 representing those who report that at least 'sometimes' they felt too tired to drive in the past 12 months and 0 representing those who report never or rarely felt too tired to drive. Drivers who report that at least 'sometimes' they felt too tired to drive in the past 12 months are referred to as fatigued drivers.

Model Fit

Logistic regression modeling approach is used to describe the relationship between the explanatory variable and driving whilst fatigued. This model is used to obtain estimated measures of association in terms of odds ratios. The results of the model containing all explanatory variables described above are presented in Table 4. The Hosmer-Lemeshow test showed a good fit of the model (χ^2= 10.94, p= 0.205) (Table 4).

Interpretation of the results

The association between driving whilst fatigued and various factors are interpreted in terms of odds ratio of the logistic regression model in Table 4. The odds of driving whilst fatigued for women in comparison with men (self-reported) are multiplied by a factor of 0.78. This means that odds of driving whilst fatigued for women decrease significantly by 22% when controlling for all the other mentioned factors (odds ratio= 0.78, $p<0.001$). In other words, women are less likely to drive when they are too tired.

Age of drivers

Driving whilst fatigued is reported more by males and decreases with age. The reference category for age group is the category of drivers aged 17 to 24. The odds of driver fatigue (self-reported) decrease by 64% for 65 and over year olds compared with the reference category (odds ratio= 0.37, $p<0.001$). For 35-44year olds, 45-54 year olds and 55-64 year olds the odds decrease significantly by 23% ($p<0.01$), 29% ($p<0.001$) and 44% ($p<0.001$) respectively compared with the reference category. There is no significant difference in the odds of driving whilst fatigued for drivers aged 25 to 34 and 17 to 24.

Level of education and marital status

The odds of driver fatigue for the drivers with further education increase by 18% compared with the drivers with a primary education (odds ratio= 1.18, p= 0.015). The odds of driving whilst fatigued for drivers with secondary or no education are not significantly different from drivers with a primary education.

Drivers living as married are more likely to drive whilst fatigued compared with drivers who are single (odds ratio= 1.30, $p<0.001$). Married drivers are also more likely to drive whilst fatigued compared with drivers who are single (odds ratio= 1.209, $p<0.01$). Being separated or divorced increases the odds of driver fatigue by a factor of 0.25, holding other variables constant. The association between marital status and the dependent variable is significant $\chi^2_{(4)}$= 31.39, p= 0.000).

Living area

Thirty nine per cent of the respondents who report that at least 'sometimes' they felt too tired to drive in the past 12 months are drivers who live in urban cities or large towns. Drivers who live in urban cities or large towns have odds of reporting driver fatigue that is 19 percent higher than for those live in rural areas/village (odds ratio= 1.189, $p<0.01$). The association between living area and the dependent variable is significant ($\chi^2_{(3)}$= 8.71, p= 0.033).

Kilometres travelled

Driver fatigue is reported more by drivers driven more kilometers per year. The odds of driver fatigue for Driving over 10,000 kilometers a year increases driver fatigue by 65% (odds= 1.65, $p<0.001$) compared with those driven less than 3,500, holding other variables constant. The association between kilometers travelled and the driver fatigue is significant ($\chi^2_{(4)}$= 79.97, p= 0.000).

Injury Accident experience

The respondents who have been involved in an accident where someone was injured have 63% higher chance of suffering from driver fatigue compared with those with who have not been involved in an accident where someone was injured in the past 3 years (odds ratio= 1.63, $p<0.001$).

Table 4: Logistic regression model for driving whilst fatigue.

	driving whilst fatigue	Odds Ratio	z	[95% Conf.	Interval]
Factors (reference category)					
	country	0.974***	-6.73	0.967	0.982
Gender (male)	female	0.778***	-5.47	0.711	0.851
Age(17-24)	25-34	0.873	-1.77	0.751	1.015
	35-44	0.773**	-3.05	0.655	0.912
	45-54	0.708***	-3.91	0.595	0.841
	55-64	0.555***	-6.05	0.459	0.672
	65+	0.363***	-8.62	0.288	0.457
Marital status (single)	living as married	1.304***	3.74	1.135	1.499
	married	1.209**	2.96	1.066	1.371
	separated or divorced	1.253*	2.27	1.031	1.523
	widowed	1.354	1.88	0.987	1.856
level of education (primary)	secondary	1.056	0.83	0.929	1.201
	further education	1.183*	2.44	1.034	1.355
	None	0.619	-1.43	0.321	1.195
Area(Rural /Village)	Small town	1.099	1.57	0.977	1.236
	Suburban/ City outskirts	1.105	1.32	0.953	1.283
	Urban City/ Large	1.189**	3.11	1.066	1.326
Kilometer travelled (<=3500)	>3500 and <=5000	0.963	-0.4	0.797	1.163
	>5000 and <=7500	1.093	0.84	0.888	1.345
	>7500 and <=10000	1.129	1.56	0.970	1.315
	>10000	1.650***	7.53	1.448	1.879
Fatigue detection (very)	fairly	0.902*	-2.11	0.819	0.993
	not much agree	0.765***	-4.12	0.674	0.869
	not at all	0.91	-1.09	0.768	1.078
Involvement in injury accident	Yes	1.63***	5.94	1.388	1.916

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Discussion

This chapter examined the SARTRE 4 survey with the intent of understanding the scale of the problem of alcohol, drug and other factors affecting fitness to drive and what counter measures the public may accept.

Alcohol

The danger of drinking and driving seems understood by majority of car drivers in Europe. However, on average 31% of car drivers in Europe reported driven after taking even a small amount of alcohol, and up to 15% of car drivers acknowledged to drink and drive at least occasionally over the legal limit. There is a definite problem with drink and driving over the legal limit in Europe, as to be expected from previous SARTRE studies. The drivers from southern Europe are found to be more likely to drink and drive over the legal limit. Driving after taking even a small amount of alcohol is also high in southern Europe. Drink driving is more prevalent in Belgium, Cyprus, France, Israel, Italy and Spain. This is consistent with DRUID results which show that driver with BAC of 0.1 g/L or more are highest in Italy (8.6%), Belgium (6.4%) and Spain (3.9%). Regarding the BAC limit, 13% of drivers in Europe report to desire a lowering of the legal limit, 46% to no alcohol at all. The results showed that for countries with 0.0g/l limit or 0.2g/l limit, 95% or more have not driven over the legal limit with exception of Czech Republic. The lower BAC limit seems to play a key role in controlling drink driving habits.

Likelihood and incidence of being checked or fined for drink driving in all over Europe is low. Majority of drivers have never been checked for drink driving in the past 3 years. For European countries where the legislation for random breath testing is in force, drivers' perceived probability of being stopped and fined by the police is high. Drivers who drink and drive over the legal limit are more likely to be male than female and of any driving age. They are more likely to have no education and live in a small town or urban city. They are more likely to be single or separated/divorced than married. They do not believe that drink driving increase the risk of accident. They also have history of involvement in injury road traffic accident. In their opinion, they can drink five or more units of alcohol and still remain under legal limit. These drivers do not see that if you drink and drive you will be stopped and fined by the police. Drivers' perceived probability of being stopped and fined by the police, perception of increase risk of accidents, living area, educational status and marital status are significantly associated with drink-driving habits. Our findings also confirm the impact of educational level on drink driving behaviour seen in other studies (Shinar et al., 2001).

Drug

The results showed that vast majority of car drivers in Europe understand the dangers of taking medication that carries a "warning: it may influence your driving ability" when driving. However, 10% sometimes or often take such medication when driving.

Just 1% of car drivers in Europe have been checked for drug driving in past year and less than one percent has been punished for usage when driving.

Fatigue

Driving whilst fatigued is prevalent among all the drivers in Europe and is reported more by males and decreases with age. Perhaps older drivers simply do not recognise certain symptoms as fatigue anymore. It could be that these people are more active and fatigue to them is not just due to driving but due to a hectic life. The country comparison shows that there differences between countries among age groups.

Two third of car drivers in Europe pull over and take a break when driving if they feel too tired. The most popular activity is to open a window or lower heat (78%) and talking to a passenger (79%). Encouraging drivers to stop and take a break when fatigue sets in is necessary as 34% continue to drive. Driving whilst fatigued is more likely to be suffered by male than female and aged 17 to 34. They are more likely to be suffered by driver with higher education and live in urban city or large town. They are more likely to be married or living as married than single. They are more likely to travel over 10,000 kilometers a year.

Conclusions

Further reductions in drink driving habit will require attention to transport needs within small towns or urban city, more enforcement of existing legislation, and road safety campaign more targeting drivers having lower educational status. Encouraging drivers to stop and take a break when fatigue sets in is necessary as 34% continue to drive.

Complementary table
a: Factors affecting drink-driving behaviours in Southern countries.

Factors (reference category)	drink driving over the legal limit	Odds Ratio	z	P>z	[95% Conf.	Inter-val]
Gender (male)	female	0.53	-5.15	0.0000	0.41	0.67
You can drink and drive if you drive carefully (very)						
	not much agree	0.34	-2.22	0.0270	0.13	0.88
	not at all	0.13	-4.21	0.0000	0.05	0.33
checked for alcohol (never)	Once	2.03	5.11	0.0000	1.55	2.67
	more than once	2.60	6.05	0.0000	1.91	3.55
Marital status (single)						
	married	0.61	-2.84	0.0040	0.44	0.86
	widowed	0.33	-2.25	0.0250	0.13	0.87
level of education (Primary)						
	None	5.19	2.79	0.0050	1.63	16.47
number of units of alcohol (0 units)						
	3-4	3.29	3.61	0.0000	1.72	6.28
	5+	3.04	3.08	0.0020	1.50	6.18
Area (Rural /Village)	Small town	1.64	2.92	0.0030	1.18	2.27
if you drink driving you be stopped and fine by the police (very)						
	not much agree	1.74	3.25	0.0010	1.25	2.42
drink driving increase the risk of accident	fairly	1.62	3.72	0.0000	1.26	2.09
	not much agree	3.35	3.74	0.0000	1.78	6.32
Involvement in injury accident	Yes	2.21	4.45	0.0000	1.56	3.13

z= z-score for test of effect in factor change; P>|z|= p-value for z-test; Odds ratio= factor change in odds for unit increase in predictor variable, holding all other variables constant.

b: Factors affecting drink-driving behaviours in Western countries.

Factors (reference category)	drink driving over the legal limit	Odds Ratio	z	P>z	[95% Conf.	Inter-val]
Gender (male)	female	0.48	-5.98	0.0000	0.38	0.61
You can drink and drive if you drive carefully (very)						
	not much agree	0.30	-4.14	0.0000	0.17	0.53
	not at all	0.11	-7.66	0.0000	0.06	0.19
checked for alcohol (never)						
	more than once	1.46	2.46	0.0140	1.08	1.97
Marital status (single)						
	married	0.74	-1.92	0.0550	0.54	1.01
number of units of alcohol (0 units)	1-2	2.51	3.86	0.0000	1.57	4.01
	3-4	6.15	6.98	0.0000	3.69	10.25
	5+	6.75	4.44	0.0000	2.91	15.68
Kilometer travelled (<=3500)	>3500 and <=5000	2.06	2.56	0.0110	1.18	3.60
	>7500 and <=10000	1.74	2.28	0.0230	1.08	2.79
	>10000	2.05	3.20	0.0010	1.32	3.18
drink driving increase the risk of accident	fairly	1.76	4.22	0.0000	1.35	2.29
	not much agree	2.23	3.17	0.0020	1.36	3.66
Involvement in injury accident	Yes	2.83	4.75	0.0000	1.84	4.36

c: Factors affecting drink-driving behaviours in Eastern countries.

Factors (reference category)	drink driving over the legal limit	Odds Ratio	z	P>z	[95% Conf.	Inter-val]
Gender (male)	female	0.51	-3.16	0.0020	0.34	0.78
Age (17-24)	25-34	2.06	2.3	0.0210	1.11	3.82
	35-44	2.47	2.59	0.0100	1.25	4.88
	45-54	2.09	2.05	0.0400	1.03	4.22
You can drink and drive if you drive carefully (very)	fairly	3.90	2.41	0.0160	1.29	11.79
	not at all	0.36	-1.91	0.0570	0.12	1.03
Marital status (single)	living as married	0.54	-2.17	0.0300	0.31	0.94
	married	0.60	-2.02	0.0430	0.36	0.98
level of education (Primary)						
	further education	0.44	-2.68	0.0070	0.24	0.80
	None	4.35	1.73	0.0830	0.82	22.95
number of units of alcohol (0 units)	1-2	2.72	5.27	0.0000	1.87	3.94
	3-4	6.15	3.78	0.0000	2.40	15.77
Kilometer travelled (<=3500)	>3500 and <=5000	2.22	2.32	0.0200	1.13	4.36
	>10000	1.79	2.1	0.0360	1.04	3.07
if you drink driving you be stopped and fine by the police (very)	fairy	1.83	2.79	0.0050	1.20	2.79
	not much agree	2.00	2.7	0.0070	1.21	3.31
drink driving increase the risk of accident	not much agree	4.12	3.81	0.0000	1.99	8.53
	not at all	0.34	-1.27	0.2020	0.07	1.78
Involvement in injury accident	Yes	2.87	3.64	0.0000	1.63	5.06

Chapter 1.5

Car Drivers Intelligent Transportation Systems[10]

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Introduction

Perhaps the title 'Intelligent Transport(ation) Systems (ITS)' we use is somewhat misleading and too general, but it is a generic term covering all sorts of devices aimed to support drivers. In fact the concept of Intelligent Transportation Systems (ITS) covers the collection of systems and subsystems for solving increasing problems in traffic, from traffic density to safety (Brookhuis & de Waard, 2007), providing drivers with time-, situation-, and location dependent information, warnings and physically intervening with the vehicle control in critical situations (Oppenheim and Shinar, 2011). Some systems can prevent unsafe driving (e.g. Alcolock), others may prevent unsafe situations/actions while driving (e.g. Antilock Braking System - ABS, Electronic Stability Control - ESC, Adaptive/Autonomous Cruise Control - ACC), but there is also a class of mainly nomadic devices that could present distraction to the drivers (e.g. mobiles). Oppenheim and Shinar (2007) also warn against possible negative side effects of ITS and e-Safety, e.g. under-load and diminished attention level, information overload, incorrect interpretation of information, overreliance on the system, risk compensation and effect on non-users. In general within ITS systems at least two main subsystems could be distinguished: In-Vehicle Information (and Communication) System (IVIS), and Advanced Driver Assistance System (ADAS), but there is a number of different classifications of ITS, one being present in Figure 1 (Schulze et al., 2005).

10 - For the valuable comments to the chapter the authors would like to thanks Ilona Buttler (ITS), Julien Cestac (IFSTTAR), and Miklós Gábor (KTI).

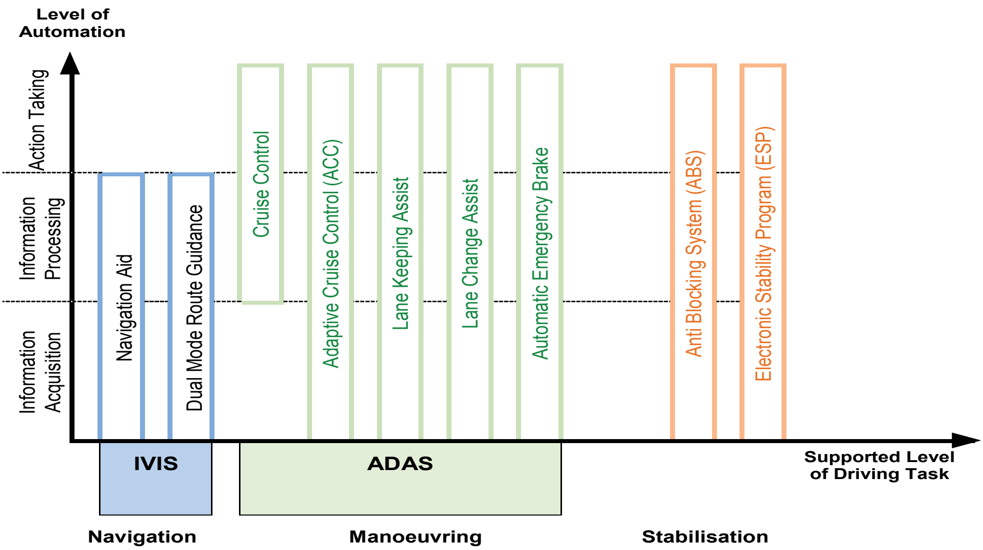

Figure 1: Examples for Driver Assistance System classification (after Schulze et al., 2005). While some systems are only offering information to a driver, others could even interfere with his control over vehicle.

Stevens (2009) introduces a fourfold classification of in-vehicle functions covering IVIS and ADAS:

- *In-built* – where function is automatically initiated by driver or vehicle actions (e.g. ABS, ASC)
- *Informing* – driver is presented with information, but important issue is distraction (e.g. route guidance, mobile)
- *Warning* – function is designated to attract driver attention (e.g. LDWS)
- *Assistance* – driver initiates and supervises an automated aspect of driving (e.g. ACC).

Functions differ in the level of driver control, safety issues, human interface, etc. what possibly influence their acceptability. Influence of ITS should be considered in the frame of inherent hierarchical structure of driving task, where strategic, tactical and operational components demand different levels of driver control (after Nilsson, Harms & Peter, 2010).

During recent years there is/was a number of research project studying different aspects of ITS, e.g. HUMANIST, PReVENT, GADGET, HASTE, AIDE, eIMPACT, INTERACTION etc. Their importance stem from the fact that human factors are the most important in traffic safety and that ITS devices help drivers in fulfilling their task. In this way they could contribute to safety, though sometimes not safety but driver's comfort is in the forefront. The fact that change in any part of the system does not leave 'all other things the same', but that other parts of the system – especially human component – may change should be considered as well (Oppenheim & Shinar, 2011). Quite naturally the level of penetration of the ITS in the overall traffic system is of great importance for its effectiveness. Acceptance of ITS is therefore basic for its implementation. In this sense drivers' attitudes toward such systems are important. It is not self-evident that they will accept and use each and every supporting system, because they could interfere with the very nature of driving as self-paced activity. They could prevent driver from certain (unsafe) actions and interfere with its control of the vehicle. Not every technical support is therefore subjectively acceptable and situation should be known and understood to achieve greater safety through technical means. Also the results of the INTERACTION survey revealed that although the majority of the users of the navigation system avoided entering the destination in the device when the car is moving, there were still quite a significant proportion of the drivers who tend to do so. This can be thought to cause driver distraction and has to be considered as dangerous behaviour.

In this chapter we are discussing car drivers attitudes toward certain ITS and their use and are not discussing so called nomadic devices, e.g. mobiles which are covered in other chapters. Already SARTRE 3 project investigate the attitudes of the European drivers towards new technologies, namely perception of their usefulness and acceptance. The investigated systems for usefulness were a navigation system, a congestion warning system, a speed limiter, an alco-lock and a fatigue warning system. The proportion of drivers that considered certain system fairly or very useful ranged from 15% to over 80%, namely:

- Navigation system from 44% (Austria) to around 50% (Denmark, Germany, Netherlands, Belgium, Finland) to over 70% (Greece, Spain, Portugal);
- Congestion warning device was perceived as more useful and respective percentages ranged from just over 50% (Germany, Austria) to over 80% (Poland, Croatia, Italy, Cyprus, Greece, Slovenia, UK, Spain, Portugal);
- Speed limiter was considered as the least useful (26%), while alco-lock device and fatigue warning system were perceived as somewhat more useful (32%), again with some differences between countries.

It seems that system that interfere with the driver's control of action are perceived as less useful then system that only inform his about the situation in this way helping his action.

Acceptability was investigated for the following systems: speed limiter, black box (for identification of accident causes and for recording driver behavior) and electronic identification (for services and for enforcement). Black box used for identifying accident causes was considered the most acceptable (36%), followed by black box for recording driver behavior (28%), speed limiter (28%), e-identification of services (25%) and e-identification for enforcement (20%). For speed limiter the pattern of acceptance between countries was similar to that of usefulness. Regarding other devices, there were differences between countries, ranging from 10% to 63%, the attitudes within country being consistent.

According to the findings of INTERACTION project, speed limiter was not very commonly used in the countries that participated in the survey. 70% of all participants said that they didn't have Speed Limiter. Another system designed for controlling the speed, cruise control, was much more widely used and accepted by the respondents. However, speed limiter as well as speed alert system were considered useful especially in long trips, on motorways, in daytime, when the weather conditions are clear or when the drivers knew that there would be speed checks on the roads. (Britschgi et al., 2010.)

All these systems present new and advanced technologies and new perspectives are constantly opening and their acceptance is important for their introduction. It must be understood that only a small fraction (see Pauzie & Amditis, 2011) of possible ITS devices is considered in SARTRE 4 survey as its aim is much wider than studying only attitudes toward ITS devices – attitudes and usefulness of a sample of them is only investigated in the frame of general attitudes toward traffic safety of which ITS is important aspect.

Method

Altogether 12507 car drivers from 19 European countries participated in the study. The following variables have been taken into account for the analysis concerning ITS: CO.06 for the acceptance of the ITS use (attitudes), and CD.22 for the use of ITS in car drivers' own cars. Comparisons were made according to countries, but also gender, age and the number of kilometres covered annually.

Statistical analysis of the different variables and their comparisons were performed with a significance level of 95%, and a cutoff level of confidence of 1.96. In the comparative analysis between countries, and other variables we used an inferential method (one-way ANOVA completed with post-hoc Tukey test and χ^2) as well as multiple regression analysis and K-means clustering.

Results

Answers to questions CD.22 and CO.06 will be presented, first regarding the countries and afterwards some more in – depth analyses will be given.

Use of the ITS in own car

Attitudes toward ITS devices are of course not enough to understand their influence on traffic safety. Their presence in someone's car reflect on one side his attitude, but also the general level of car fleet quality and modernity, presenting at the same time possibility for getting the relevant experience. In this questionnaire use covered the following ITS devices participants have in their own cars:

a. Navigation system, built-in or portable
b. An anti-lock braking system (ABS)
c. Seat belt reminder
d. A system that detects 'fatigue' and warn you to stop driving
e. Electronic tag for collection of tolls (highways-cities-tunnels, etc.)

Answers were given on the two point scale from 1= Yes to 2= No. Regarding checked devices there is quite a "messy" situation here, with systems that are connected with safety + car fleet, one that is connected with safety + demographics and one that has nothing to do with safety.

Navigation System

Navigation systems, portable or fixed are not yet self-understandable part of the cars, with exception of the more expensive ones, though portable devices are not so expensive. Also the frequency of driving and knowledge of destinations may influence their use. This is revealed also in the answers of our participants.

Figure 2: Presence of the navigation system in own car in different countries (χ^2= 877,287 ; p= 0.000).

Navigation system is relatively widely used in all the countries, shares varying between 20% (Hungary) and over 60% (Austria, Netherlands), though it is not prevailing (EU average being less than 40%), see Figure 2. This could be analysed at least descriptively to find out differences between genders, age-groups, geographical areas etc. It is a pity that it can not be said anything about differences in using in-built and portable devices, since both alternatives were included in the same question. According to the findings from EU-project INTERACTION (a big internet survey in nine countries including Finland, France, Czech Republic, The Netherlands, Austria and Spain), about 75% of the users had a portable navigation device. 13% of respondents were users of an in-built navigation system and 13% used a smart phone with a navigation function. Unfortunately it is not known what the shares were in SARTRE 4 surveys but probably this could give some idea of the how common the different alternatives are

Anti Lock Braking System

Anti-Lock Braking System (ABS) is almost necessary function of modern cars. It exists, but is invisible to the driver, perhaps only sensed when in action. Especially in connection with ABS risk compensating mechanisms should be considered.

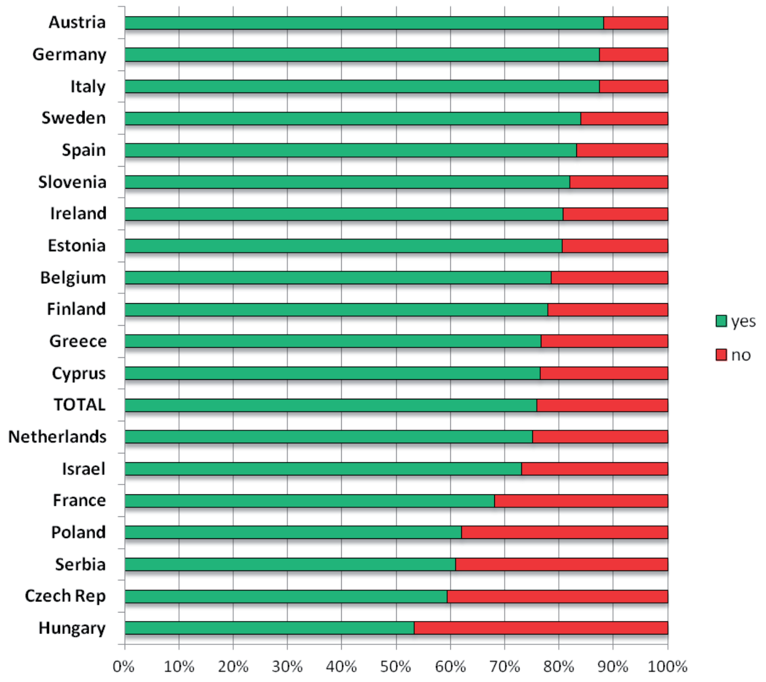

Figure 3: Presence of the ABS in own car in different countries (χ^2= 653,083 ; p= 0.000).

This system is evidently much more widely used (shares varying between > 50% to nearly 90%), see Figure 3. This are inbuilt systems and thus connected with the differences in car fleets in different countries, not as much interesting in regard with driver background - probably income or occupation could explain some differences.

Seat Belt Reminder

Seat belts are nowadays self-evident and necessary part of the car. As their use is more the matter of habit than of attitude, seat-belt reminder could support their use and device is more and more present in modern cars.

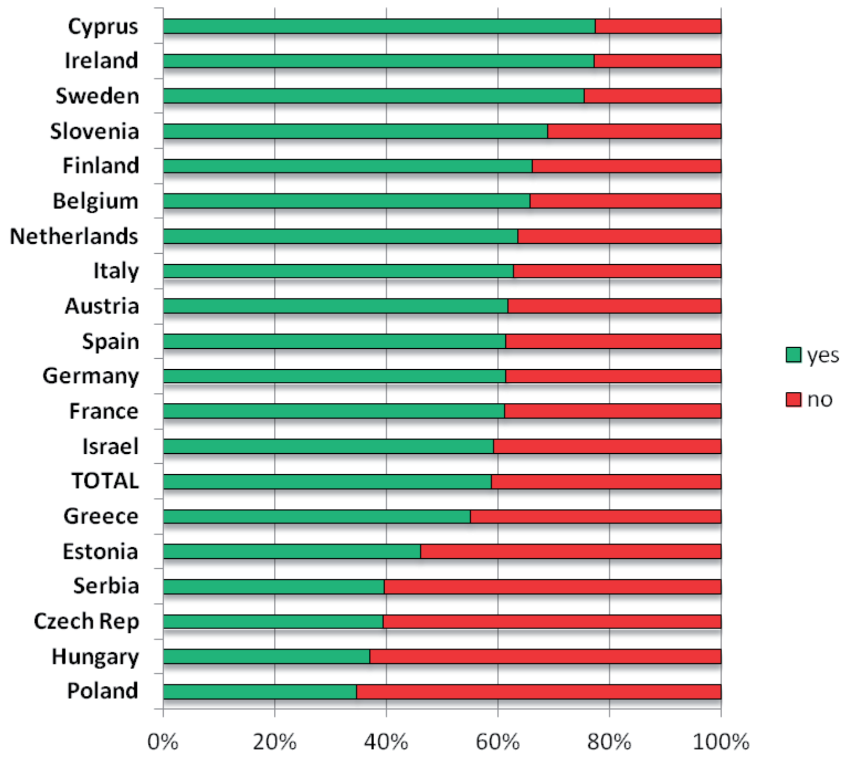

Figure 4: Presence of the seat belt reminder in own car in different countries (χ^2= 820,845 ; p= 0.000).

Answers revealed that this system is also widely used (shares varying from 35% to almost 80%), see Figure 4. This is inbuilt system and thus connected with the differences in car fleets in different countries, not as much interesting in regard with driver background - probably income or occupation could explain some differences.

Fatigue Detection and Warning

Fatigue is important factor in traffic safety, especially for professional drivers whose work schedule is in EU regulated by law, though implementation could vary between countries. Nonprofessional drivers are not subject to it and regarding fatigue and driving all depends on their decisions. There are hardly any users in the samples, the highest share being about 9% in Serbia and the lowest in Italy (0,5%) and France (0,5%), nevertheless differences between countries being statistically significant (χ^2= 178,083 ; p= 0.000). Therefore there is not very much to analyse regarding the use of this ITS.

Electronic Tag

Electronic tags are not connected with safety and one could ask about the sense of its inclusion into the questionnaire. Perhaps they could offer only a service to drivers for easier fulfilling some non-driving tasks.

The device is not yet widely used but there are relatively big differences between countries: only 3 users in Finnish data compared with over 30% of Italian car drivers (χ^2= 1105,005 ; p= 0.000).

Regarding the use of ITS devices there is quite a “messy” situation, with systems that are connected with safety and car fleet, one that is connected with safety and demographics and one that has nothing to do with safety. There are also a lot of differences in the way the systems are used while driving: some of them are switched on automatically when the engine of the car is started or the driver uses them regularly, where others are used only occasionally when needed. For example, according to the results of INTERACTION, speed limiter was used mostly regularly and navigation system was used mostly occasionally. About 30% of the respondents reported that they use the navigation system for the entire journey.

Analytic statistics

One of the first questions that appeared in connection with ITS devices was their interaction with drivers’ behavior, namely would – as proposed by Wilde’s risk homeostasis theory - drivers with ABS in their cars compensate with faster driving. Speed ticketing is an indicator of speeding and greater relative numbers of punished drivers in cars with ABS in comparison to those without it can give us at least partial answer, see Figure 5.

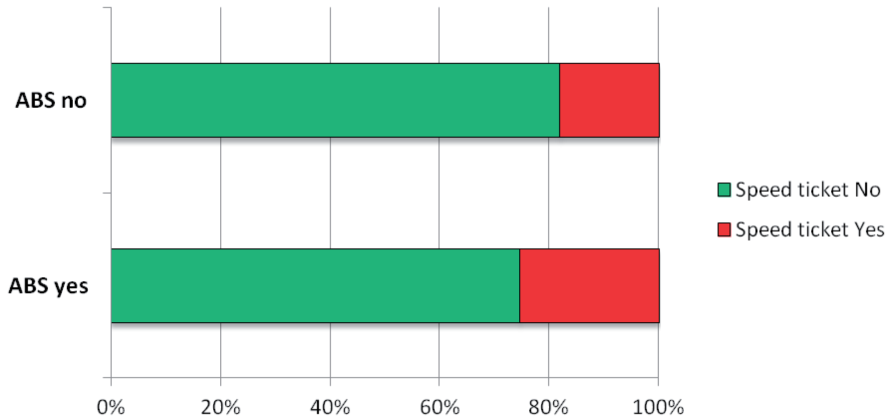

Figure 5: Crosstabulation of ABS presence in own car and speed ticketing ($\chi 2$= 68,257; p= 0.000). Variable was dichotomised, namely categories ‘Yes, only fine’ and ‘Yes, other with/out fine’ were joined, due to the relatively small numbers of speed ticketed drivers.

Findings are probably in agreement with Wilde’s (1982) risk homeostasis theory, namely drivers with ABS system in car are more prone toward speeding, of course if speed tickets adequately reflect such a behavior. Such a tendency is more or less prevailing in the majority of countries, with exception of Cyprus, Germany, and Ireland (see Figure 6). Of course also other explanations of this tendency are possible due to not complete control of all the relevant variables, e.g. the fact that new and up-to-date passenger cars are equipped with ABS device apart from the older and less modern ones also with a smaller engine capacity. The lower performance might be therefore the reason why is among the drivers having no ABS system in their cars lower the rate of those punished for speeding. So, it is hardly possible to make any important conclusion in this regard due to relatively small number of drivers without ABS in cars and because of incomplete control over the relevant variables.

We can take the results more as an indication of a tendency and warning that this kind of interactions should be considered. This means that introduction of ITS safety devices should be accompanied by relevant drivers education and campaigns supporting change of motivation towards safer behavior.

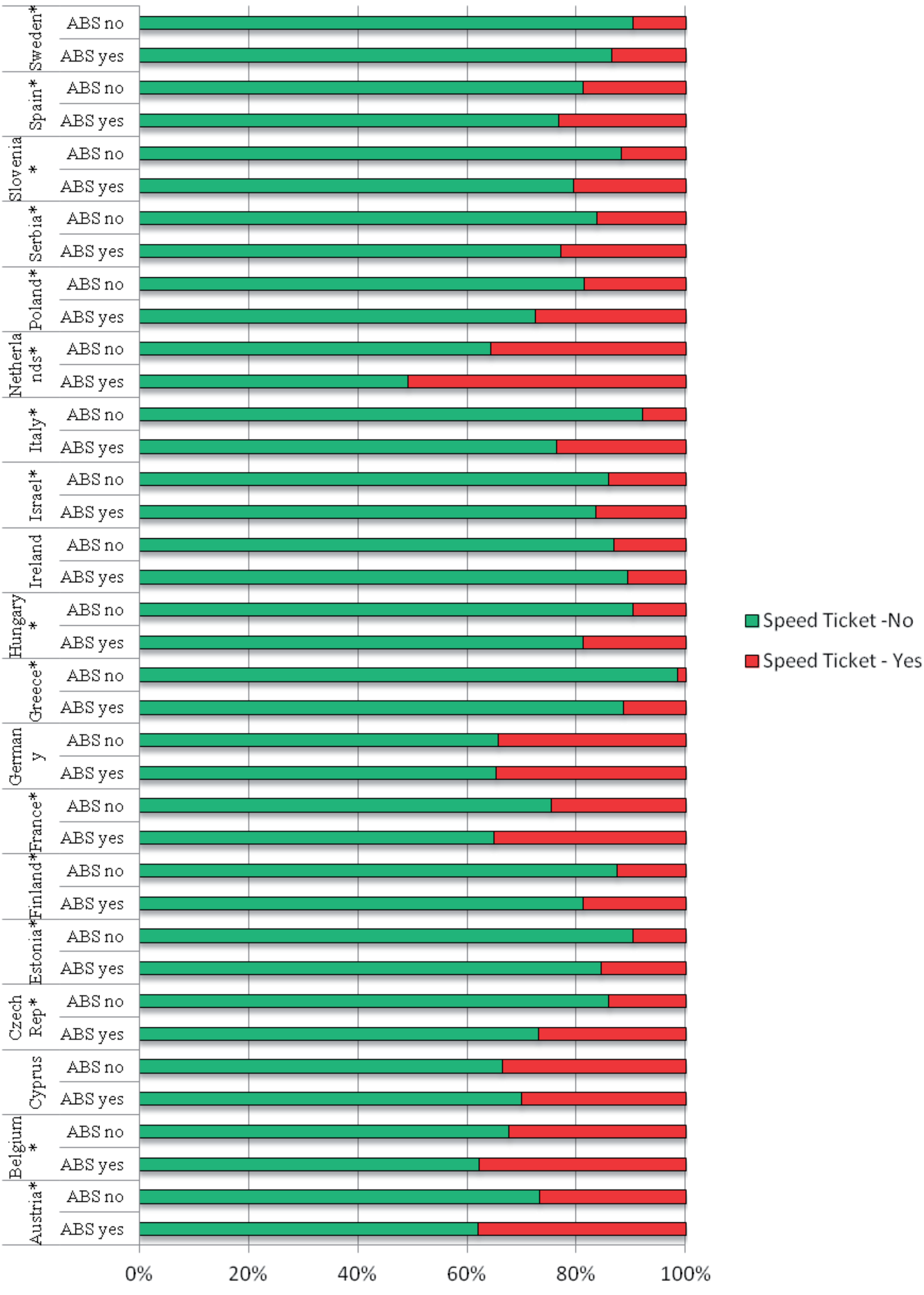

Figure 6: Proportion of reported speed tickets among ABS and non ABS users in different countries. With * are signed countries where drivers with ABS have relatively more speed ticketing than drivers without ABS. Statistically significant are χ^2s for Czech Republic, France, Greece, Hungary, Italy, Netherlands, Poland and Slovenia.

Presence of ITS devices is not strongly connected with gender, there are even very small differences for ABS (χ^2= 5,426; p= 0.02) and no statistically important differences for seat belt reminder and fatigue alert. The reason could be the use of the same car, small number of certain devices, etc. Regarding differences in the use of navigation system (χ^2= 93,165; p= 0.000), they could depend on the nature of journey of males and females, their experience, professional position, etc. and similarly for the use of the electronic tag presence among males and females (χ^2= 32,122; p= 0.000). Males in average drove 18112,82 km per year and females 12057,44 km per year, males has in average 22,35 years of driving experience, females 18,16 years. Differences are not so small, besides females are in average in less paid professional positions.

Regarding age, only differences for ABS presence will be presented.

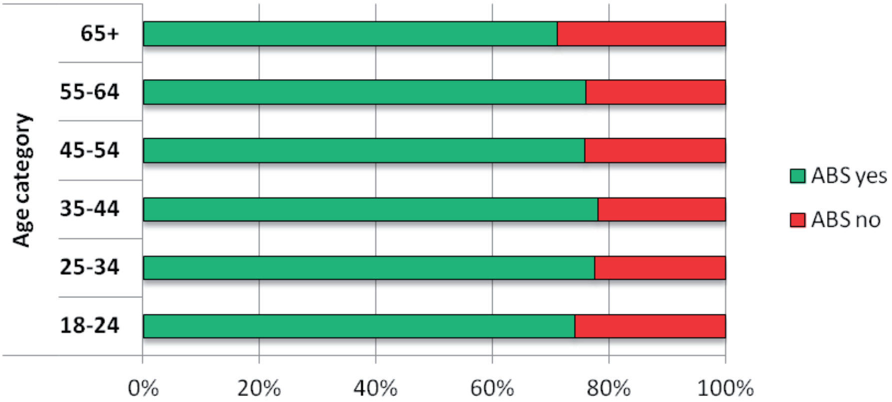

Figure 7: Crosstabulation of ABS presence in different age groups (χ^2= 27,846; p= 0.000).

For all ITS devices it could be said that they are the least present in oldest and youngest groups (see Figure 7). While the first have probably aged cars, the second could not afford the better ones.

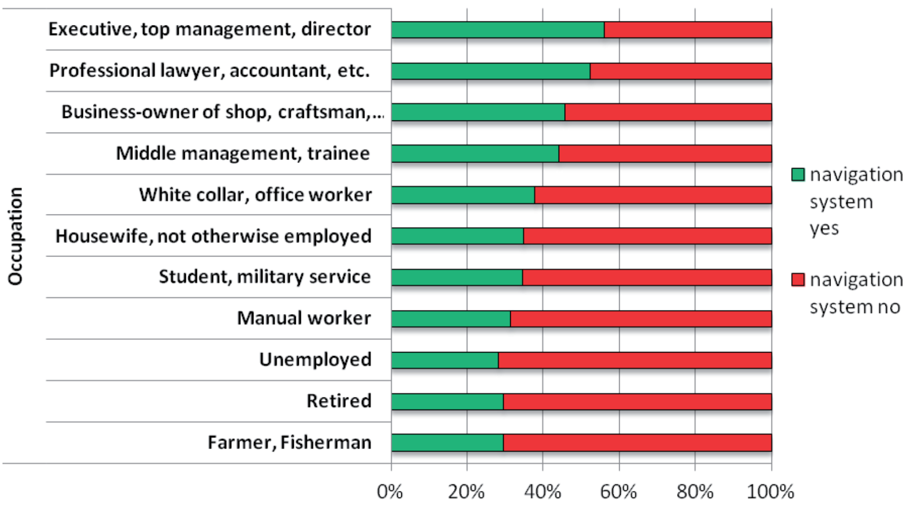

Figure 8: Crosstabulation of navigation system presence in different professional groups (χ^2= 265,071; p= 0.000).

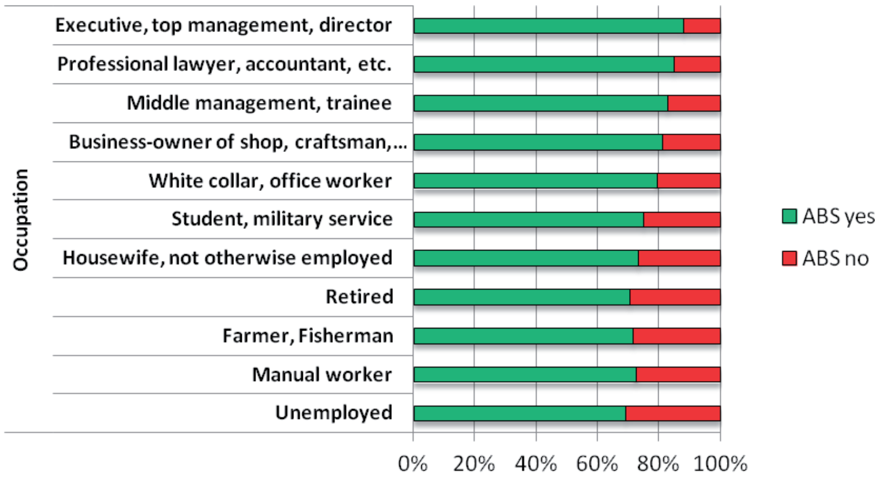

Figure 9: Crosstabulation of ABS system presence in different professional groups (χ^2= 170,259; p= 0.000).

It seems that presence of ITS devices is in a great part a matter of economic factors. There are difference in general presence of certain devices, but inside this frame people with greater income (top management, lawyers, etc.) have cars better equipped with them (see Figure 8 & Figure 9).

Attitudes to ITS devices

Attitudes covered favourability of the use of the following ITS devices:

a. Speed limiting devices fitted to cars that prevented drivers exceeding the speed limit
b. A 'black box' to identify what caused an accident
c. An "alcolock" that prevented the car to start if the driver exceeds the legal alcohol limit for driving
d. An "alcolock" that prevented the car to start for recidivist driver that exceeds the legal alcohol limit for driving
e. Fatigue detection devices that warn the driver to stop if he/she was too tired to drive

Answers were given on the four point scale from 1= Very to 4= Not at all.

Table 1: ANOVA for favourability of ITS devices among countries.

ITS DEVICE	F	Sig.	η2
speed limiting devices	49.990	.000	0,067
black box	23.612	.000	0,038
alcolock	15.442	.000	0,022
alcolock recidivist	44,911	.000	0,061
fatigue detection device	32.853	.000	0,045

Statistical significance of differences between countries is not surprising both because of high N and because of real differences in attitudes of participants from different countries.

Speed Limiting Devices

The favourability of speed limiting device (very + fairly) ranges from at least 41,7% (Sweden) to 83,7% (Ireland), see Figure 10. The majority of participants are therefore favouring this device. On the one extreme we have Sweden (41,7%), Netherlands (42,9%), Poland (46,9%) and Finland (47,4%) and on the other Ireland (83,7%), Greece (81,3%), Estonia (76,9%), Cyprus (73,2%), Italy (73,3%), Serbia (72,4%), Spain (70,9%), and Israel (65,7%), so a division between northern and southern countries, the later being more in favour of speed limiting device.

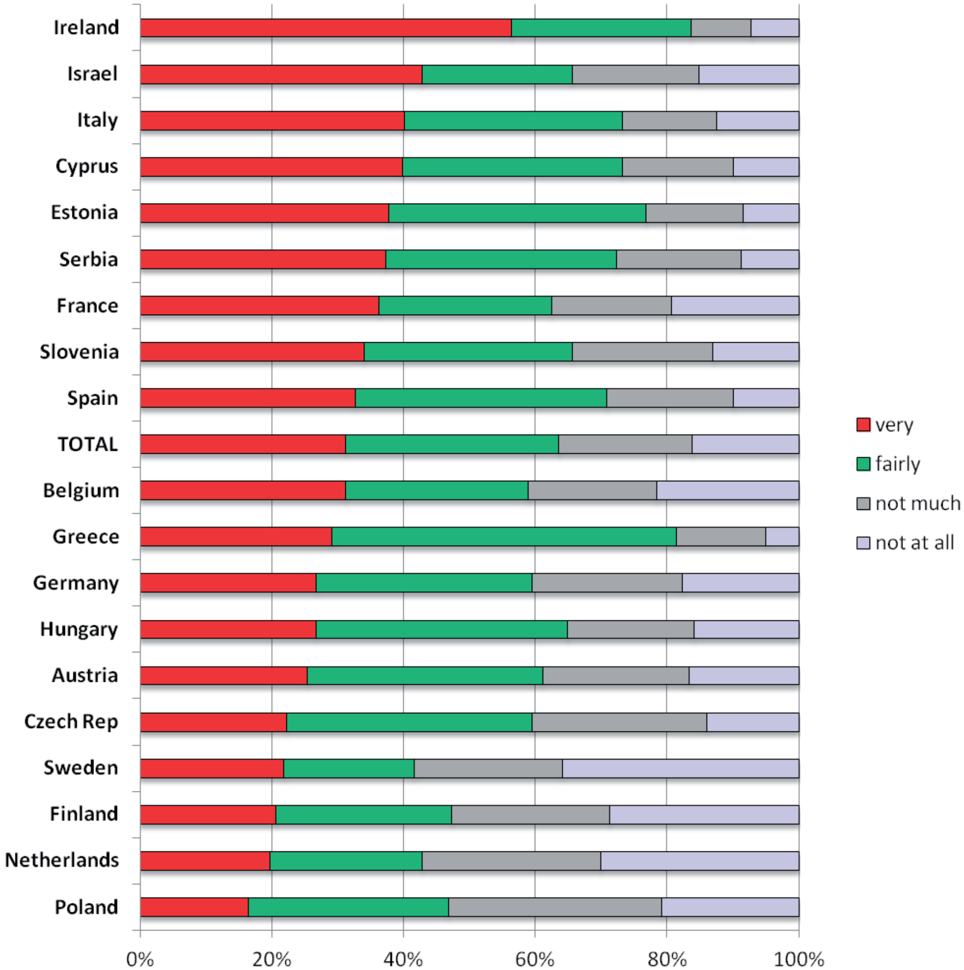

Figure 10: Favorability of using speed limiting devices in different countries.

The reason could lie in traffic culture, importance of exceeding speed limits, experience with the device, but possible are also other reasons. Average favorability for speed limiting device was 63,6%. Nevertheless it is interesting that in Sweden the speed limiting device is less favoured nonetheless that it was here that the development of the device started first.

Black Box

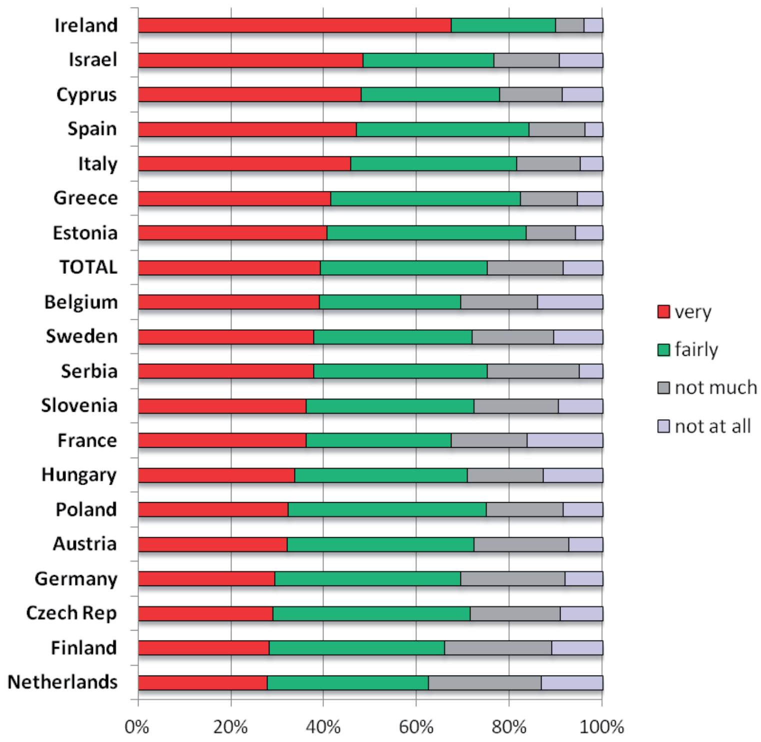

Figure 11: Favorability of using black box in different countries.

The favorability of black box device (very + fairly) ranges from at least 62,6% (Netherlands) to 90,0 % (Ireland), see Figure 11. The majority of participants are therefore even more in favoring this device than the previous one. On the one extreme we have Netherlands (62,6%), Finland (66,0%), France (67,4%), Belgium (69,4%), and Germany (69,5%) and on the other Ireland (90,0%), Spain (84,4%), Estonia (83,6%), Greece (82,4%), Italy (81,6%), Cyprus (78,0%), and Israel (76,6%), so a different division than previously, the later countries being more in favour of black box. Average favorability for black box was 75,3%.

Alco-lock

The favourability of Alco-Lock device (very + fairly) ranges from at least 68,8% (Austria) to 88,6% (Sweden), see Figure 12. The majority of participants are therefore even more in favouring this device than the previous two, the differences between countries being relatively small. On the one extreme we have Austria (68,8%), Czech Republic (75,6%) and Poland (77,8%), and on the other Ireland (89,1%), Sweden (88,6%), Slovenia (86,5%), France (84,0%), Finland (81,3%), Germany (80,9%), and Israel (79,6%), so a different division than previously, the later countries being more in favour of Alco-Lock. Average favourability for Alco-Lock was 80,3%. Evidently, drivers in all countries are aware of seriousness of driving while under the influence of alcohol problems, and would therefore support this kind of preventive measure.

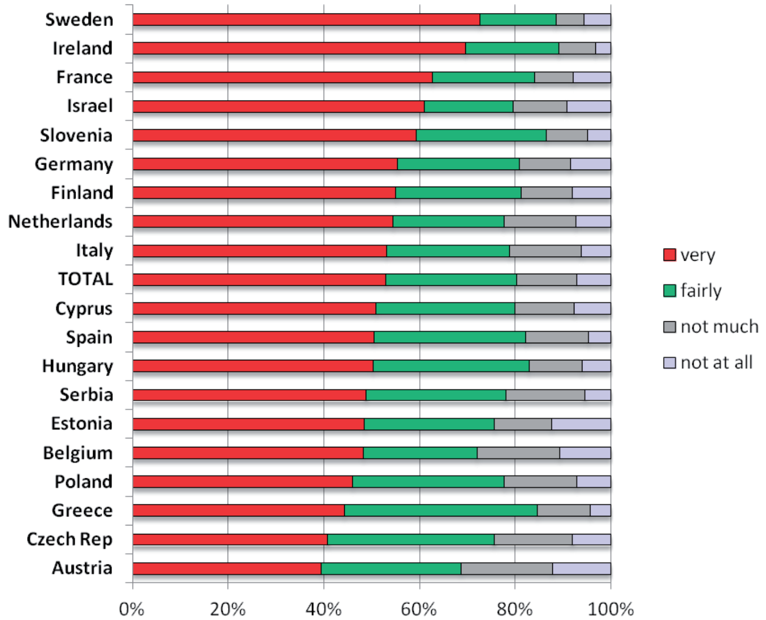

Figure 12: Favorability of Alco-Lock in different countries.

Alco-lock for Recidivists Driver

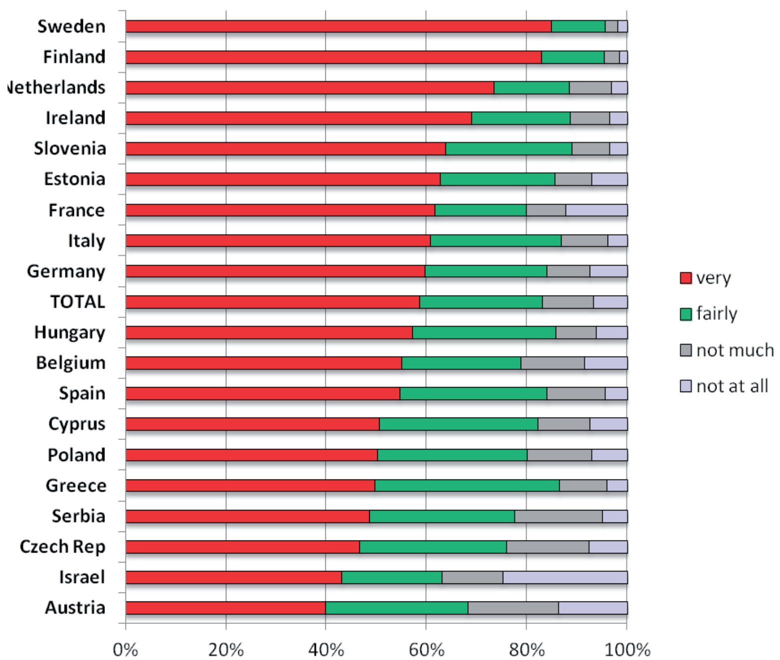

Figure 13: Favourability of Alco-Lock for recidivous drivers in different countries.

The favorability of Alco-Lock device for recidivous drivers (very + fairly) ranges from at least 63,1% (Israel) to 95,8% (Sweden), see Figure 13. The majority of participants are therefore even more in favouring this device than all the previous, the differences between countries being again relatively small. On the one extreme we have Israel (63,1%), Austria (68,3%), Czech Republic (76,1%), and Serbia (77,5%), and on the other Sweden (95,8%), Finland (95,5%), Slovenia (89,1%), Ireland (88,8%), Netherlands (88,5%), and Estonia (85,7%), so a different division than previously, the later countries being more in favour of alcolock for recidivists. Average favorability for alco lock for recidivists was 83,1%.

Fatigue Detection Devices

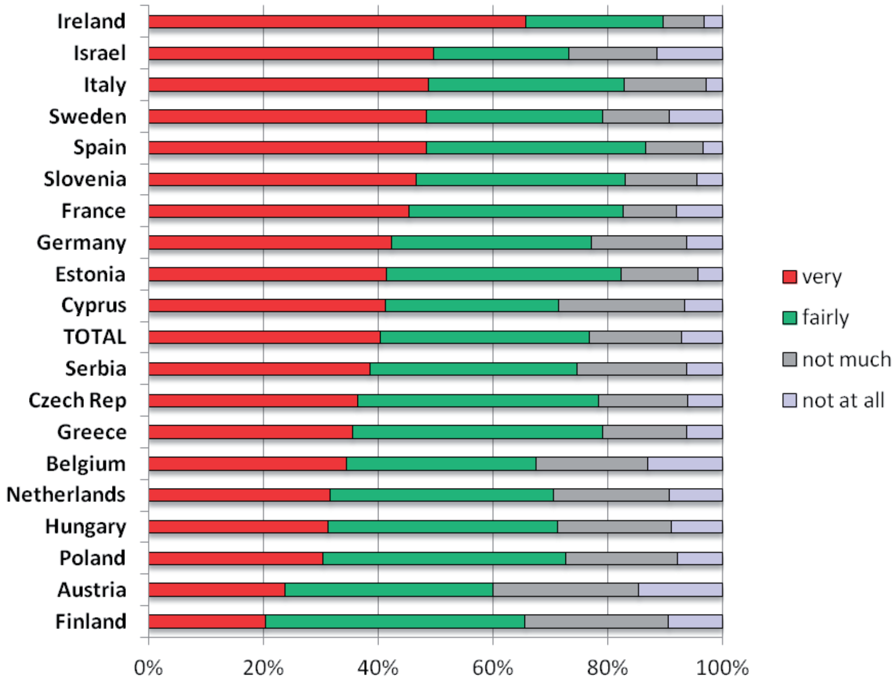

Figure 14: Favourability of fatigue detection devices in different countries.

The favourability of fatigue detection devices (very + fairly) ranges from at least 60,1% (Austria) to 89,8% (Ireland), see Figure 14. The majority of participants are therefore favouring this device, the differences between countries being relatively small. On the one extreme we have Austria (60,1%), and Finland (65,7%), and on the other Ireland (89,8%), Spain (86,7%), Slovenia (83,1%), Italy (82,9%), Sweden (79,2%), and Israel (73,3%), so again a different division than previously, the later countries being more in favour of fatigue detection devices. Average favorability for fatigue detection devices was 76,8%.

Analytic Statistics

It could be concluded, that the majority of participants is in favour of ITS devices, average percent of acceptance ranging from 63,6% (speed limiting device), 75,3% (black-box), 76,8% (fatigue detection devices), 80,3 % (alco-lock) to 83,1% for alco-lock for recidivists (see Table 2). There are differences across the countries depending on traffic culture, traffic regulations, experiences, etc. As the newer and more expensive cars are in greater degree equipped with such devices the factors influencing their use, e.g. income, tax policy, etc. should also be considered.

Lets now check the influence of some demographic factors as gender and age.

Table 2: ANOVA for favourability of ITS devices among males and females with descriptives (Mean and SD).

DEVICE	N	Mean	SD	F	Sig.	η^2
Speed limiting devices	12445	2.21	1.056	341.157	0.000	0,027
Male	6845	2.37	1.083			
Female	5600	2.02	0.989			
Black box	12421	1.94	0.943	120.136	0.000	0,010
Male	6836	2.02	0.976			
Female	5585	1.84	0.892			
Alco-Lock	12434	1.74	0.934	197.382	0.000	0,016
Male	6832	1.84	0.975			
Female	5602	1.61	0.863			
Alcolock recidivist	12429	1.65	0.914	154.501	0.000	0,012
Male	6837	1.74	0.953			
Female	5592	1.54	0.851			
Fatigue detection device	12411	1.90	0.916	84.811	0.000	0,007
Male	6823	1.97	0.942			
Female	5588	1.81	0.876			

For all ITS devices males are less fond of them than females, the reason being perhaps in females' greater interest for safety, wish for technical support in driving or some other factors (see Table 3).

Table 3: ANOVA for favourability of ITS devices among different age groups with descriptives (Mean).

DEVICE/AGE	18-24	25-34	35-44	45-54	55-64	65+	F	Sig	η^2
Speed limiting devices	2,41	2,29	2,22	2,15	2,10	2,04	26.407	.000	0,011
Black box	1,95	1,93	1,89	1,96	1,95	1,99	2.799	.016	0,001
Alco-Lock	1,77	1,81	1,75	1,70	1,69	1,64	7.878	.000	0,003
Alco-Lock recidivist	1,71	1,70	1,67	1,62	1,60	1,55	7.304	.000	0,003
Fatigue detection device	2,03	1,95	1,89	1,87	1,81	1,81	14.562	.000	0,006

It seems that older participant are more in favour of ITS devices than younger, perhaps because they perceive them more as a support than as an interference with their driving activity.

Table 4: ANOVA for favourability of ITS devices regarding car usage with descriptives (Mean).

DEVICE/Usage	Nearly daily	1 to 4 times/week	1 to 3 times/ month	less than 1 time/month	F	Sig.	η^2
Speed limiting devices	2,23	2,20	2,16	2.02	4.307	.005	0,001
Black box	1,93	1.98	1,93	1,83	2.771	.04	0,001
Alco-Lock	1,75	1,73	1,68	1,61	2.961	.031	0,001
Alco-Lock recidivist	1,66	1,63	1,60	1,52	3.923	.008	0,001
Fatigue detection device	1,90	1,92	1,89	1,82	1.313	.268	0,000

The non-frequent drivers (driving less than ones a month) seem the most in favour of ITS devices (see Table 4). Probably because of rare drives they feel insecure and prefer some technical support in driving.

Table 5: ANOVA for favourability of ITS devices regarding engine size with descriptives (Mean).

DEVICE/AGE	<1000	1000-1299	1300-1999	2000+	F	Sig.	η^2
Speed limiting devices	2,00	2,08	2,21	2,49	66,198	.000	0,016
Black box	1,93	1,89	1,93	2,03	8,111	.000	0,002
Alco-Lock	1,78	1,70	1,74	1,82	6,758	.000	0,002
Alco-Lock recidivist	1,68	1,63	1,66	1,66	1,314	.268	0.000
Fatigue detection device	1,89	1,85	1,90	1,96	4,655	.003	0,001

While drivers of weaker cars are more in favour of speed limiting devices, drivers of stronger cars are less prone toward them, probably they prefer to show the full strength of their machines (see Table 5). Regarding other devices the differences between owners of cars with different machine size are much smaller.

Living area and education do not influence favorability to ITS devices very much; the people without formal education express the highest preference for them.

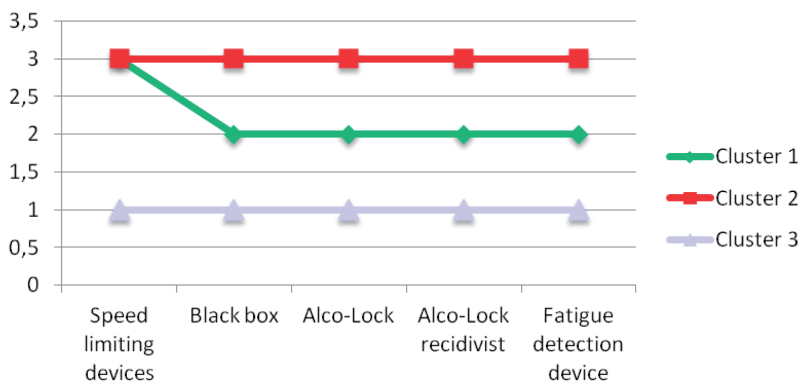

Figure 15: K-means analysis of favourability (1= very - 4= not at all) of ITS devices ($N_{Cluster\ 1}$= 5083; $N_{Cluster2}$= 2062; $N_{Cluster\ 3}$= 5205).

K-means analysis[11] revealed three groups of answers, those more in favour of all ITS devices (Mean close to 1), those not very much in favour of all devices (Mean around 3) and those that prefer more neutral answers, see Figure 15. Participants from Cluster 3 are the oldest in average (Mean= 44,31; SD= 14,961), followed by Cluster 1 (Mean= 41,71; SD= 15,066) and Cluster 2 (Mean= 41,42; SD= 14,850) participants. Participants least concerned with road accidents (Mean= 2,09; SD= 0,851) have rather negative attitude toward ITS devices (Cluster 2), while those the most concerned with accidents (Mean= 1,55; SD= 0,707) have the most favourable attitude toward ITS (Cluster 3), while those from Cluster 1 are in between (Mean = 1,88; SD = 0,762). Those from Cluster 3 are also the most experienced (Mean= 21,23 years; SD= 13,984), followed by Cluster 2 participants (Mean= 19,99 years; SD= 13,841) and Cluster 1 participants (Mean= 19,90 years; SD= 13,912).

11- K-means clustering is a method of cluster analysis that produce k different clusters proposed in advance by researcher (perhaps on the base of hierarchical clustering of data) of greatest possible distinction. Computationally it is ANOVA 'in reverse'.

Table 6: Share of cases in three clusters for different countries (K-means clusters).

COUNTRY	Cluster 1 -neutral	Cluster 2 -not in favour	Cluster 3 - in favour of ITS
Austria	39,20%	29,50%	31,30%
Belgium	37,20%	24,30%	38,40%
Cyprus	33,40%	17,50%	49,10%
Czech Rep	46,20%	20,60%	33,30%
Estonia	33,70%	16,50%	49,80%
Finland	53,80%	13,50%	32,70%
France	40,20%	14,20%	45,60%
Germany	41,50%	17,50%	41,00%
Greece	39,80%	14,60%	45,60%
Hungary	44,90%	16,90%	38,20%
Ireland	22,10%	8,20%	69,70%
Israel	35,80%	20,40%	43,80%
Italy	33,20%	13,90%	52,90%
Netherlands	54,00%	17,80%	28,10%
Poland	51,30%	21,50%	27,20%
Serbia	34,40%	19,70%	45,80%
Slovenia	41,30%	12,10%	46,60%
Spain	40,00%	13,60%	46,40%
Sweden	55,30%	8,00%	36,70%
TOTAL	41,20%	16,70%	42,10%

While in previous analyses by countries attitudes toward particular ITS devices were presented, here is a more general view (see Table 6). Participants from Cluster 3 (the most favorable to ITS devices) were prevailing in general (42,1%), and especially in Ireland (69,7%), Italy (52,9%), Estonia (49,8%), Cyprus (49,1%), Slovenia (46,6%), Spain (46,4%), Serbia (45,8%), Greece (45,6%), and France (45,6%). The least favorable (Cluster 2) was the attitude of participants from Austria (29,5%), Belgium (24,3%), Poland (21,5%) and Czech Republic (20,60%). It appeared that favorability of ITS devices is increasing from Northern toward Southern countries, Estonia and Ireland being an exception.

Regarding gender, 49,7% of females belong to Cluster 3, 38,0% to Cluster 1 and 12,3% to Cluster 2. Majority of males (43,7% belong to Cluster 1, 36,1% to Cluster 3 and 20,2% to Cluster 2. It seems that females are more in favour of ITS devices than men. Is this because they prefer safety or technical support remains for discussion.

Multiple regression analyses revealed at least certain factors that explain variances in favourability of ITS devices. Forward stepwise analysis was conducted so that contribution of different variables to explained variance could be seen. Analyses started with a much greater number of relevant variables for certain ITS device that were entered into the model, but all those that did not contribute significantly to the dependent variable variance explanation were skipped. Only the models with greatest explanatory power are presented in Table 7.

Table 7: Summary of Forward Stepwise Regression for Speed Limiting Device.

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	R^2 Change	F Change	df1	df2	Sig. F Change
4	.492d	.242	.242	.918	.011	177.582	1	12502	.000

d. Predictors: (Constant), Speed cameras (β= 0.158), Speeding Penalty (β= 0.223), Road Accidents (β= 0,147), and Speed Zone Cameras (β= 0.15).

On its own speeding control measures, concern for road accidents and especially attitude to speeding penalty explain the greatest part of variability (about 24%) in attitudes toward speed limiting device. It seems that motivation for this device is still more extrinsic than intrinsic, what means that there is a need for appropriate actions, education, campaign, etc.

Table 8: Summary of Forward Stepwise Regression for Black Box.

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	R^2 Change	F Change	df1	df2	Sig. F Change
2	.286b	.082	.081	.903	.027	372.113	1	12504	.000

b. Predictors: (Constant), Speeding penalty (β= 0.199), Road accidents (β= 0.169).

Independent variables included into the model explain only around 8% of variability in attitudes toward a black box, the most important being again attitudes toward speeding penalty and concern for traffic accidents (see Table 8).

Table 9: Summary of Forward Stepwise Regression for Alco-Lock.

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	R^2 Change	F Change	df1	df2	Sig. F Change
2	.382b	.146	.146	.862	.02	290.155	1	9976	.000

b. Predictors: (Constant), Drink-driving penalty (β= 0.33), Road accidents (β= 0.143).

Independent variables included into the model explain only around 15% of variability in attitudes toward a alco-lock, the most important being again attitudes toward drink-driving penalty and concern for traffic accidents (see Table 9). It seems again that attitudes toward penalties and general concern for traffic accidents strongly influence people' attitudes.

Table 10: Summary of Forward Stepwise Regression for Alco-Lock for recidivists.

Model	R	R 2	Adjusted R 2	Std. Error of the Estimate	R 2 Change	F Change	df1	df2	Sig. F Change
2	.318a	.101	.101	.865	.012	161.744	1	12504	.000

b. Predictors: (Constant), Drink-driving penalty (β= 0.267), Drink drive carefully (β= -0.112).

Independent variables included into the model explain only around 10% of variability in attitudes toward a Alco-Lock for recidivists, the most important being again attitudes toward drink-driving penalty and disagreement with the opinion that you could drink if drive carefully (see Table 10).

Table 11: Summary of Forward Stepwise Regression for Fatigue Detecting Device.

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	R^2 Change	F Change	df1	df2	Sig. F Change
1	.232a	.054	.054	.889	.054	711.44	1	12005	.000

a. Predictors: (Constant), Road accidents (β= 0.232).

Independent variables included into the model explain only around 5% of variability in attitudes toward a fatigue detecting device, the most important being concern for traffic accidents (see Table 11).

All in all, it seems that concern for traffic safety and attitudes toward penalties are the most important factors determining attitudes toward ITS devices, at least concerning variables included into the model. It must be considered that those devices could interfere with drivers' control or execute control over his driving behavior, and though mostly supportive could be viewed also differently. Attitudes and use of ITS devices are evidently complex, much more than revealed through our analysis. There are still a number of factors influencing these attitudes especially because the devices present new and advanced technology taking certain driver's functions out of his hands.

Comparison of SARTRE 3 and SARTRE 4 regarding ITS Devices

SARTRE 3 was going on in 2002, while SARTRE 4 appeared 8 years later in 2010. In the meantime development of ITS devices was growing and it is interesting how is this process reflected in people' attitudes.

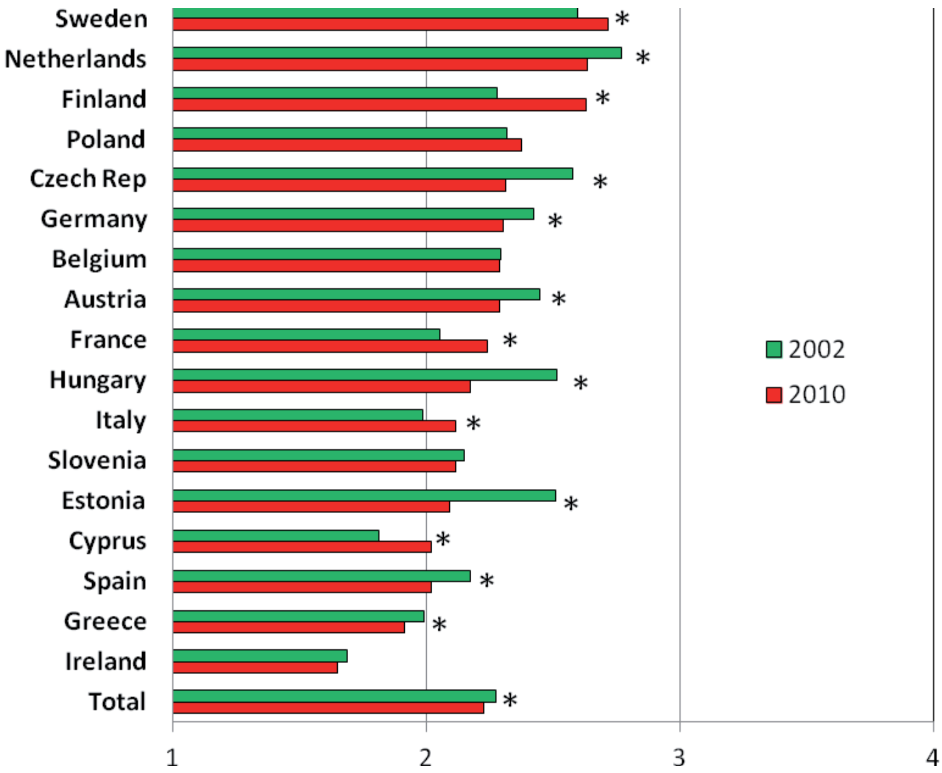

Figure 16: Not in favour of using a speed limiting device, comparison data from 2002 and 2010 (1= "very", 2= "Fairly", 3= "Not much" and 4= "Not at all").

The figure 16 shows that a significant change had taken place in all countries between 2002 and 2010 with regard to their attitudes about speed limiting device (t-tested; *= p<0,05). In Sweden, Finland, France, Italy and Cyprus drivers had become more negative whereas in the other countries drivers had become more positive.

Figure 17 shows the attitudes of drivers not in favour of a black box which can identify the cause of an accident in 2002 and 2010.

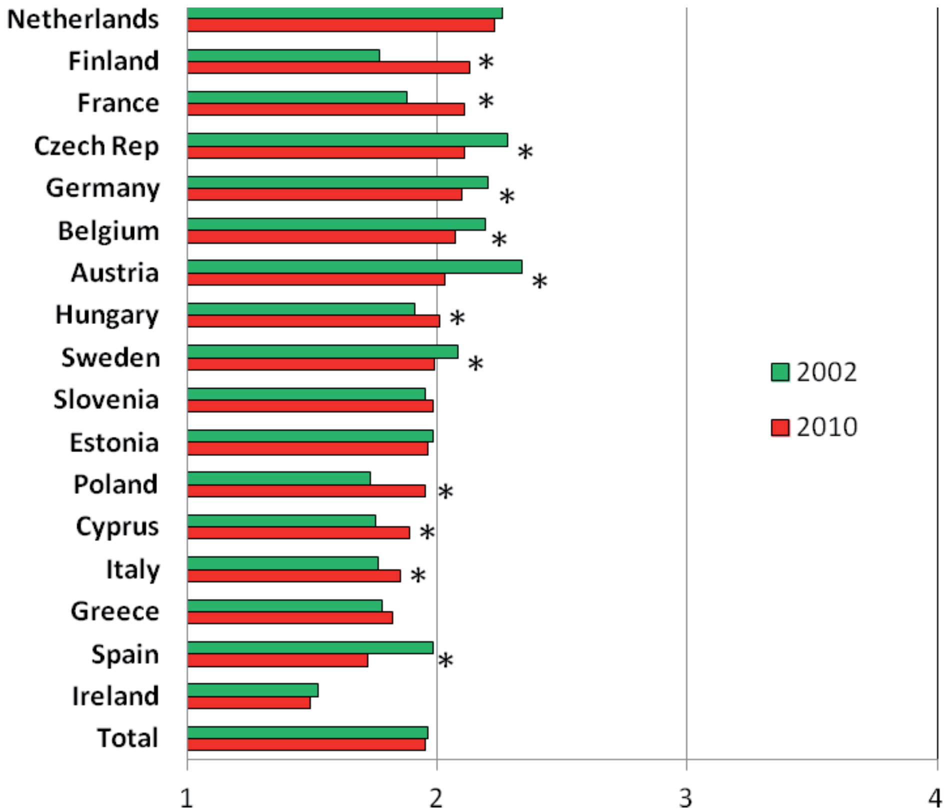

Figure 17: Not in favour of using a black box (%), comparison data from 2002 and 2010 (1= "very", 2= "Fairly", 3= "Not much" and 4= Not at all").

In five countries, no differences between 2002 and 2010 were found (t-test; *= p<0,05). For the other twelve countries, a change had taken place towards a more negative attitude in half of the countries while the other six countries changed towards a more positive view. In total, when all data was taken into account, no significant differences were observed.

Conclusion

Situation regarding ITS devices is pretty variegated, with mostly great differences in their use and attitudes between participants from different countries. Also the relatively strong influence of demographic factors is presented either in use or in attitudes. Respondents could be – according to their attitudes – divided into three groups with very favourable, mildly favourable and mildly unfavourable attitude toward ITS devices. Those, most in favour of ITS devices are prevailing, being the oldest, most concerned with traffic accidents and most experienced. Differences between SARTRE 3 and 4 surveys are evident but not always easy to explain also due to methodological differences between both measurements. What is important is relative support for existence of compensating mechanisms (ABS and ticketing) what should warn that ITS devices could have also not intended influences. Therefore their introduction into use could not be haphazard but planned and accompanied with different measures (training and education, campaigns, etc.). While differences in use depend also on car producers and manufacturers in different countries, i.e. on presence of devices on the market and their price, attitudes are those that could support their use, even demands for manufactures to inbuilt them regularly. Of course attitudes depend also on experience so we have here some circulus vitiosus.

Chapter 1.6

Summary and recommendations for Car Drivers

Ilona Buttler (ITS, Poland)

On 2 June 2003, the Commission adopted its 3rd European action programme for road safety (RSAP), including an ambitious target to halve the number of road deaths by 2010 (EC; 2003). While the target has not been fully reached, the number of killed in 27 member states went down by 43% (CARE; 2012a), the biggest reduction in road deaths in EU history. However, despite this reduction in road fatalities the results from the present SARTRE study showed that some drivers still feel unsafe. Only 10% are convinced that the roads in Europe are very safe and 47% generally agree but have some reservations (fairly safe). The interesting thing is that drivers opinions correlate with objective road safety indicators (number of fatalities per 1 million population) suggesting that car drivers in Europe have a good general perception of road safety in their countries. 14% of the drivers surveyed believe that the roads in their countries have definitely become safer in the last decade with 55% saying that they are safer. However, the drivers in this study were not very pleased with the actions taken by different authorities. Indeed, only 10% of our car drivers' sample believed that their government was 'very' and 41.8% 'fairly' concerned about road safety. It is difficult to tell, however, whether these opinions are reflecting the real involvement of governments because of the lack of reliable methods for assessing this.

As we know from European Commission's data (CARE; 2011) 14 out of 16 countries participating in SARTRE 3 and SARTRE 4 have improved their road safety performance (accidents in this group are down by 19%) and drivers were expected to report the same. They were asked whether in the last 3 years they had been involved in any injury accidents. 5.9% of car drivers said they had, compared to 5% 8 years ago (SARTRE 3). Moreover, drivers declared riskier driving behaviours such as following too closely or passing a traffic light that is amber.

The results from this study showed that for the first time the driving population was less concerned about road accidents. While on average 82.6% of European car drivers continued to be 'very' (42.3%) or 'fairly' (40.3%) concerned about road accidents, in comparison to 2002 (SARTRE 3) this corresponds to an average decrease of around 3%. In fact, the concern for all the listed areas decreased between 2002 and 2010, except for one, namely "unemployment". It is difficult to say if this is a positive sign for road safety (concern decreased because safety increased) or if it is a balance effect (concern increased for unemployment and thus decreased for other issues).

Regarding risk perception, the main results are summarized below:

- 83% of the surveyed drivers believe that driving 20 km/h over the speed limit in a residential area will increase the risk of being involved in an accident, but they also believe that speeding is fun, that they reach their destination faster and that a road accident is not very likely. A common belief among drivers is that driving over the limit is a normal and socially accepted behaviour. The drivers believe that more than 82% of other drivers exceed the limits on motorways (always+very often+often), nearly 80% on main roads, 77% on other country roads and 60% in built-up areas.

- 94% of car drivers believe that drinking and driving substantially increases the risk of an accident, alcohol is still perceived as the most important accident cause, yet 30% of drivers admit that they had been drinking and driving in the last month and 15% said that they may have exceeded the legal BAC in their country (including more than 3% saying that this happens to them at least "often" in a month),

- 67% of drivers surveyed believe that fatigue is at least a "frequent" cause of road accidents but 26.3% of drivers report driving when they at least 'sometimes' felt too tired to drive. When asked what actions they take when they feel tired while driving, 79% of drivers report they 'sometimes' talk to a passenger, 78% open a window, turn down the heat or switch on air conditioning, and only 26% actually pull over to rest and get some sleep.

- More than 4 in 5 car drivers understand the dangers of taking medication that carries a "warning: it may influence your driving ability", but 10% admitted to having driven after taking such medication.

The basic objective of enforcement is to enforce road traffic regulations. It is accepted that drivers who think that speed checks are frequent and the penalties severe, will not violate traffic regulations. The SARTRE survey has looked at drivers' perception of the likelihood of a speed check. The European Transport Safety Council work under the PIN programme showed that between 2007 and 2010 many European countries recorded a higher number of speeding and drink-drive fines. This has been reflected in SARTRE results. As an example, in 2002 SARTRE 3 showed that 20% of drivers surveyed said they had been fined for speeding compared to 23.5% of drivers eight years later. What is interesting is that in the case of alcohol a higher number of checks and fines increased drivers' subjective perception of the likelihood of checks (30% of drivers believed that sobriety checks are likely; an increase in this kind of answers by more than 2%).

Analyses of road safety in Europe and the results of SARTRE showed that despite the progress, a number of problems remained unsolved. This calls for new preventive measures. Of the numerous proposed measures examined under SARTRE 4, the most popular proposal was to reduce the legal BAC (nearly 60% of car drivers think that the alcohol limit should be less than today (i.e. no alcohol at all (46%) + less alcohol than at present (13%)). What should be added is that this solution gest the most support from drivers in countries with alcohol limits already below 0.5 g/l. In countries which allow a limit of 0-0.2 g/l, nearly 90% of drivers support a lower or the same limit (an increase by 1.5 % since SARTRE 3). In countries which allow 0.5 g/l, nearly 57% support the change (an increase by 4% since the last SARTRE 3). This shows an obvious acceptance of the current regulations in the first case and real support for change in the second. Lower BAC limits have a number of advantages. As an example, in countries with limits of 0-0.2 g/l on average 8% of drivers admitted that they had drunk and driven a car in the recent month and 5% that their BAC may have exceeded the legal limit. In the case of 0.5 g/l countries the percentages were 38% and 18% respectively. In 2011 a document published by WHO Regional Office for Europe "European action plan to reduce the harmful use of alcohol 2012–2020" included a proposal to introduce a legal BAC level closer to 0.2 g/l for all drivers. The results of SARTRE 4 show that it is time to start a serious discussion on implementing this as a Europe-wide limit.

There is a very strong relationship between high speed and accidents but despite this European drivers have a relatively positive attitude towards speeding. To drive 20 km/h over the speed limit was regarded as pleasant and that it would take them to their destination quicker. They were less likely to believe that it would result in an accident. So it is no surprise that only half of the drivers support an extension of 30km/h zones in urban areas and 60% support motor car exclusion zones. On the positive side, drivers have increased their support for speed cameras (from 67% in 2002 to 69% in 2010), show a relatively high and stable support for red light cameras (72% support this) and pretty good support for speed checks between two points (61%). What looks like a positive trend is somewhat disturbed by the dwindling support for increasing speeding penalties (a 9% drop in 8 years). This seems to herald a new broader tendency because a similar phenomenon was observed in the case of tougher drink and driving penalties, although the drop in support was not that high (5% less). Hence, future policies will have to tackle the problem of keeping the right balance between the number of automatic checks (and as a result making these offences more detectable) and the penalties for speeding.

The assumptions to the 4th European Policy Orientation on road safety state that the application of information and communication technologies to the road transport sector will make a significant contribution to improving safety. SARTRE 4 examined driver opinions regarding several selected devices which if commonly introduced can help to reduce the risks of road traffic. The results show that drivers valued the following devices most:

- An “alcolock” that prevented the car from starting for recidivist drivers if exceeding the legal alcohol limit for driving (supported by 83%, including 58% with strong support)

- An “alcolock” that prevented the car from starting if the driver exceeds the legal alcohol limit for driving (supported by 80%, including 53% with strong support; an increase in support by 23%)

- Fatigue detection devices that warn the driver to stop if he/she was too tired to drive (supported by 77%, including 41% with strong support; an increase in support by 11%)

- A ‘black box’ to identify what caused an accident (supported by 75%, including 39% with strong support)

- Speed limiting devices fitted to cars that prevented drivers from exceeding the speed limit (supported by 64%, including 32% with strong support; an increase in support by 7%)

To consider a device useful and installing it in the car are two different things. The most popular devices are those that come with the car with 76% of drivers were in favour of an anti-lock braking system (ABS) and 59% a seat belt reminder. On the other hand, only 36% have navigation systems (built-in or portable) and a mere 2% highly appreciate systems that detect ‘fatigue’ and tell drivers to stop. The main barrier to ITS dissemination in cars might be the costs (perhaps with the exception of speed limiters). As we know from the reports of the European Automobile Manufactures Association (2010) the average age of the European car fleet is about 8 years and about 34% of the cars on EU roads are older than 10 years. This would indicate that many drivers cannot afford to buy new safer cars or additional safety equipment. What is equally important is that such economic barriers were already identified in 2006 (Eurobarometr; 2006). Because they seem permanent rather than temporary and not the result of bad economy, they should be considered when planning the next steps.

One challenge in the years to come will be the need to adapt road safety policies to the changing driver demographics. A number of forecasts expect that already in 2060 the share of people 65+ will increase from 17% today to 30%. Prevention should take into account a number of new factors such as a higher share of women, people with better education and single-person households and the growing use of the Internet and social networks. Attention should also be paid to the problems of a growing international mobility.

The results of SARTRE 4 showed that another challenge for the future decade will be to change driver attitudes to speed. The recent speed limit changes on motorways (Italy; 2003 – speed limits on six-lane motorways can be raised from 130 to 150 km/h, Denmark; 2004 – speed limits on motorways changed from 110 to 130 km/h, Poland; 2010 – speed limit changed from 130 to 140 km/h (+10 km/h tolerance) on motorways and 120 km/h on two lane expressways, the Netherlands; 2012 – new speed limit on 48% of motorways from 120 to 130 km/h or the proposal of UK’s Transport Secretary (2011) to raise the limit on motorways from 70 mph to 80 mph) show that more and more people are unhappy with the traffic calming policy outside built-up areas. The results of SARTRE 4 showed the need to revisit the mutual relations between speed management policy and transport system development. It is becoming increasingly clear that motorways and expressways are struggling with the conflict between road class and its speed limits. To improve the infrastructure is definitely a factor which can reduce accidents, yet at the same time it can make drivers to feel a mismatch between speed and the probability of a road accident.

The new problems will definitely require more effort on preparing effective preventive measures in the area of legal and illegal psychoactive substances (drugs and medication) and fatigue. Finally, there is an increasing problem related to distraction whilst driving such as the use of mobile phones. Despite the fact that there is extensive research demonstrating the risks of using mobile phones while driving plus the media coverage of this problem, fewer drivers now believe that the use of a handheld phone while driving could cause a road accident. This is a particular concern in the context of the high usage of mobile phones. According to the Special Eurobarometer (2011) 87% of EU population had a mobile phone in 2010. Thus, the provision of new phone functions lead to more distraction and more effective methods of enforcement are therefore needed.

Recommendations:

- The generalization of a 0.2g/l legal Blood Alcohol Content (BAC).
- The development of preventive measures against drink-driving, including alcohol interlocks.
- Changing positives attitudes towards speeding via education and campaigns and the development of intelligent speed limiting devices.
- Campaigns targeting mobile phone use while driving and drink driving.

Powered Two Wheelers

Chapter 2.1

Introduction

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The high accident risk of motorcyclists is well documented in many countries (Lin & Kraus, 2008). Although this is known for many years research on road safety relevant topics concerning motorcyclists have been strongly neglected. In SARTRE 4 motorcycling is a key aspect for the first time. The focus is set on speeding, driving under the influence of alcohol, drugs and driving/drugs, motives risk perception and driving style, use of safety equipment, accidents and profiles. Each of these topics is presented in a separate chapter. The introductory chapter deals with gender, age education, family situation and living area of motorcyclists and with motorcycle type, engine size and riding frequency. The sample contains 4.483 motorcyclists.

Method

Descriptive analyses have been performed to summarize gender and age, education, family situation and living area of motorcyclists and the use of motorcycle type, engine size and riding frequency in different countries.

Results

Gender and Age

As Table 1 shows there are large differences in the proportion of male or female riders. The largest proportions of male rides are in Hungary and Serbia. The largest proportions of female riders are in Italy, France and Netherlands. The largest proportions of younger riders are in Serbia and Israel, and the largest proportions of older riders are found in Italy and Germany.

Table 1: Gender and age of motorcyclists separated for countries (in %).

	Gender	Age category					
	Male	18-24	25-34	35-44	45-54	55-64	65+
Austria	86%	13%	20%	22%	32%	11%	5%
Belgium	90%	11%	15%	26%	32%	13%	4%
Cyprus	86%	22%	43%	20%	10%	4%	1%
Czech Rep	83%	17%	37%	28%	8%	6%	3%
Estonia	92%	23%	38%	26%	10%	3%	1%
Finland	89%	10%	23%	22%	24%	17%	4%

France	77%	16%	22%	29%	22%	8%	2%
Germany	88%	14%	16%	17%	29%	14%	10%
Greece	87%	14%	29%	29%	20%	8%	1%
Hungary	96%	13%	31%	31%	15%	6%	4%
Ireland	94%	11%	28%	33%	19%	7%	4%
Israel	85%	29%	48%	15%	4%	3%	0%
Italy	70%	14%	17%	22%	20%	15%	11%
Netherlands	74%	10%	16%	23%	31%	18%	3%
Poland	93%	9%	20%	30%	20%	15%	5%
Serbia	96%	30%	46%	14%	5%	3%	1%
Slovenia	94%	14%	29%	17%	19%	19%	3%
Spain	81%	9%	23%	27%	25%	12%	4%
Sweden	81%	11%	22%	24%	24%	16%	4%
MEAN	86%	15%	27%	24%	19%	10%	4%

Education

There are large differences concerning education of motorcyclists. Primary school level of motorcyclists has most frequently been found in Austria, Hungary, Germany and Spain. Further education level is more often in Israel, Cyprus and Netherlands than in the other countries (Figure 1).

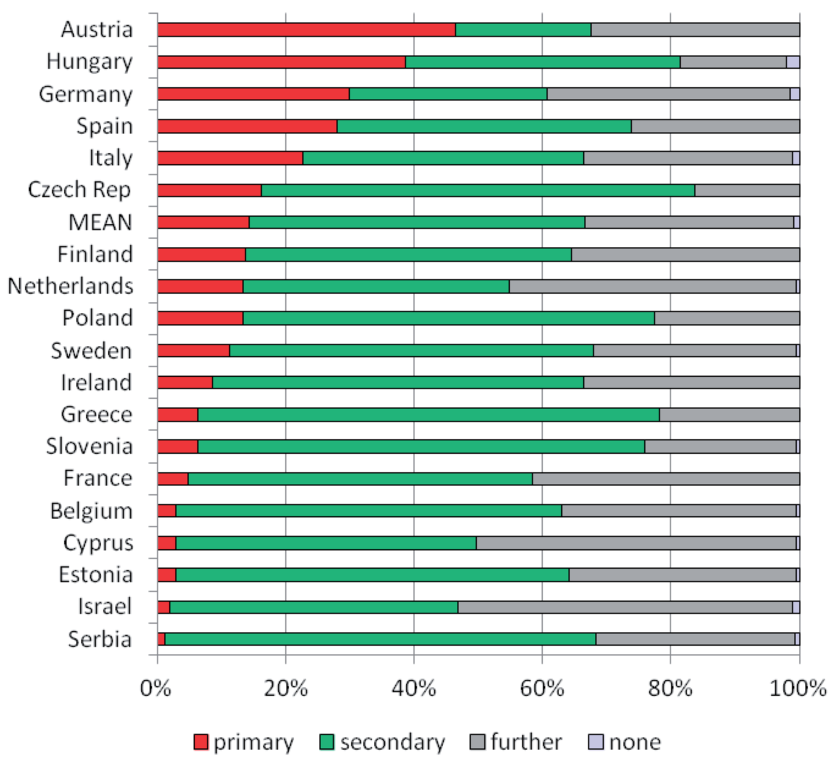

Figure 1: Education (CO13), in %.

Family Situation

Motorcyclist's family status differs a lot between the countries (see Table 2). In total motorcyclists are most often married followed by single and as married living motorcyclists. Separated for the countries the highest rate of singles can be found for Israel, Cyprus and Serbia. As married living motorcyclists are most often found for Estonia, Sweden and Austria and married motorcyclists are mostly living in Poland, Italy, Germany and Netherlands.

Half of motorcyclists have at least one child. Belgium, Poland and Netherlands have the highest rates of motorcyclists with children.

Table 2: Family situation (CO10) and children (CO11), in %.

	Situation					children	
	single	as married	married	separated	widowed	yes	no
Austria	31%	27%	31%	11%	1%	39%	62%
Belgium	25%	20%	46%	9%	0%	68%	33%
Cyprus	49%	10%	35%	5%	0%	33%	67%
Czech Rep	41%	11%	40%	7%	1%	49%	51%
Estonia	26%	43%	25%	5%	1%	51%	49%
Finland	24%	20%	45%	11%	0%	52%	48%
France	30%	25%	34%	10%	0%	56%	44%
Germany	28%	11%	51%	8%	1%	61%	39%
Greece	42%	6%	49%	3%	0%	42%	58%
Hungary	40%	16%	37%	5%	1%	43%	57%
Ireland	43%	21%	33%	4%	1%	48%	53%
Israel	72%	0%	21%	6%	1%	22%	78%
Italy	27%	7%	55%	8%	3%	56%	44%
Netherlands	26%	20%	51%	2%	0%	66%	34%
Poland	26%	4%	63%	5%	2%	67%	33%
Serbia	48%	18%	28%	6%	0%	28%	72%
Slovenia	32%	25%	39%	3%	1%	60%	40%
Spain	33%	12%	49%	6%	0%	55%	45%
Sweden	31%	32%	33%	4%	0%	63%	37%
MEAN	35%	17%	40%	6%	1%	50%	50%

Motorcycle type

There are also large country differences concerning motorcycle type (see Figure 2). *Scooters* are most frequently used in Israel, Greece, Italy and Spain. The *sport style* is found most frequently in Serbia, Czech Rep, Sweden and Estonia. Conventional street motorcycles are most frequently used in Poland, Ireland and Austria. Enduro or offroad motorcycles will mainly be found in Cyprus, Greece, Italy and Slovenia. Touring style motorcycles are typical for Netherlands, France, Israel and Hungary. Choppers are most frequently used in Finland, Netherlands and Sweden. In general there is a high proportion of scooter riders in mediterranean countries and high proportions of conventional street machines in northern countries.

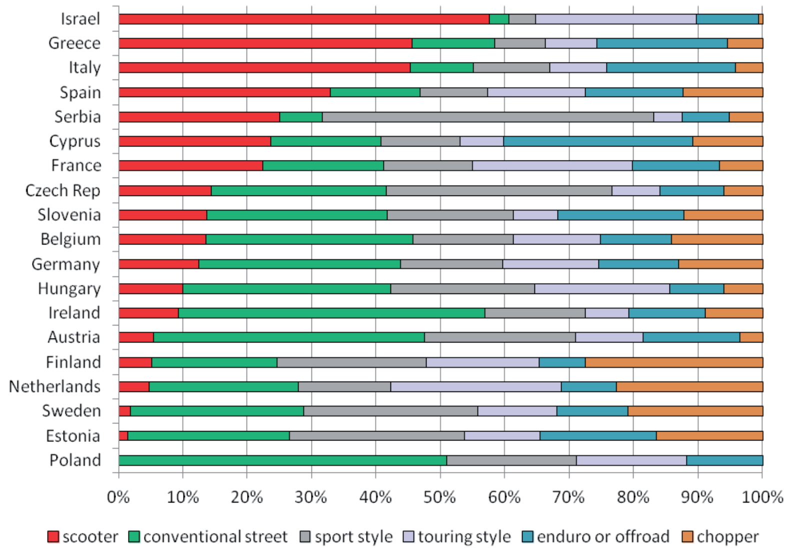

Figure 2: Kind of Motorcycle (MC28), in %.

Engine size

There are large country differences concerning engine size (see Figure 3). Less than 126cc is most frequently used in Greece, Spain, Israel and France. 126-250 is most frequently used in Israel, Italy, Serbia and Hungary. 251-500cc is typical for Israel, Austria and Czech Rep. 501-750cc will be most frequently seen in Serbia, Estonia, Netherlands and Sweden. 751+cc is most frequently used in Finland, Sweden and Belgium. In general, smaller engine size up to 250cc is more typical for mediterranean countries. In northern countries higher engine size above 750cc is used.

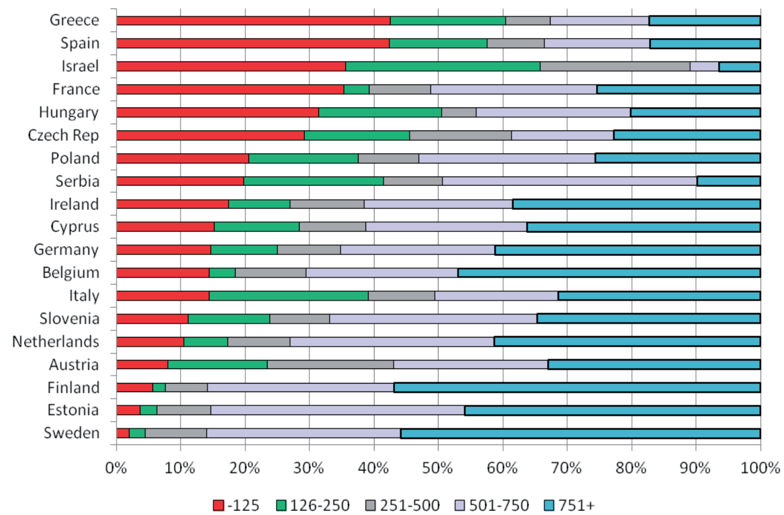

Figure 3: Engine size (MC27), in %.

Riding Frequency

Nearly daily use of motorcycle most frequently occurs in Greece, Israel, Cyprus and Ireland. Nearly daily use is seen more often in southern countries than in northern countries (see Figure 4). The fewest riding frequency is found in the Netherlands, Poland and Germany.

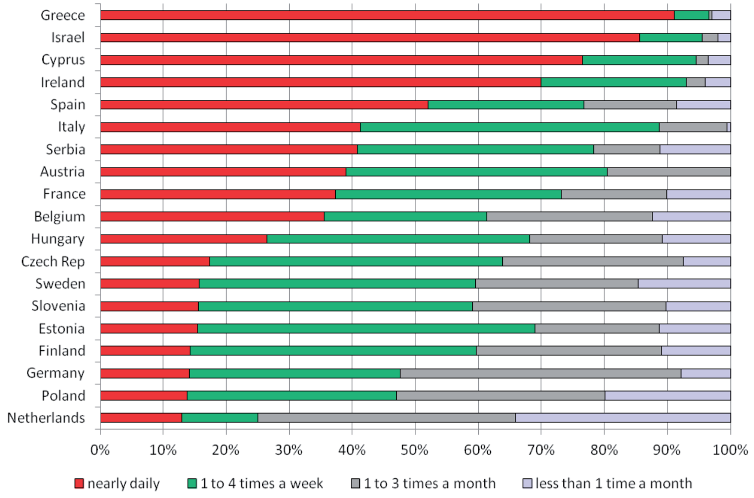

Figure 4: Motorcycle riding frequency (C001c), in %.

Area description

The largest proportion of motorcyclists who are living in a rural area is found in Slovenia, followed by Germany Belgium, Poland and Netherlands (see Figure 5). The fewest proportion of this group lives in Sweden, Israel and Serbia. In Israel and Sweden most of the motorcyclists live in urban areas.

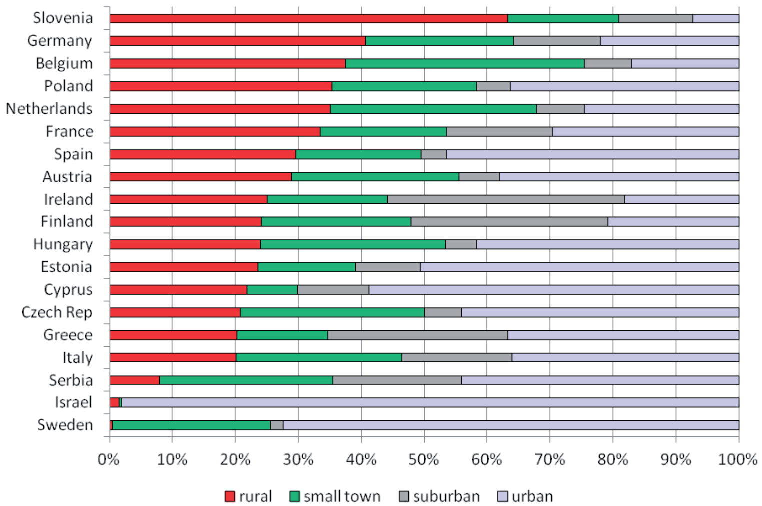

Figure 5: Area description (C014), in %.

Conclusion

More men than women and more younger than older people ride a motorcycle. High proportion of scooter riders is more typical in mediterranean countries, high proportions of conventional street machines in northern countries. In mediterranean countries smaller engine size up to 250cc will be found; in northern countries higher engine size above 750cc is used. Nearly daily use of motorcycle most frequently occurs in southern countries than in northern countries. There are large differences between the countries concerning education of motorcyclists.

Chapter 2.2

Speeding experience and attitudes

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Introduction

Speed is one of the basic risk factors in traffic (Aarts & van Schagen, 2006). Higher driving speeds lead to higher collision speeds and thus to severer injury. Higher driving speeds also provide less time to process information and to act on it, and the braking distance is longer. Thus the possibility of avoiding a collision is smaller. In short, high driving speeds lead to a higher crash rates and more severe crash outcomes.

This chapter examines how riders' and motorcycle characteristics are related to speeding behavior. Since in SARTRE-4 only car drivers, but not motorcyclists, were asked about own driving speeds, the analysis in this chapter was based on self-reported 'speeding tickets in three years', which can be considered a reasonable proxy to a driver's 'speeding behaviour'. In the following sections we describe recent findings about prevalence of motorcycles speeding, its impact, and factors influencing speeding.

Speeding behaviour of motorcyclists compared to car drivers

In UK, Horswill and Helman (2003) compared speed behaviour and following distance behaviour of motorcyclists and a matched group of non-motorcycling car drivers, using a video-based simulator (study 1) as well as with road side monitoring on 30 or 40 mph roads (studies 2 and 3). Motorcyclists travelled faster than a matched group of car drivers, whether measured in the laboratory or by the roadside. The simulator study also indicated that motorcyclists overtake more often and pull out into smaller gaps in traffic.

In UK, Broughton et al. (2009) compared self-reports on speeding in 30mp/h/50 km/h zones and open rural roads of older car drivers and older motorcyclists (> 35 years). Consistent with theoretical predictions compared to drivers, riders reported to be more compliant with speed limits in an urban environment and under certain conditions less compliant with speed limits on an open rural road. However, the self-report data were not consistent with actual UK speeding data, based on 26 urban sites. Although the proportion of motorcyclists and car drivers who exceed the speed limit in 30 mph zones are about the same, motorcyclists are much more likely to speed excessively. On the other hand, motorcyclists are more likely to be riding well below the speed limit compared to car drivers. As the authors point out, it is likely that in the self-report data the subgroup of older, safety-motivated riders is overrepresented.

Speed measurements at 100 km/h roads in Victoria indicated that motorcyclists in regional Victoria travelled at higher speeds than other traffic. Whether all speeds were included or only free travelling speeds, motorcycles had a higher mean, median, and 85th percentile speed, were more likely to be travelling in excess of the speed limit, and more likely to be travelling more than 10 km/h above the speed limit (Baldock et al., 2010).

In two independent studies in Israel, motorcycles were observed to be travelling at higher speeds than other vehicles. Zaidel, Zilberstein and Ben-Zino (2009) measured free flowing speeds of passenger cars and motorcycles on a nationally representative (with reference to motorcycle crash locations) sample of interurban road sections, at peak and off-peak hours, day and night. Speeds were measured with laser speed guns. Motorcycles travelled 10 km/h faster, on average, than cars. Day and night speeds were similar. An analysis by motorcycle engine size showed increase in all speed indicators (mean, max, 85th %) with increase in motorcycle engine size class.

Gitelman, Pisahov and Carmel (2010) conducted a National Speed Survey for the National Road Safety Authority in Israel. Free-flow vehicle speeds were measured on all types of roads, including urban roads. Speeds were measured with detection tubes or with ‘speed guns’ where tubes could not be used. On both urban and interurban road classes, motorcycles were generally observed to travel over the speed limit or at the high end of traffic speed distribution, more often than all other vehicles. However, differences in mean speeds between motorcycles and cars were only in the range of 3-8 km/h and on some types of roads (single carriage interurban, local interurban, local urban) mean speeds of motorcycles were actually lower than or equal to that of cars.

It should be noted that in Israel the majority of motorcycles are used in urban and metropolitan areas and most motorcycles are, as yet, scooters and of small size engine. Therefore, motorcycles encountered on major interurban roads are likely to be of larger size than those encountered on low class interurban roads and local urban roads.

Contribution of speeding to specific types of accidents or injuries

Several studies have looked into the role of speed in specific types of accidents. Accidents in rural areas involving motorcyclists occur at higher speeds and may be characterised by inferior perceptual/handling skills resulting in a loss of control or involvement in overtaking accidents (Sexton et al., 2004).

Clarke et al. (2004) found that most single motorcycle accidents were caused by the rider’s misjudgment of the appropriate speed when riding through a curve, and that the majority of the riders were aware of this error.

Clabaux et al. (2011) studied the role of speed in the “looked-but-failed-to-see” accidents where motorcyclists are crashed into by another road user performing a non-priority manoeuvre. One of the main types of accidents involving motorcyclists concerns priority motorcyclists driving straight ahead and whose trajectory is cut off by another road user performing a non-priority manoeuvre (Clabaux et al., 2011). It is common in these accidents for the other user to declare that he/she had looked in the direction of the motorcycle prior to undertaking his/her interfering manoeuvre, but did not see it even though, according to witnesses, it was visible. These accidents are called “looked-but-failed-to-see” or “motorcycle conspicuity-related accidents”. Using in-depth analysis of the MAIDS (2004) data, these researchers showed that, in urban environments, the initial speeds of motorcyclists involved in “looked-but-failed-to-see” accidents were significantly higher than in other accidents at intersections.

Determinants of speeding behavior

Why do motorcyclists speed? In Great Britain, Sexton et al. (2004) identified three motivational aspects (pleasure from riding, liking for speed, economic aspects), three riding styles (careful vs. careless, tolerant vs. intolerant and slow vs. fast) and five behavioural aspects of motorcycling: traffic errors, speeding, stunting, use of safety equipment, control errors. Riding style, getting pleasure from motorcycling, and a liking for speed predicted behavioural errors, and behavioural errors predicted accidents.

In recent studies more refined social- psychological models are used to answer this question in more detail. Elliott (2010) studied cognitive determinants of motorcyclists' speeding behavior. He used a theoretical model that comprised selected constructs from the Theory of Planned Behaviour (affective attitude and perceived controllability), and constructs from identity theory (self-identity) and social identity theory (perceived group norm and group identification). An important predictor were affective attitude (an emotional, or experiential, evaluation about performing a behaviour; e.g., "for me, doing X is non-enjoyable – enjoyable") and perceived controllability (a component of perceived behavioural control that taps the extent to which individuals perceive their behaviour to be under their own internal, versus external, control; cf. locus of control). Together, affective attitude and perceived controllability accounted for a significant proportion of the variance in motorcyclists' speeding intentions. For both 30mph urban roads and 70mph dual carriageways and motorways, the proportion of variance that was accounted for by these two constructs exceeded $R^2 = .25$, which is regarded as a 'large' sized effect in the social sciences (Elliot, 2005; Cohen, 1988).

Wong et al. (2010) studied how personality characteristics influence risk taking among young motorcyclists. They identified three primary personality traits of young motorcyclists; sensation seeking, amiability and impatience. While amiable riders represented a group of relatively mature and safe riders, the sensation-seeking riders were extremely self-confident, comfortable with unsafe riding and interested in the utility gained from it. Utility perception was measured by items 'Riding is not only for transportation but also for fun or recreation' and 'Riding a motorcycle makes me feel relaxed'. The sensation-seeking motorcyclists were highly aware of traffic conditions, which may lower accident chances. Impatient riders, having low riding confidence and lacking traffic awareness, also sought utility from certain risky riding behaviors. However, their fear of accidents led them to fail to observe surrounding traffic conditions.

There are significant differences for male riders especially in relation to speed and competition in comparison to female riders. The motivation to ride with higher speed or in a competition is smaller for female riders. Female riders are just "riding relaxed" or "going on tour ", which is the main reason for their motorcycling with less sport orientated feeling. These attitudes lead to a lower accident involvement of female riders, especially in comparison to young male riders (Noordzij et al., 2001).

Recently, Chung and Wong (2011) studied patterns of risky behavior by young motorcyclists in relationship to gender and age. Male riders were more likely, than female riders, to exhibit risky driving behavior, including fast driving and driving violations. Male motorcyclists were more sensation seeker and less impatient than female motorcyclists. Males also had a higher level of driving confidence, perceived less risk and more utility from risky driving behavior, and were less aware of traffic conditions.

Research questions

Based on the literature review, two questions are addressed in this chapter:

1. How do numbers of speeding tickets depend on age, gender, annual mileage, motorcycle type, and engine size?

2. How do motorcyclists in different countries compare with respect to experiences of speed control, being ticketed for speeding, and attitudes towards speed penalties?

We predicted the following relationships:

1. the higher the engine size, the more frequent the speeding tickets

2. sports type motorcycle riders have more speeding tickets than other type riders

3. male riders have more speeding tickets than female riders

4. young motorcyclists have more speeding tickets than older motorcyclists

Method

The survey questions that inquired about personal experience with speeding enforcement were the following:

- 'On a typical journey, how likely is it that you will be checked for speeding?
- In the past 3 years, have you been fined, or punished in any other way, for breaking the speed limit driving a motorcycle?

For the present analysis, the answers were re-coded and the proportions of drivers who had experienced at least one accident or ticket events were calculated. The response options to the question on experiencing speed enforcements (Never, Rarely, Sometimes, Often, Very often, Always), were re-coded such that Never to Sometimes= No, and Often to Always=Yes.

Personal observations drivers may have about actual speeding on the roads reflect complex mix of direct personal experiences as well as attitudes towards speeds, speeding and speeders. In the survey, respondents were asked: "in general, how often do you think other MC drivers break speed limits on the following roads? a) Motorways b) Main roads between towns c) Country roads d) Built-up areas". For this analysis, the response options for each type of road where combined into two categories: Never or Rarely or Sometimes= 0; Often or Very often or Always= 1. An index score, named 'perceived prevalence of speeding' was calculated for each respondent based on the sum of responses to items a-d. Thus the possible score ranged from 0 to 4.

Another index score was derived regarding the level of support a driver was willing to give to four specific speed control measures on highways and in towns. The question items were "How much would you be in favour of using [or] the following measures." in-vehicle speed limiting devices, speed cameras, zone speed cameras [section control], more "30 km/h" zones in built-up areas. Response options were dichotomized (Very or Fairly= 1; Not much or Not at all= 0). An index score, named "support for speed control", was calculated for each respondent based on the sum of responses to the four items, with a possible score range from 0 to 4.

From a question on possible causes for accidents "How often do you think each of the following factors is the cause of motorcyclists being involved in road accidents?" we considered only the percent of MC drivers answering "Always" with respect to the factor "driving too fast".

The motorcycling attributes that were considered here include motorcycle machine attributes (type of motorcycle, engine size in cc), MC rider attributes (age group), and motorcycle usage attributes (frequency of use, amount of driving expressed as annual kilometers driven on the motorcycle).

Motorcycle 'type' or 'kind' was directly encoded in the survey (conventional street, sport style, touring style, endure or off-road, chopper, scooter). Although the classification could not be as clear and unique as one would wish for, it provides a reliable distinction between scooter style machines and all other motorcycles, and a fair distinction between off-road /enduro machines, to conventional, sporty and touring machines. At the level of the total sample of MC in the survey, there was a rather balanced distribution of the types of motorcycles.

Based on the empirical distribution of engine sizes reported, and taking in account typical industry grouping and marketing of motorcycle classes (either by engine cc or power), five categories of motorcycle size were defined: up to 125 cc, 126-250 cc, 251-500 cc, 501-750 cc, 751-1000 cc, 1001+cc.

Age and gender are MC rider attributes that are universal and strongly related to motorcycling. The overall proportion of women in the sample was less than 14%, (mostly accounted by few Mediterranean countries; most women rode scooters or small size street type motorcycles). These facts made more detailed segmentation impractical because of the small number of cases. Therefore gender was only analyzed on a main aggregation level. Drivers were classified into six age categories: 18-24, 25-34, 35-44, 45-54, 55-64, and 65+ year old.

Motorcycle usage attributes (frequency of use and annual km driven) refer to different dimensions of use. Frequency of use- daily, weekly, or less than that- was re-coded from a question “During the last 12 months on average how often did you travel by motorcycle as a driver” with set response options. This attribute refers to the extent that the motorcycle is the primary mobility vehicle for the respondent. If a motorcycle is used by a person daily, it is most likely used for the chores and errands of everyday life, whatever these may be. However, one may drive daily a short distance to work and back only, while another MC rider might take very long trips every few weeks or months, for whatever purpose.

The amount of time a motorcyclist is actually exposed to the risks of the roads is estimated by ‘annual km driven’. Based on the empirical distribution of kilometers reported, a driver’s annual travel was classified into one of five categories: 0-2500 km, 2501-5000, 5001-10,000, 10,001+ km.

The analyses consist primarily of descriptive statistics and ANOVA of the distribution of traffic experiences (speeding tickets, speeding prevalence, and speed checks) across motorcycling attributes of the total sample of MC drivers.

EU country differences self-reported speeding tickets

Respondents reported whether they have been cited for speeding violations, driving a motorcycle, during the last three years. Figure 23.1 presents the proportion of drivers in each of 19 countries) who reported receiving at least one speeding ticket in three years.

The experience of getting a speeding ticket is shared by less than 10% of motorcyclists in some countries (Sweden, Slovenia, Ireland, France) but involves up to over 30% of drivers in other countries (Estonia, Cyprus, Belgium). There is no obvious commonality to the countries in each end of the scale.

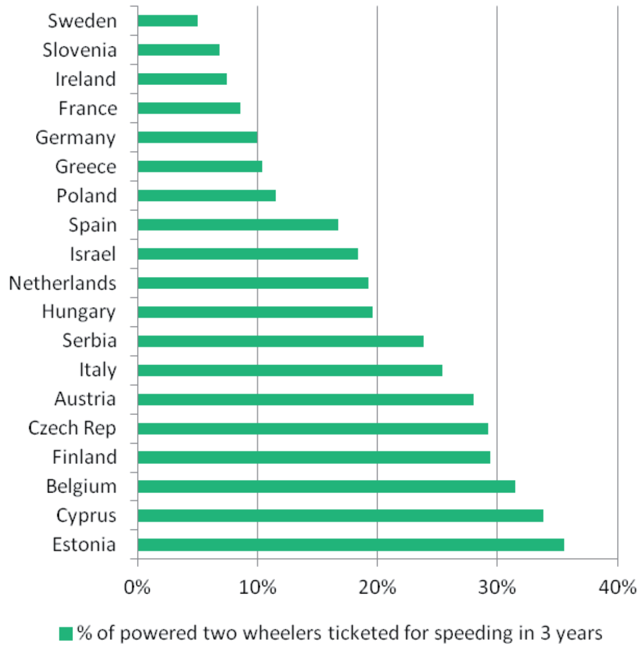

Figure 1: MC self-reported speeding tickets in EU countries.

Speeding tickets and accident involvement

If speed tickets are an indicator of unsafe speeding behavior, there should be an association between speed tickets and accident involvement. Table1 presents data on the relationship between receiving speed tickets and accident involvement.

Table1: Injury accident involvement (yes/no) by experience with speed tickets/penalties.

	Speed ticket/penalty in the past 3 years		
Injury accident	No	Yes	Total
No	3241	692	3933
	82%	18%	100%
Yes	307	147	454
	68%	32%	100%
Total	3613	730	4387
	81%	19%	100%

As can be seen in Table 1 riders who have received a speed tickets/penalty in the past three years are more likely to have been involved in an injury accident than riders who have received no speeding tickets/speed penalty $X^2_{(1,N=4387)} = 57.5$; $p < .001$). Possibly km driven is an intervening variable in this relationship since both speed tickets and accidents are strongly associated with accidents.

Speeding fines/penalties and riders' characteristics

One set of factors that may affect the experience of receiving speed tickets are attributes of the motorcycle, of the rider and how, when and where motorcycles are used. Here we examine the effects of MC type, frequency and amount of use, and age group of rider on the overall mean proportion of MC drivers receiving speeding tickets.

Table 2 summarizes data on the analyses of the relationship between receiving a speed fine or penalty and characteristics of riders or engine. The group of motorcyclists that has received a speed ticket or penalty, is more likely to be male, to ride more kilometres, to ride more frequently, to ride a cycle with larger engine size, and to be slightly older (perhaps due to the economic link between age and the very big bikes). The 'exposure effect' of riders who use the MC daily or few times a week are more likely to receive a speeding ticket compared to less frequent users.

Table 2: ANOVA- and chi-square of speeding tickets by age, kilometrage, gender, frequency of driving and engine size.

Characteristic			Fine or penalty for speeding? No	Yes	Sign.
Age			n = 3386	n = 735	$F_{1,4119}$ = 12.30;
			Mean = 37.9	Mean = 39.8	$p < .001$; η^2 = .003
MC kilometres			n = 3570	n = 855	$F_{1,4423}$ = 47.18;
			Mean = 6361	Mean = 8595	$p < .001$; η^2 = .011
Gender		n			
	Male	3876	80%	20%	$X^2_{(1,N=4473)}$ = 30.85;
	Female	597	89%	11%	$p < .001$
Frequency of driving		n			
	Nearly daily	1582	79%	21%	$X^2_{(3,N=4450)}$ = 32.01;
	1 to 4 times a week	1472	80%	20%	$p < .001$
	1 to 3 times a month	931	80%	20%	
	Less than 1 time a month	465	91%	9%	
	Total	4450			
Engine size		n			
	Up to 125	907	88%	12%	
	125 – 250	573	84%	16%	$X^2_{(5,N=4365)}$ = 53.83;
	250 – 500	468	79%	21%	$p < .001$
	500 – 750	1113	79%	21%	
	750 – 1000	719	77%	23%	
	1000 and higher	585	76%	24%	
	Total	4365	81%	19%	

(NB: Interval variables were analysed with ANOVA; η^2 (Partial Eta squared) is shown as a measure of effect size. Cohen (1988) characterizes η^2= .01 as small, η^2= .06 as medium, and η^2= .14 as a large effect size).

Figure 2: shows the proportion MC in each Type group who got speeding tickets.

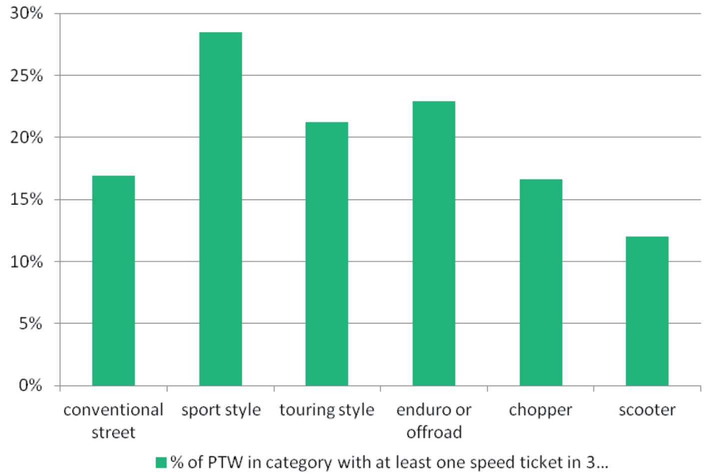

Figure 2: MC self-reported speeding tickets by MC Type.

As could be expected, riders of sporty Types of motorcycles (sport, enduro) and the most powerful machines, used largely for long trips on rural roads and highways (touring), were more likely to be ticketed for speeding. Scooters and conventional street bikes are dominated by smaller engines and often are operated in urban or local areas. The small size engine and the built-up driving environment are less conducive to speeding (and to speed enforcement). The chopper class MC is a somewhat ambiguous designation that may apply to custom built touring type MC or a custom sporty type or a modified street type motorcycle.

Figure 3 presents the proportion of speed-ticketed drivers in each age group, for MC and car drivers.

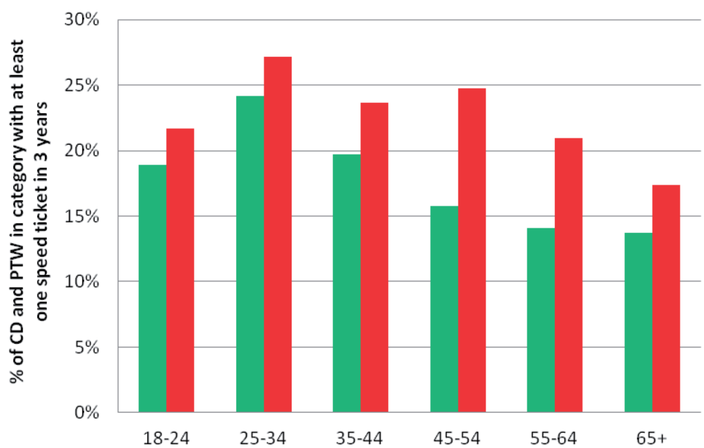

Figure 3: MC and Car drivers' reported speeding tickets by age groups.

There is a clear similarity between the age effect pattern of results for motorcyclists and car drivers. The proportion of ticketed drivers generally gets smaller as age groups get older. At every age group higher proportion of car drivers reported having speed tickets compared to MC drivers. Both findings may reflect differential motoring attributes (such as different amount of driving by CD and MC drivers and by different age groups) and not necessarily different propensity for speeding or differential speed enforcement practices and successes regarding the groups.

Speed tickets and perception of control

Several factors affect the amount of speeding tickets. Perhaps the largest determinants of the amount of speeding tickets are enforcement policies and efficiency of their implementation, and these vary greatly between countries and even within regions of same country. One common indicator for potential effectiveness of speed enforcement is the extent that drivers notice, are aware or believe that their speed is being checked by policing authorities. What is the relationship between noticing speed-checks (or assessing their likelihood indirectly) and the probability of obtaining a speeding ticket?

Respondents were asked ‘On a typical journey, how likely is it that you will be checked for speeding?’ 48% of MC drivers chose the response options Never or Rarely, 33% chose ‘Sometimes’, and 19% chose Often or Very Often or Always. The last category was considered a YES response.

Figure 4 presents the four outcomes of the joint distribution on perception of speed check and getting a speeding ticket in 3 years (the proportions add up to 100%).

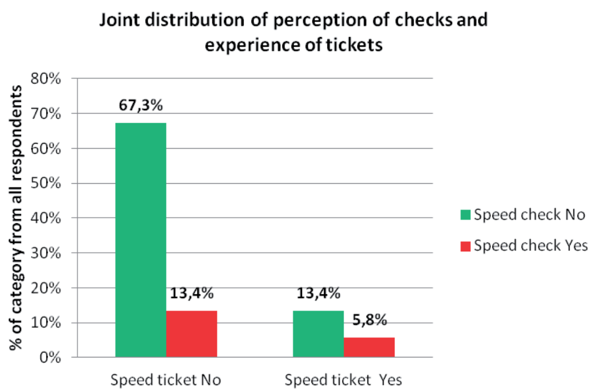

Figure 4: MC perception and experience of speed enforcement.

The majority of riders had experienced no speed checks and no speed ticketing. Of the 19% of riders who believed there is a good chance for being checked for speed, 13.3% did not get a ticket, possibly, but not necessarily, indicating the effect of general deterrence. The 5.7% who got a ticket *and* believed there is active speed enforcement, could be interpreted as indicating either little relationship between the two or that those who get a ticket believe more strongly in the prevalence of enforcement. However, there were more riders, 13.4%, who did get a speeding ticket yet still believed that the likelihood of speed check (prevalence of speed enforcement) is very small or nul.

EU differences in perception of speeding prevalence and speeding as accident cause

Whatever their individual behavior regarding speeding, 73% of MC drivers considered speeding as a ‘cause of motorcyclists being involved in road accidents’. (27% Often, 37% Very often, and 19% Always). Many of them also observed that speeding by ‘other MC drivers’ was a prevalent behavior on all or some types of roads in their countries. The proportions of respondents choosing Often+ Very Often+ Always speeding on motorways, major inter-urban roads, country roads, and built-up areas, were 73%, 71%, 68%, and 41%, respectively. The within individuals correlations between the two observations (how often speed is a cause of accident with frequency of speeding on each type of road) were positive but small.

A Pearson correlation across countries, between mean country score on proportion of 'Always' choice of speeding as cause of accident; and mean country index score of Speeding Prevalence on all four types of roads, yielded a value of r= 0.71. A scatterplot of the two variables provides a visual representation of the correlation and possibilities to speculate about the relative positions of various countries on the two scales.

Figure 5 is the scatter-plot of Country mean score on 'perceived speeding' with Country mean of proportion of MC drivers who consider Speeding as Always a relevant cause of MC accidents.

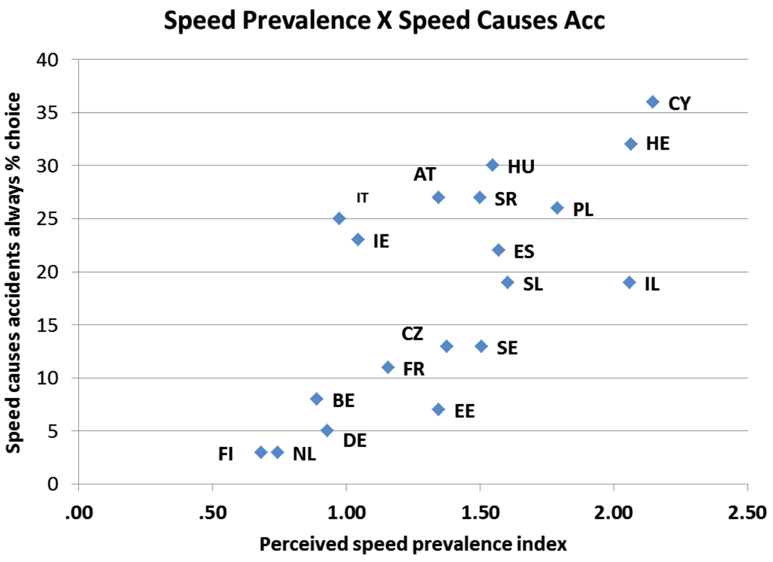

Figure 5: Perceived speeding prevalence & belief in speeding as accident cause.

Northern and Old EU countries dominate the lower left side of the plot, while Mediterranean or New EU countries are on the upper right side. Examination of the components of the speeding prevalence index suggests that lesser than average frequency of speeding in Built-up areas and on country roads contributed to the position of the first cluster of countries, and the opposite effect worked to put the second cluster where it is on the plot.

More specific knowledge about traffic behavior, speed enforcement situation, and drivers' opinions in a particular country may help interpreting the position of that country in the scatterplot.

Support for speeding measures

A logical consequence of believing that MC drivers often speed on various types of roads and that speeding is a frequent cause of MC road accidents, could be an attitude of support for measures to limit the prevalence of speeding. 40% of MC drivers were in favor of using in-vehicle speed limiters, 59% supported regular speed cameras, 49% supported zone based [section] speed control cameras, and 42% were in favor of increasing the use of 30 km zones in built-up areas.

The affirmative responses to the questions were combined into an index score ranging from 0 to 4. The overall mean index score for the total sample of MC drivers was 1.98, with Country mean scores ranging from 1.49 to 2.94. Germany, Sweden, Finland and France are at the lower end of the scale; Ireland, Hungary, Greece and Serbia are at the highest end in the scale.

In countries with already strong speed control measures, for all or part of the roadway system, MC drivers were less inclined to support further implementation of such measures, whereas in countries lacking strong controls, drivers were in favor of adopting them. Accordingly, the Pearson correlation between country scores on speed control and country scores on perceived speed prevalence was only r= 0.36. The correlation between country speed control index, with % MC riders thinking that speeding is Always a factor in MC accidents, was r= 0.58.

Figure 6 presents the extent of support, by Car and MC drivers in age groups, for speed control measure that include in-vehicle device, speed enforcement cameras and 30 km zones.

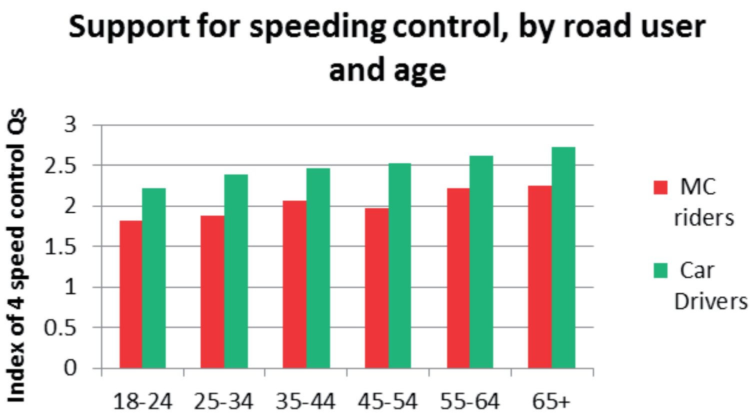

Figure 6: Support of speed control measures by MC and Car drivers, by age-group.

When individual scores are considered, the support for speed control is clearly going up with older age groups, although the differences between age groups are not large. The level of support by car drivers for speed controls measures is consistently higher compared to that of motorcyclists.

Given the acceleration power of most motorcycles and their general sporty styling, the specialized sporty classes of motorcycles, and the fact that many people chose to ride a motorcycle for its speed and maneuverability, it is to be expected that as a group motorcyclists would be less inclined to support speed control measures.

One potential control measure not yet considered here is support of stronger penalties for speeding offences. Figure 7 shows the percentages agreement or disagreement with the statement "Penalties for speeding offences should be much more severe". The percentage is provided for each country, but in addition a combined percentage is provided for northern and southern European countries. For this purpose the 19 participating countries are segmented into North and South. The northern countries are Austria, Belgium, Czech Republic, Estonia, Finland, Germany, Ireland, Netherlands, Poland and Sweden; and the southern countries are Cyprus, France, Greece, Hungary, Israel, Italy, Serbia, Slovenia and Spain.

As can be seen in Figure 7 Southern countries are somewhat more in favour of more severe penalties for speeding offences. This difference is however not large and could be explained by the fact that speed enforcement is already more frequent in Northern countries. The available information on actual enforcement (contextual data in the present survey) shows that in Northern countries there were (on average) 169 speeding tickets per 10^3 population in 2008, whereas the figure for Southern countries was only 68 tickets per 10^3.

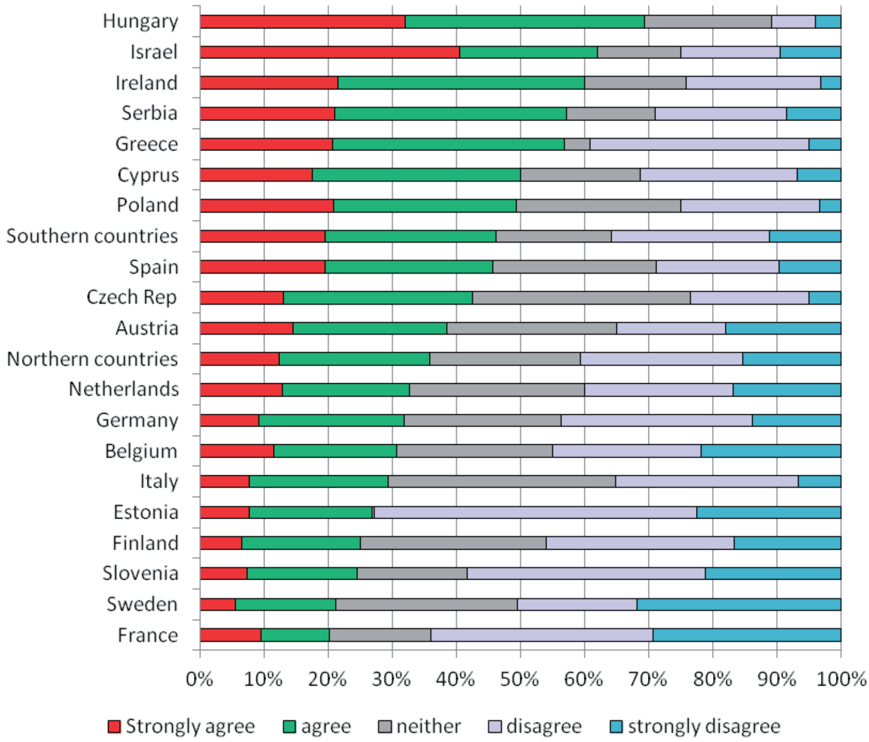

Figure 7: Percentage of responses to the statement "Penalties for speeding offences should be much more severe".

Conclusions

This chapter presented results about motorcyclists' experiences with speed controls and their opinions about causes of accidents and speed reducing measures.

Experience with speed tickets

Ten percent of motorcyclists reported receiving a speeding ticket (in three last years) and 19% believe there is a good chance of them being checked for speeding. Basic motorcycling attributes, in particular frequency and amount of use, MC type and rider age, were associated with receiving speeding tickets.

Proportion of speed-ticketed MC drivers in different EU countries ranged from 5% to 35%. There were no self-evident country characteristics to consistently explain the differences.

There was a strong positive correlation between reported speed tickets and reported injury accidents, at a personal level. This is likely to be mediated by a common exposure factor.

As in MC reported accidents, interpretation of differences in reported speed ticketing between countries needs to consider the variation in basic motorcycling attributes, such as MC use patterns and rider age distribution.

Effects of riders' characteristics

As was predicted, riders of sporty Types of motorcycles (sport, enduro) and the most powerful machines, used largely for long trips on rural roads and highways (touring), were more likely to be ticketed for speeding.

Male riders rode their motorcycles more frequently than female riders and male riders had more speeding tickets than female riders. Most women riders operate in Southern countries and in built-up environment. The proportion of speed- ticketed riders (and also car drivers) goes down with age, but it is not the youngest, but the next youngest age category (25-34), which gets the most speed tickets. Perhaps contrary to expectation, motorcycle riders, at each age group, experienced fewer speed tickets than car drivers. Again, this may mostly reflect amount and type of 'exposure' and enforcement efficiency, and not necessarily universal slower driving by motorcyclists compared to car drivers.

Perception of speeding by others and as accident cause

Among MC drivers, 73% of them considered speeding as a 'cause of motorcyclists being involved in road accidents', ~70% believed that speeding by other motorcycle riders was very prevalent on motorways, major inter-urban roads and country roads, and 41% thought they speed also in built-up areas.

Support for speeding measures

Among MC drivers, 40% of them were in favor of using in-vehicle speed limiters, 59% supported regular speed cameras, 49% supported zone based speed cameras, and 42% were in favor of increasing the use of 30 km zones in built-up areas. Support increased with age.

In countries with already strong speed control measures, for all or part of the roadway system, MC drivers were less inclined to support further implementation of such measures, whereas in countries lacking strong controls drivers were in favor of adopting them.

In Southern EU countries there is more agreement with stronger penalties for speeding (46% agrees or strongly agrees) than in Northern countries (36% agrees or strongly agrees). This difference is not large and could be explained by the fact that speed enforcement is already more frequent in Northern countries.

Methodological comments

Analyses here were limited to simple univariate ANOVA, or chi-square-analysis on cross-tables. Therefore, the effects of individual variables such as gender, mileage, engine size, could not be separated from other interrelated variables, notably kilometrage and frequency of riding. However, large differences between countries in distribution of important motorcycling characteristics, such as motorcycles types and sizes, rider age and gender composition, nature and frequency of motorcycle use, the share of motorcycles in vehicle population- pose difficulties in implementing and interpreting across countries multivariate type analysis.

Although self-reported travel and behaviour information should be interpreted cautiously due to possible sources of bias, there is strong evidence that self-report data about speeding tickets and km driven reflect reliably real experiences. For example, the systematic relationship between self-reported speeding tickets and amount of driving (exposure) even after averaging across at least 19 enforcement systems, many types of driving environments, different kinds of motorcycles and motorcyclists, attests to the universal and strong effect of the attribute ‘km driven’, and gives further credence to the validity of self-reported data about speeding tickets or km driven.

Chapter 2.3

Driving a powered two wheeler while impaired

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Introduction

Reducing drink-driving is one of the major challenges of road safety in several European countries. However, the alcohol consumption by motorcyclists is rarely considered as a specific issue in road safety research. Yet, it has been shown that motorcyclists are more sensible to the effects of alcohol than car drivers (Lin & Kraus, 2009). This result is confirmed by the fact that they are involved in fatal crashes with lower levels of alcohol in their blood than car drivers (Voas et al., 2007; Watson & Garriott, 1992). Motorcyclists are aware of this, and thus have a specific relationship with drink-driving: indeed almost all motorcyclists are car drivers as well and they often decide to choose their car rather than their motorcycle when they go to some place where they know that they are going to heavily drink alcohol (Syner & Vegega, 2000). Nevertheless, despite this "adaptation" attempt reserved to heavy drinking situations, 24% of killed motorcyclists in France in 2009 were under the influence of alcohol, with a BAC higher than 0.5g/l (ONISR, 2011) and 27% of killed motorcyclists in 2005 in the US were under the influence of alcohol, with a BAC higher than 0.8g/l (NHTSA, 2008).

Motorcycle use across Europe is highly variable: in Italy there are 156 Powered Two-Wheelers (PTW) per 1000 inhabitants, whereas in Ireland there are 9 PTW/1000 inhabitants (ACEM, 2011). Moreover, the frequency of use of the different kinds of PTW (such as scooter, touring, enduro, chopper or sport-style) is also highly variable across countries. The type of motorcycle and the engine size is an often discussed factor of risk taking and accident severity (Yannis, Golias & Papadimitriou, 2005). We thus can expect differences between countries regarding motorcyclists' attitudes to drink-driving and driving while impaired (DWI) behaviours.

This chapter will address three goals:

- to identify differences of attitudes towards the use of alcohol and medicines while driving and self reported behaviours between different groups of motorcyclists and different countries;

- to evaluate the impact of road safety measures (e.g., legal blood alcohol concentration, breath testing and alcohol interlock) on intended behaviour;

- to explain the differences as far as possible, in particular to highlight predictors of drinking and driving.

The text is divided into three sections - one focusing on alcohol, the second on legal drugs and the last on fatigue. For each section, descriptive statistics and deeper analyses are presented. Descriptive statistics focus on differences between motorcycle users and between countries. The analytic part goes into further details and explores relations between those different factors in order to evaluate what are the driving while impaired predictors and how efficient are existing measures.

Material and method

The survey includes 14 questions relevant for alcohol consumption, 5 for medication use and 1 for Fatigue driving.

The questions fall into 3 broad topics.

- The first topic deals with **driving while impaired behaviours**. For alcohol-impaired driving, two questions are relative to one's reported drink-driving (*even after a small amount*, *when you may have been over the limit*) and one question is about respondent's friends' behaviour (*Most of your motorcycle-driving friends would drink and drive a motorcycle*). For medicine-impaired driving, participants were questioned about their own use (*Have you driven while taking medication*, *how many times have you been fined for the use of medication while driving*). For fatigue driving, participants were asked about their own behaviour (*In the past 12 months while driving a motorcycle, how often did you realize that you were actually too tired to drive*).

- The second topic addresses the **perception of road risks** associated with such behaviours. Physical risks and legal risks perception have been assessed for both alcohol and medicine-impaired driving. Physical risks perception corresponds to the estimated link between road crashes and the use of alcohol at the wheel (*You can drink and drive if you do it carefully*, *Drinking and driving a motorcycle increase the risk of crash*, *Drinking and driving causes crashes*) or the use of medicine at the wheel (*How dangerous do you think it is to drive while taking a medication*). Legal risk perception corresponds to the perceived risk of apprehension (*How many times were you checked for alcohol while driving a motorcycle, On a typical motorcycle journey, how likely is it that you will be checked for alcohol*).

- The third topic consists on **attitudes towards various measures** taken in order to regulate driving under the influence behaviours: attitudes towards the law (*tolerated BAC threshold*), attitudes towards police checks and fines (*Penalties for drink-driving offences should be more severe*), and finally attitudes towards security devices (*alcohol interlock*).

The following variables were taken into account as potential predictors of drink-driving:

- driving experience: *duration of the driver's license*, *annual mileage*, *number of injury accident*;
- demographic indicators: *gender*, *age*, *city size*;
- exposure: *use of motorcycle in days per week* and *in months per year*;
- *engine size*;
- *type of motorcycle*;
- *Number of speed tickets* and *drink-driving tickets*.

Results part 1: Alcohol

Overview

By construction, nearly 20% of the SARTRE 4 sample concerns motorcyclists, including 3885 men and 598 women. Their mean age is 39.5 years old, which shows that motorcyclists in the sample are significantly younger than Car Drivers (mean= 43 years old) and Other Road Users (mean= 45 years old) in our sample.

Drink-drive behaviour

Thirteen percent of motorcyclists declared they may have driven their motorcycle while being probably over the legal BAC during the previous month. The proportion of motorcyclists who declared that they drove, at least once during the last month, after they had drunk even a small amount of alcohol is 23%. Most of them declared that they performed this behaviour rarely though. This result is consistent with data about alcohol prevalence among killed motorcyclists: for instance, in France, in 2009, 35% of moped riders and 20% of motorcycle riders involved in fatal crashes had a BAC above the limit (20% for car drivers, ONISR, 2011). In the United States, 34% of moped and motorcycle fatal crashes are alcohol related (NHTSA, 2006) and 27% of moped and motorcycle riders involved in a fatal crash have a BAC above the legal limit of 0.8 g/ l (23% for car drivers).

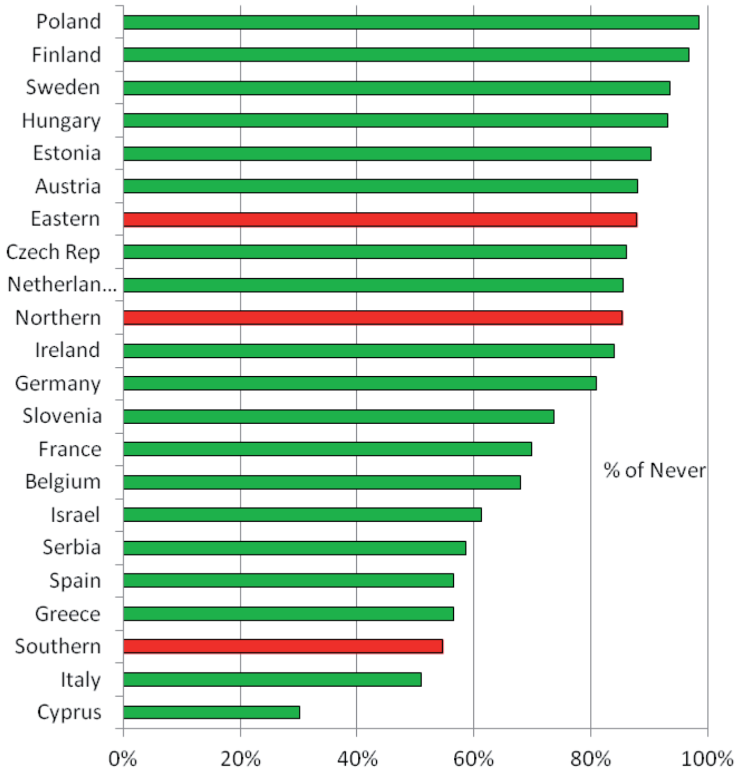

Figure 1: «Over the last month, how often have you driven a motorcycle after having drunk even a small amount of alcohol?».

These overall results mask differences between subgroups. Indeed, there were significant variations between countries (see Figure 1). First, a regional categorisation[12] seemed to emerge. Northern (e.g., Finland, Sweden) and Eastern (e.g., Poland, Hungary) countries have declared almost only sober drivers, whereas Southern countries have a significant number of motorcyclists declaring some drink-driving during the last month (Israel, Spain, Greece, Italy, and Cyprus especially with only 30% of never DWI motorcyclists). There was no significant difference between Northern and Eastern countries. Southern countries declared significantly more drink-driving than the two other groups, $F_{(2,\ 4464)}$= 323.07, p < .001, η^2= .13[13]. The more restrictive legislation in Eastern countries could explain the low rate of declared drink-drive behaviour. Indeed, all Eastern countries have a 0.0g/l or 0.2g/l legal BAC except Slovenia. The DWI differences between Northern and Southern countries, where legislations are mostly equivalent (0.5g/l legal BAC except for Sweden where the legal BAC is 0.2g/l), could be due to better road safety culture and attitudes in general.

There was also a marginal gender difference. Women motorcyclists (85%) were more consistently sober than men (75%), $F_{(1,\ 4465)}$= 20.92, p < .001, η^2= .004. When examining these result for each country, it appeared that the difference was significant only in Southern countries, $F_{(1,\ 1399)}$= 39.19, p < .001, η^2= .027. However, it is noted that the sample of women motorcyclists in Northern and Eastern countries was very small, making it difficult to identify gender differences in these countries.

The effect of age also differed between European regions. In Northern and Eastern countries, younger and older adults tended to drink-drive equally often. On the other hand, in Southern countries, younger adults drink-drive more often than their older ones, $F_{(5,\ 1394)}$= 4.78, p= .009, η^2= .017. Specifically, the 25-34 years old category tended to drink-drive significantly more than the 35-44 and 45-54 age categories, $F_{(2,\ 999)}$= 11.14, p < .001, η^2= .022.

Motorcyclists who overestimated the number of alcohol glasses they can take while remaining under the legal BAC threshold were those who reported the most frequent drink-drive behaviours. These differences were significant for Eastern, $F_{(2,\ 1587)}$= 45.78, p < .001, η^2= .055, Northern, $F_{(2,\ 1398)}$= 32.58, p < .001, η^2= .045 and Southern countries $F_{(2,\ 1286)}$= 52.96, p < .001, η^2= .076. This problem is a major issue of road safety: motorcyclists, as others, are expected to comply with a maximum BAC level before they drive but they are unable to accurately estimate their BAC when needed (Assailly, 1995).

Moreover, the frequency of declared drink-driving decreases as engine size increases. In fact, 80% of 999cc-or-more motorcycle owners declared that they remained always sober while driving during the last month, whereas this number drops under 70% for the 126cc-or-less motorcycle riders.

Similar contrasts were found when considering the type of motorcycle owned. Scooters and enduro-style motorcycle owners declared drink-driving more often than others, and conversely, sport and conventional motorcycle owners were more sober riders, $F_{(5,4209)}$= 26.48, p < .001, η^2= .03. However, this result seems to vary according to the country considered (see Table 1). Unfortunately, some categories include very small samples, making it impossible to draw conclusions.

12 - Countries have been divided in 3 categories. The Eastern category regroups countries of the Warsaw pact and ex-Yugoslavia. The Southern category regroups Mediterranean countries. The Northern category (in contrast with Southern) regroups Nordic and Central countries.
13 - η^2 represents de variance explained by the relation between the variables.

Table 1: "Over the last month, how often have you driven motorcycle after having drunk even a small amount of alcohol?", Percentage of answers different than "never".

	Poland	Finland	Hungary	Sweden	Estonia	Austria	Czech Rep	Netherlands	Ireland	Germany	Slovenia	France	Belgium	Israel	Serbia	Spain	Greece	Italy	Cyprus
conventional street	2	0	5	5	7	12	13	10	15	11	25	26	39	0*	67*	39	46	58	70
sport style	1	6	4	9	5	9	17	7	27	22	32	21	16	12*	36	37	44	39	75
touring style	0	5	12	0	12	19	20	20	8*	7	15*	38	26	39	83*	43	31	71	92*
enduro or offroad	2	7	6	6	16	17	25	11	13	28	32	14	32	26	60*	44	44	49	84
chopper	NA	2	0*	15	12	0*	0*	21	6	27	22	36*	39	0*	43*	46	64*	62*	62
scooter	NA	0*	15	0*	20*	9*	3	0*	28	36	27	38	30	47	35	46	42	44	56
Total	2	3	7	7	10	12	14	14	17	19	27	30	32	40	42	43	44	49	72

Note: Red shade indicates cells superior to the total, * indicates cells for which n<15.

The motorcycle use frequency was moderately correlated with drink-driving, estimated in months of use per year (r= .26, p < .001) and estimated in days of use by week (r= .20, p < .001): those who use their motorcycle more consistently declared more drink-driving. Drink-driving (even a small amount) was correlated with considering oneself as a commuter (r= .19, p < .001) and with the motivation to avoid traffic jam when choosing to use the motorcycle (r= .17, p < .001).

It was also observed that those riders who were the most often penalized for speeding reported more frequent drinking and driving (even a small amount; r= .11, p < .001) and drinking and driving while being probably over the legal limit (r= .14, p < .001) during last month. Despite the correlation were low, this result is consistent with the hypothesis of poly-offenders. However, if this result indicates a tendency for offenders to commit several violations, it does not suggest that they are committing those violations at the same time.

A similar result was observed when comparing motorcyclists who already had an injury accident to those who have not. There is an 18 point gap between those two groups (79% and 61% respectively) in declaring never drink-driving during last month.

Friends' drink-driving behaviours

Overall, motorcyclists didn't believe that most of their friends would drink and drive their motorcycle (M= 3.3 on a 4-points scale ranged from 1 "very" to 4 "not at all"). However, when we distinguished between countries on this question (see Figure 2), compared to the personal reported drink-driving, we found a similar general pattern. Indeed, northern and eastern countries such as Sweden, Finland or Hungary obtain low positive scores for both questions, whereas southern countries such as Serbia, Greece, Cyprus and Italy obtain relatively higher positive scores for both questions.

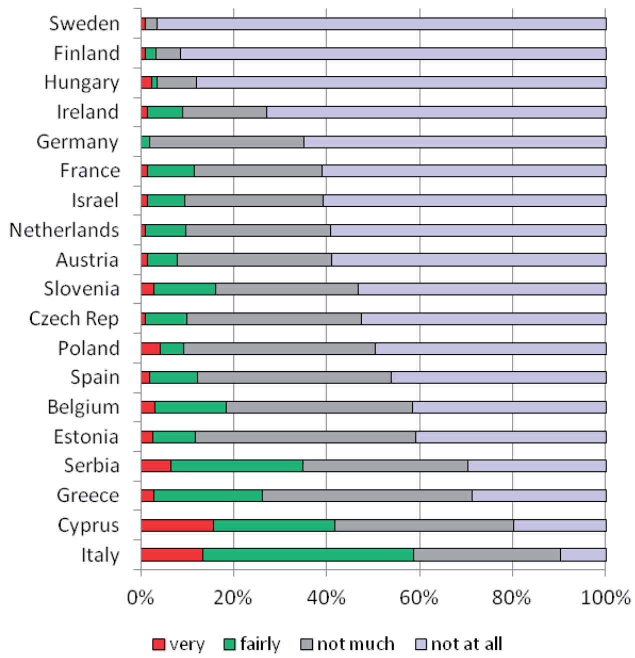

Figure 2: «Most of your motorcycle-driving friends would drink and drive a motorcycle», by country.

Differences between groups of countries were statistically significant. Motorcyclists from Southern countries declared that their friends would drink and drive more frequently than those from Eastern and Northern countries, $F_{(2, 4451)}$= 155.45, p < .001, η^2= .065. There was also a significant difference between Eastern and Northern countries. For this question, the Eastern motorcyclists (M_{ean}= 3.35) declared more frequently than Northern motorcyclists (M= 3.60) that their friends would drink and drive (p < .001, 99% CI [-.34, -.17]). Nevertheless, the overall correlation between the two questions is average (r= -.34[14], p <.001). This may be due to the poor link between the two variables in some countries such as Austria, Belgium, Poland and Slovenia.

Alcohol Consumption and riding if careful

Motorcyclists were overwhelmingly convinced of the incompatibility between alcohol and driving. Nearly 80% of them totally disagree with the statement that it is possible to drink and drive if you do it carefully. There was no significant difference between men and women.

Figure 3 below shows differences by country for thisstatement ; we found again the same regional pattern with the same countries on top and bottom of the figure. There was no difference between Eastern (M= 3.72) and Northern (M= 3.77) countries. However, Southern motorcyclists reported more frequently that you can drink and drive if you do it carefully, $F_{(2, 4468)}$= 57.79, p< .001, η^2= .025.

This statement was also significantly correlated with the "drink-drive even a small amount" and "drink-drive over the legal limit" behaviours (r= -.38, p < .001 and r= -.34, p < .001 respectively). The more frequently the motorcyclists reported to drink and drive the more they thought that they could assume this behaviour with a controlled risk even if they exceeded the legal limit.

14 - The correlation is negative because the scales are oriented in a different way for each question.

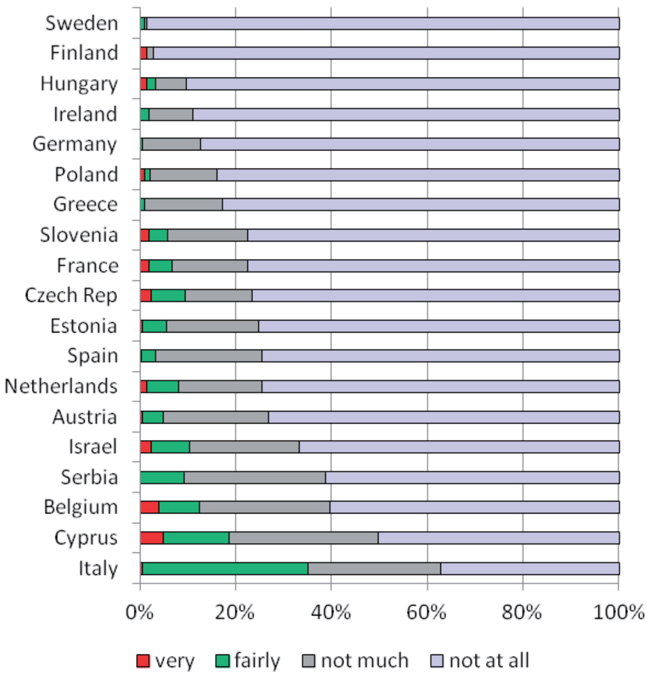

Figure 3: «You can drink and drive if you do it carefully», by country.

Drink-driving and Accident risk

Overall, the vast majority of drivers - almost 93% - believed that alcohol increases the probability of collision with a third party (sum of the «very» and «fairly» answers). There was neither significant difference by gender nor by age. For most countries we reached a ceiling effect if we added those who answer "very" and those who answer "fairly". However, the comparison of answers "very" by country showed a pattern roughly similar to the preceding ones. Drinking and driving, a small amount or over the legal limit, was correlated with the belief that drink-driving did not increase the risk of accident (r= .20, $p < .001$ and r= .24, $p < .001$ respectively). The more frequently riders reported to drink and drive, the less they believed that DWI causes accidents. As a whole, motorcyclists appeared confident in their skills to avoid an accident, even when they are under the influence of alcohol.

Perception of alcohol as an accident Causation factor

Participants were asked, in a list of 10 potential accident factors, whether they thought that drinking and driving was a cause of motorcyclists being involved in road accidents. The results contrasted with those exposed above. Indeed when we compared countries (see Figure 4), the rankings were totally different than for previous questions. For example, in Sweden people were fully aware of the increased risk of accident when drink-driving and perceived, on the other side, a low involvement of this factor in road accidents. It may be that Swedish motorcyclists are convinced that very few of them are actually driving under the influence of alcohol. On the contrary, in Germany we found high proportions of positive answers for both questions. It could be that German motorcyclists perceive a high risk in drink-driving and associate it with a high involvement of this factor in road crashes.

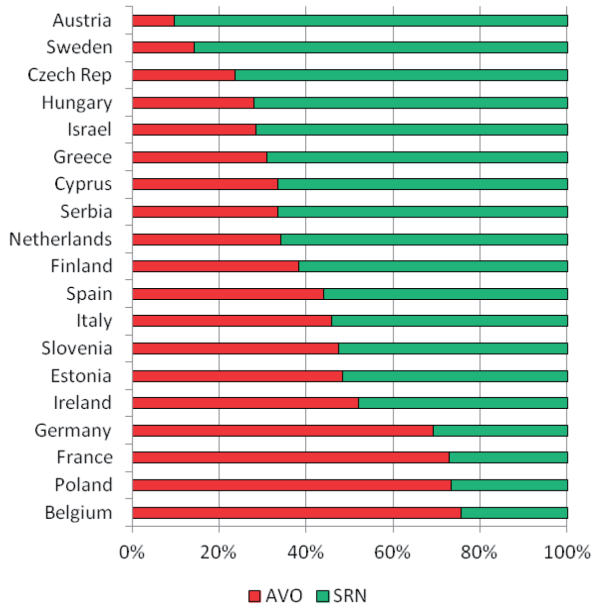

Figure 4: «How often do you think that drinking and motorcycling is the cause of motorcyclists being involved in road accidents «, by country.

Note: AVO is the sum of "Always", "Very often" and "Often" answers. SRN is the sum of "Sometimes", "Rarely" and "Never" answers.

Another related aspect could be considered: what is the actual percentage of killed drivers in each country who where under the influence of alcohol? It is difficult to obtain accurate and comparable statistics on this issue in Europe. According to the SafetyNet report (Vis & Van Gent, 2007) some countries such as Czech Republic, Austria, Hungary, Netherlands, Greece and Poland have relatively low levels of alcohol-related killed drivers (below 10%) whereas some countries such as Italy, Belgium, France, Spain, Estonia, Cyprus, Finland and Sweden have relatively high levels of alcohol-related fatalities in road accidents (over 22%). But again, if the relation between "actual" alcohol-related road fatalities and perception by respondents seems possible in some cases (for example, in Austria, Czech Republic, Hungary, Belgium and France), it appears that those two variables are not related in some other countries (for example Sweden, Cyprus, Spain, Italy and Poland).

Alcohol is more frequently perceived as a cause of accident by owners of small engine motorcycles than by those who own motorcycles with bigger engines ($F_{(4,4449)}$= 42.72, p < .001, η^2= .04). There was also an exposure effect, either estimated in months of use by year, $F_{(3,4354)}$= 18.13, p < .001, η^2= .01, or in days of use by week, $F_{(3, 4427)}$= 30.08, p < .001, η^2= .02. Those who used more frequently their motorcycle attributed greater weight to alcohol in the genesis of accidents.

Attitude towards legal measures

Alcohol check

On average, European drivers were moderately controlled for alcohol over the last 3 years (never for 62% of them). However, once again there were huge differences between countries. In Italy, Belgium, France and Slovenia, more than 80% of motorcyclists have never been checked for alcohol (94.3, 86.3, 82.3 and 80.5% respectively). Yet, these countries were some of those that declared the most drink-driving behaviours. At the other extremity, in Czech Republic, Spain, Cyprus and Finland, around 50% of the motorcyclist declared an alcohol check in the last 3 years (53.7, 50.9, 50 and 47.4% respectively). Finally, 86.4% of the Estonian motorcyclists reported that they have been checked in the past three years. This last result was somewhat surprising and differs considerably from the other countries. Moreover, if we compare this rate with the low number of actual roadside breath tests per inhabitant (95 per 1 000 inhabitants, ETSC, 2008) in that country, the reported number of alcohol checks in Estonia seems inconsistent and leads us to consider this result with caution.

To the question "On a typical motorcycle journey, how likely is it that you be checked for alcohol?", the mean answer was low for all the countries (M= 2.19; SD= 1.02; on a 6 point scale from 1 "never" to 6 "Always"). Motorcyclists reported that they were rarely checked in a typical journey. There was no significant difference between countries.

Declared alcohol controls by motorcyclists increased with the frequency of motorcycle use whether estimated in months of use per year (χ^2= 45.3, $p < .001$) or estimated in days of use by week (χ^2= 25, $p < .001$): those who used their motorcycle more consistently were more likely to report alcohol roadside breath tests. This result implies a logical exposure effect.

Alcohol tickets received over the past 3 years

Overall, motorcyclists rarely declared that they had been fined for driving under the influence of alcohol: on average, it was the case with only 3% of them over the past 3 years. There was however a great variability between countries with percentages ranging from 0% to 15%. In some countries, the proportion of motorcyclists fined for alcohol is ≤ 1% (Austria, Estonia, Finland, France, Germany, Ireland, Italy, Netherlands and Sweden) whereas in some others the proportion is > 6% (Belgium, Cyprus, Israel and Serbia). In order to gather information about fine's effect on recidivism, we analyzed how the participants that received a ticket for drink-driving during the past 3 years changed or not their behaviour. Results indicated that among fined participants (N= 125), 44.8% answered that they never drove a motorcycle when they may have been over the legal limit during last month. So, despite the fine, the majority of the participants declared that they have reoffended recently.

Some variables seem to be linked with the number of alcohol tickets received: driving experience (χ^2= 40.4, p <.001), prior injury accident (χ^2= 78, $p < .001$) and motorcycle frequency of use (χ^2= 35.1, $p < .001$). For this last point, we can reasonably assume that it is a simple effect of exposure: it is more likely to be controlled if one is more on the road.

Although alcohol tickets remain infrequent, they increased by 6% for most drivers already fined for speeding (98% vs. 92% never fined for alcohol, χ^2= 106.4, $p < .001$). This could indicate a tendency for some motorcyclists to commit several violations pointing toward a "general risk taker" interpretation.

Perceived risk to be fined for drunk-driving

Contrary to the low reported number of alcohol check in a journey and in the last three years, motorcyclists generally believed that if they drive under the influence of alcohol they have a great risk to be fined by the police. Indeed, 77% of the motorcyclists declared that the risk to be fined is «very» or «fairly» important if they drink and drive. So, while they are rarely checked for alcohol, motorcyclists of SARTRE countries generally don't have a feeling of impunity toward drink-driving behaviour. Italian motorcyclists represented an exception in so far as they were only 27% to have this opinion. At the other extremity 91% of the motorcyclists in Finland thought that they had a great risk to be fined if they drink and drive. For those two countries at least, it seems that answers reflects reality: the lowest rate of roadside breath tests among SARTRE countries is in Italy (23/1000hab) whereas the highest rate is by far the Finnish one (385/1000hab) (European Transport Safety Council, 2008).

Results also indicated that the perceived risk to be fined was correlated to both "small amount" or "over the legal limit" drink-drive behaviours (r= .15, $p < .001$ for both). The more frequently respondents reported to drink and drive, the less they thought that they were likely to be fined by the police. This significant result could be interpreted in two complementary ways. First, those who believe that they will be fined if they drink-drive don't want to take the risk and prefer to stay sober. Second, those who regularly drink-driving may perceive that the risk to be checked is low and thus develop a relative feeling of impunity.

Alcolock, more severe penalties for drink-driving, and BAC change

A clear majority of the motorcyclists interviewed were in favour of using an "alcolock" for all drivers (73% approved this measure «very» and «fairly») and for recidivist only (79%). They were also 78% in agreement with the statement that penalties for drink-driving offences should be much more severe. Italy again makes an exception, as it was the only country where the majority disapproved the alcohol interlock measure for all drivers (52% of «not much» and «not at all» in favour) and only 52% of them wanted to increase the penalties for drink-driving offences.

The attitudes towards the legal BAC changes were quite different. On average the participants thought by 60% that motorcycle drivers should be allowed to drink "no alcohol at all" and "less alcohol than at the present", however there were important differences between countries. First, in the countries where the legal BAC is actually zero, the rate was higher than the average (72% for Czech Republic and 90% for Hungary). They were few to claim a change in legislation. These results showed a good acceptance of the more restrictive measure that exists in Europe. Second, in the countries that allow a single unit BAC, the majority of respondent reported that they were in favour of more restrictive legal BAC (Estonia 58%, Poland 97%, Serbia 54% and 72% in Sweden). Finally, the results seemed to provide some cultural information: Southern countries were less in favour of more restrictive BAC legislation than Northern and Eastern countries, $F_{(2, 4463)} = 143.54$, $p < .001$, $\eta^2 = .06$. In fact, Southern was the only region where a minority of participants (45%) claimed a change in the way of "less alcohol" and "no alcohol at all", while 70% of participants thought so in Northern countries.

As expected, the results showed a consistent pattern between attitudes toward legal measures and reported frequency of drink-driving. Motorcyclists who reported drink-driving over the legal limit during the last month were less in favour of alcohol interlock measures, especially when it was aimed at recidivists ($r = .14$, $p < .001$). Moreover, the more the participants reported drink-driving the less they were prone to claim more severe penalties ($r = 22$, $p < .001$ for both few amount of alcohol and over the legal limit). Finally, drink-driving was significantly correlated to the opinion that legal limit should be higher than at present ($r = 39$, $p < .001$ with "even a small amount of alcohol"; $r = 30$, $p < .001$ with "over the legal limit"). Not surprisingly, those who drink and drive are those who want less legal restrictions. Conversely, those who are sober at the wheel want to feel secure and they naturally think that one way to improve it is to legislate.

Legal BAC and drink-driving

Results indicated significant differences in declared drink-driving according to the BAC level (Figure 5). Motorcyclists reported more drink-driving behaviour in countries where the level of BAC was the higher, $F_{(2, 4464)} = 124.16$, $p < .001$, $\eta^2 = .05$. This first effect indicates that when the country legislation tolerates 2 units of BAC while driving, individuals tend to use this right to consume alcohol before driving. However, the most interesting effect of the legislation was that motorcyclists, in countries that have 0 and 1 unit legal BAC, reported the same amount of drink-driving behaviour. It seems that when motorcyclists can drink only one unit before driving, they prefer to stay sober. Perhaps, the probability to be over the legal limit is too high even if they drink only a glass of alcohol. So, they should think that it is more reasonable to avoid any drinking before driving. If this is the case, reducing the legal BAC to 0.2 g/l, especially for motorcyclists, could be an efficient policy in order to reduce the drink-driving behaviours. Indeed, due to the higher skills that are needed to drive a powered two wheeler, this specific population is more sensible to the effect of alcohol when driving. In fact, some impaired effects have been found among motorcyclists with a BAC of 0.5 g/l (Creaser, Ward, Rakauskas et al., 2007) and may increase their crash risk (Voas et al., 2007).

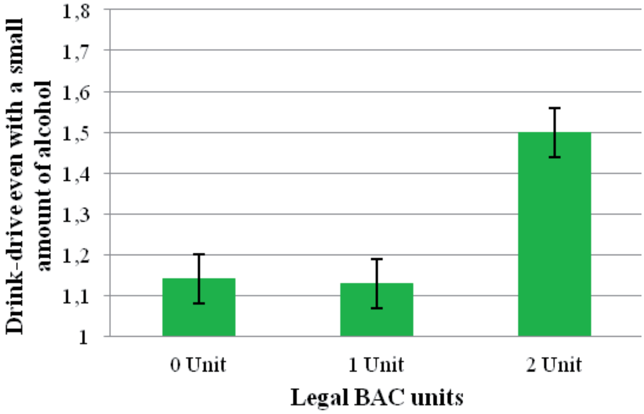

Figure 5: Drink-driving mean according to the legal BAC units. Error bars indicate a 99% confidence interval.

What are the drink-drive related variables?

In order to explore the drink-drive related variables, an ordinal regression analysis with the item «driven a motorcycle after having drunk even a small amount of alcohol» as dependant variable was performed. Ordinal regression reveals one model for each category of the dependent variable except for the highest category which is omitted (reference case). We therefore expect 5 sub-models. These models differ from each other in terms of the threshold (constant). More specifically, all the models have same predictor coefficients (B) and odds ratios but different constants. The results, in terms of parameter estimates, their statistical significance and their odds ratios, as well as model's fit, are summarised in Table 2. Given the important regional differences identified in the descriptive analyses of the previous sub-sections, three separate models were identified (Northern, Eastern and Southern countries), as well as a global model for all countries.

All the models are quite satisfactory in terms of performance, with good fit (e.g. R^2 at around 0.30) and several statistically significant predictors. It is also important that all constants are statistically significant; otherwise the results might have been unreliable.

Age was a statistically significant predictor in the whole sample but there were no regional differences. Many studies have shown that younger adults generally tend to drink and drive more frequently and are more involved in road traffic crashes (Elliot, Woolacott & Braithwaite, 2009; Holubowycz & McLean, 1995). In SARTRE 4 survey, there is likelihood that older motorcycle users report drink-driving behaviour less often than younger ones. The odds ratio is 1,006, meaning that for 1 additional year there is a 0,6% increase in the probability of reporting less often drinking-driving behaviour (i.e. (OR-1)*100).

Table 2: Ordinal regression on drink-drive behaviour (“even a small amount”).

	All		East		North		South	
	Coef. (B)	Odds ratios	Coef. (B)	Odds ratios	Coef. (B)	Odds ratios	Coef. (B)	Odds ratios
constant(rarely)	-2,65***	-	-3,16***	-	-2,93***	-	-1,32**	-
constant(sometimes)	-4,12***	-	-4,83***	-	-4,76***	-	-2,71***	-
constant(often)	-5,69***	-	-6,04***	-	-6,12***	-	-4,37***	-
constant(very often)	-6,80***	-	-7,06***	-	-8,88***	-	-5,31***	-
constant(always)	-9,28***	-	-	-	-	-	-7,32***	-
Age	0,01*	1,01	n.s.	-	n.s.	-	n.s.	-
exposure in months/year	-0,20***	0,82	-0,09***	0,91	-0,12***	0,89	-0,09***	0,91
Gender = male	-0,88***	0,41	n.s.	-	-1,17**	0,31	-1,11*	0,33
Gender = female	0a	-	0a	-	0a	-	0a	-
the number of reported accidents	-0,28***	0,76	n.s.	-	n.s.	-	n.s.	-
attitude to drink driving penalty = strongly agree/agree	0,58***	1,79	n.s.	-	0,66***	1,94	0,26*	1,30
attitude to drink driving penalty = neither	0,32***	1,38	n.s.	-	n.s.	-	n.s.	-
attitude to drink driving penalty = disagree/strongly disagree	0a	-	0a	-	0a	-	0a	-
drink and drive if carefully = very/fairly	-1,70***	0,18	-1,94***	0,14	-2,11***	0,12	-1,29***	0,27
drink and drive if carefully = not much	-1,14***	0,32	-1,29***	0,28	-1,18***	0,31	-0,96***	0,38
drink and drive if carefully = not at all	0a	-	0a	-	0a	-	0a	-
friends estimated drink driving = very/fairly	-1,49***	0,22	-1,68***	0,19	-1,13***	0,32	-1,46***	0,23
friends estimated drink driving = not much	-1,04***	0,35	-0,76***	0,47	-1,02***	0,36	-1,07***	0,34
friends estimated drink driving = not at all	0a	-	0a	-	0a	-	0a	-
alcohol ticket experience = no	1,38***	3,99	0,91*	2,49	1,12*	3,06	1,71***	5,54
alcohol ticket experience = yes	0a	-	0a	-	0a	-	0a	-
R^2	0,33		0,22		0,25		0,30	

Note: a= the reference category of each variable. The reference category of the dependent variable is ‘never’. The ‘always’ response was absent from eastern and northern countries. ns= non significant, *= p < .05, **= p < .01, ***p < .001.

The monthly/year exposure is statistically significant in all regions and in overall. The odds ratios reveal that as exposure rises, it is more likely that motorcyclists be in higher categories: motorcyclists who were using more frequently their motorcycle were more likely to self-report drinking and driving (21,8% more likely for increase of exposure by 1 unit). This result seems to be a matter of choice. Those who are using their motorcycle daily are more likely to be in a situation where they don't have another option, but on the other hand, those who use their motorcycle exceptionally decide when they are going to use it or not and most probably choose another mean of transport when they know that they will drink alcohol (Syner & Vegega, 2000). Motivations and relationship with the motorcycle use are very different between those who use it daily and those who use it scarcely.

Another influential factor in the analysis was the gender of the motorcyclists. Overall, in Northern and in Southern countries, male riders are more likely to report drink and driving more often than females. In Eastern countries there is no statistical difference between males and females. More specifically, females are 2,415 times less likely to report drinking-driving overall, 3,04 times in Southern, and 3,22 times in Northern countries.

A high predictive factor of drink-driving was the belief that individuals can drink if they drive carefully. This relationship remained significant overall and for each region. For example, those who respond 'not at all' are 5,46 times and 3,125 times more likely to report less often drinking-driving than those who respond 'very/fairly' and 'not much' respectively.

The feeling of control could be central factor in the drink-drive behaviour. Some motorcyclists think that they can drive safely if they compensate the increased risk of DWI by a more careful driving (Trimpop, 1994). Moreover, they probably drove several times under the influence of alcohol without damage. These experiences could reinforce their feeling of control and decrease their perceived probability of crash (Fuller, 1991). Nevertheless, our data showed that motorcyclists who reported more frequently to drink and drive also reported more accidents (31,9% more likely to drink and drive for each 1 more accident reported). A critical way to prevent the risk of accident due to alcohol consumption may thus still be to make them realize the effects of alcohol on vehicle control.

Friends' drink-driving was also a good predictor of motorcyclists' drink-drive behaviour. More specifically, motorcyclists whose friends very/fairly drink and drive are 4,4 more probable to report drink and driving compared to those who replied 'not at all. The respective ratios for East, North and South are 5,3, 3,1 and 4,3. This result confirmed the importance of the social influence by peers. Individuals tend to adopt the norms of their group and select their friends according to these norms.

There was a positive link between reported frequency of drink-drive behaviour during last month and reported alcohol tickets in the past 3 years. Those motorcyclists who hadn't any alcohol ticket experience are almost 4 times more probable to report less often drink-driving than those who had such experience. There are two different ways of analyzing this link. The first one is that controls are efficient because they catch motorcyclists who reported the more frequent drinking and driving. The second one is that controls are inefficient because those who were caught are drinking and driving. Unfortunately the second option seems more credible as it has been found that fines may not be a good solution for preventing DWI recidivism (Ahlin et al., 2011; Yu, 2000).

Finally, the attitude towards drink driving penalties was generally a significant predictor with some exceptions (e.g. eastern countries). When significant, there was a tendency that those motorcyclists who agree or strongly agree with more severe drink driving penalties are 1,794 times more likely to never drink and drive than those who disagree overall, 1,938 in North and 1,304 in South.

Results part 2: Drugs

If alcohol is the product by far the most frequently found among DWI offenders, the consumption of some medication (e.g., benzodiazepines) may also affect driving skills and behaviour. It may also represent a non marginal part of road accidents (Engeland, Skurtveit, & Morland, 2007). Indeed, in a recent study on the impact of medical drug use on the risk of road crashes in France, the authors reported that 18% of the drivers involved in accident were exposed to at least one prescribed medicine of level[15] 1, 2 or 3 (Orriols, Delorme, Gadegbeku, Tricotel, Contrand, Laumon, et al., 2010). The fraction of road traffic accidents attributable to level 2 and 3 medications was 3.3%. This part of the chapter will try to provide information on the proportion of motorcyclist who drive while impaired by medicine and the awareness of its potential risks.

Drug drive behaviour

Motorcycle driving under the influence of medication was reported even more scarcely in our sample than driving under the influence of alcohol (Figure 6). 81% of the motorcyclists reported that they "never" drive while taking a medication that carries a "warning: it may influence your driving ability".

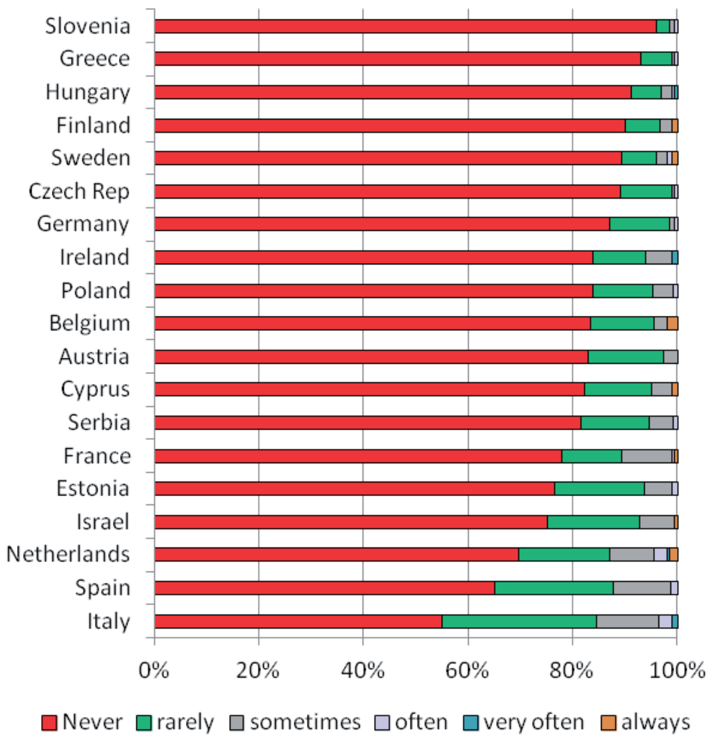

Figure 6: «Have you driven while taking a medication that carries a "warning: it may influence your driving ability"», by country.

15 - The French medication labeling system is composed of 3 graded pictograms (i.e., Level 1 «Be careful, read carefully the patient leaflet before driving», Level 2 «Be very careful, take advice from a physician or a pharmacist before driving, and Level 3 «Danger: do not drive, seek medical advice before driving again»).

A great majority of the respondents seemed aware of the danger associated to medicate driving. 86% of them think that it is «very» or «fairly» dangerous to DWI by medication. However, those who did not think that DWI was really dangerous were more prone to report driving while medicated (r= .28, p < .001). Thus, an important way to prevent such behaviour could be to make them becoming aware of the risks. Moreover, medication-affected driving was significantly correlated with associated risk attitudes as driving: when too tired (r= .14, p < .001), after a few amount of drink (r= .14, p < .001) and after drinking probably over the legal limit (r= .14, p < .001). Once again, it appears a coherent pattern of multi-risk taker.

Results part 3: Driving when Tired

Fatigue plays a significant role in road safety, as it impairs driver alertness and performance. Fatigue-related accidents on motorways or major roadways are caused by long duration of driving. Fatigue is an often overlooked but most obvious cause to an otherwise unexplainable accident in the night-time traffic (Corfitsen, 1986, 1989). Ting et al. (2008), carried out a simulator experiment about fatigue driving and revealed that sleepiness ratings, reaction times and unstable driving performance significantly increased overtime, indicating that excessive driving time is a fatigue factor and potential cause of fatigue-related accidents.

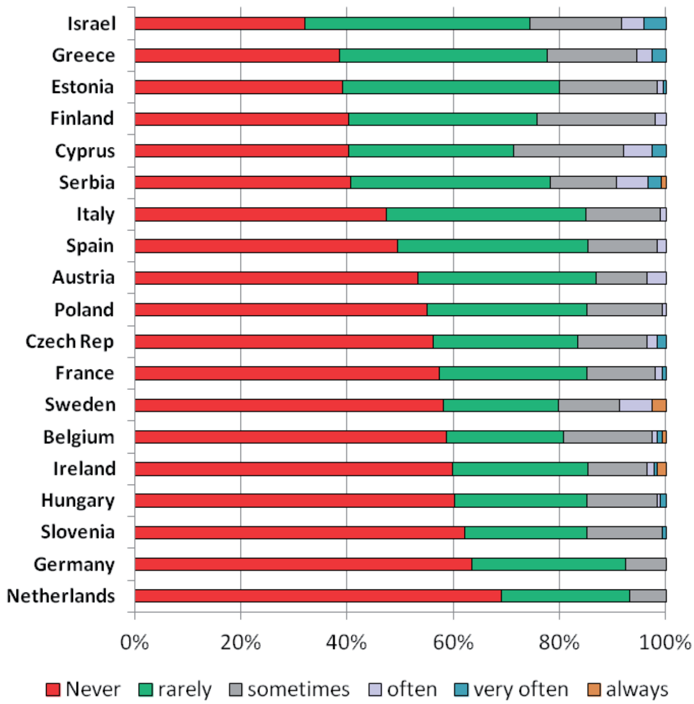

Figure 7: «In the past 12 months while driving a motorcycle how often did you realize that you were actually too tired to drive?».

Figure 7 shows that the great majority of respondents in EU never or rarely did drive in the past 12 months feeling too tired. More specifically, the percentage of MC drivers who responded ‘never’ ranges from circa 30% (Israel) and 40% (Greece, Estonia, Cyprus, Finland and Serbia) to almost 60% (France, Sweden, Belgium, Ireland, Hungary, Slovenia, Germany and Netherlands). On the other hand, MC drivers who responded ‘rarely’ range from 20% to 40%. ‘Sometimes’ average EU response is 14.1%. Finally, ‘very often’, ‘always’ and ‘unknown’ range from 0% to 1,9%.

Conclusion

From the results of the detailed analysis, a number of conclusions can be summarised as follows:

- The proportion of motorcyclists who declared that they drove, at least once during the last month, after they had drunk even a small amount of alcohol is 23%. Frequent motorcyclists reported drink-driving more often.

- A regional pattern was identified: Northern and Eastern countries have declared very low frequencies of drink-driving, whereas Southern countries have a significant number of motorcyclists declaring some drink-driving during the last month. This may be partly attributed to the increased use of motorcycles in Southern Europe, making driving behaviour more lenient, and partly to the poorer road safety culture in these countries compared to the rest of Europe.

- Young and male motorcyclists, and riders of small motorcycles, reported more frequent drink-driving, especially in Southern countries. This confirms existing research findings, as these groups are often associated with reckless and risk taking behaviour, and negative road safety attitudes in general.

- Motorcyclists who reported more frequent drink-driving were less in favour of more severe BAC limits and penalties. Interestignly, in countries with higher BAC limits, more frequent drink-driving behaviours were reported, suggesting on the one hand that riders are quite compliant to stricter, and on the other hand that more lenient limits may lead riders to attempt to fully use the rights “offered” by the limits.

- Although 80% of motorcyclists totally disagree with the statement that it is possible to drink and drive if you do it carefully, smaller proportions were identified in Southern countries .

- Although 93% of riders believe that alcohol increases the probability of road accident, riders who reported more frequent drink-driving appear to have lower perception of that risk.

- Despite the large acknowledgment of the risk of drink-driving a motorcycle, there is quite some variation between countries as regards the extent to which alcohol is a major contributory factor of motorcycle accidents. It is likely that in several countries other factors are considered to be more important.

- European motorcyclists reported a relatively low rate of alcohol controls in their countries (62% were never controlled in the last 3 years). They also reported a very low perceived risk of apprehension (i.e. probability of being controlled). This suggests that the existing levels of enforcement in most countries are not sufficient and more systematic enforcement (in time and in space) is required.

- As expected, more frequent motorcyclists appear to be more frequently controlled.

- Only 3% of the participants have been fined for alcohol in the last 3 years, although the results vary from <1% to 6% in different countries. It was also found that motorcyclists fined for alcohol were also fined for speeding.

- However, European motorcyclists believe that they are very likely to be fined when drink-driving, if controlled. They are also in accordance with more severe penalties, especially for recidivist drink-driving.

- Their attitudes towards changes in BAC limits are clearly affected by the current limits in each country. In countries where the current legal BAC is zero, the proportion of those who think that motorcycle drivers should be allowed to drink “no alcohol at all” and “less alcohol than at the present”, was higher than the average. In countries that allow a single unit BAC, the majority of respondents reported that they were in favour of more restrictive legal BAC. Southern countries were less in favour of more restrictive BAC legislation than Northern and Eastern countries.

Riding a motorcycle while impaired is one of the most dangerous situations known in road safety. The impact of alcohol on riding skills is even greater than for driving skills. Motorcyclists seem to be aware of this and often decide, when they know that they are going to drink heavily, to go by car rather than by motorcycle (Syner & Vegega, 2000). Indeed, motorcyclists are also car drivers. Unfortunately, from a road safety point of view, this adaptation attempt is clearly not a good decision: we would have preferred that they decide not to drive or not to drink. This point is important to mention because it shows that motorcyclists are already aware of the risk associated with drink-riding. Communicating on this risk and informing motorcyclists about it appears thus useless and other means of deterrence have to be found. On the other side, our results showed that punishment may not be a good way to prevent recidivism neither. It is possible that the deterrence effect of those two types of enforcement reached a ceiling level and that communicating more or implementing more severe legal sanctions would not be very efficient in reducing drink-driving offences in SARTRE countries. Our analyses revealed that some other variables could be selected as targets for enforcement campaigns: the feeling of control (“I will be careful”), the self evaluation of BAC (“I feel good, I am certainly under the threshold”) and descriptive norms (“my friends do it”).

However, those results have to be moderated by geographical considerations. Indeed, motorcycle use is very different among SARTRE countries because of both cultural and weather differences, especially between northern and southern countries. The type of motorcycle, the profiles of motorcyclists, the frequency of use and the number of motorcyclists differs widely between those European regions. Moreover, the above mentioned potential action targets seem to have different impacts depending on the country location. The impact of self-evaluation of BAC is greater in Southern and Eastern countries than in Northern. The effect of friends’ behaviour appeared to be more important for Southern countries than for others. Finally, the feeling of control had a greater effect in Eastern and Northern countries. We thus recommend considering different enforcement strategies depending on the geographical situation of the target country. Southern countries should be regarded as priority targets as they cumulate a high proportion of motorcycle use within local population and a high frequency of drink-driving.

Chapter 2.4

Driving style, risk perception and motives for driving a powered two wheeler

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Introduction

In this chapter the results of section road users interaction, ITS use and driving style of the questionnaire are discussed. In the first paragraph on driving style the results for the seven items of question MC21 are presented. The bulk of these items mainly regarded potentially dangerous behaviours (such as following a vehicle too closely for instance), but also two items regarding the use of intelligent transport systems (helmet telephone and electronic toll tag) were integrated in this question. As expected both types of items were largely unrelated, and the results are hence presented separately. In the second paragraph on risk perception the results of question MC23 are discussed. This question regarded the perceived danger of four different situations motorcyclists are often confronted with (overtaking and weaving). Finally, in a last paragraph the results regarding motorcyclists' motives for driving a motorbike are analyzed. This was done on the basis of the 11 items of question MC24 which regarded possible reasons for driving a motorcycle.

Depending on the paragraph, cross-references are made to general socio-demographic variables, experience as a motorcyclist, gender, etc. But given the main objective of the SARTRE 4 survey, the main focus lies on the differences between the different countries. Part VII of the motorcyclist questionnaire (see Appendix 1) also included a question regarding advanced motorcycle courses (MC22). Rather than treating this question as a specific topic, the results regarding this question were used to analyze the results of the attitudes discussed in the other paragraphs in depth. Further cross-analyses can also be found in the chapter 7 dedicated to specific profiles.

Driving Style

Methodology

In question MC21 motorcyclists were asked to indicate their frequency of displaying behaviours considered to be highly dangerous and the frequency of using electronic devices. The six answer options for were never (1), rarely (2), sometimes (3), often (4), very often (5) and always (6).

Descriptive results

Table 1 gives the percentage of motorcyclists that often, very often or always display the specific behaviours for each country and in the total sample (apart for giving way for pedestrians, for which the percentage of never, rarely or sometimes is given, such that all high scores are bad for road safety). High scores are indicated in red, low scores in green. In the last column, the average of columns 2, 4, 5 and 6 is included as a compound index of risky behaviour. This index does not include giving way to pedestrians since a principal component analysis showed it had a low factor loading (< .3) and a detrimental impact on Cronbach's alpha.

Table 1: Percentage of motorcyclists that often, very often or always display the behaviour (except for giving way to pedestrians for which percentage of never, rarely and sometimes is given, cf. *).

	Follow the vehicle in front too closely	Give way to pedestrians at pedestrian crossings*	Drive through traffic light on amber	Overtake when you can just make it	Flash lights or use the horn in anger	Use a helmet phone	Use an electronic tag to pay toll	Risky behavior index (mean of columns 2,4,5,6)
Cyprus	46%	24%	54%	68%	39%	14%	5%	52%
Greece	45%	18%	29%	50%	11%	7%	2%	34%
Serbia	20%	26%	24%	58%	27%	20%	21%	32%
Israel	20%	11%	21%	16%	31%	16%	--	22%
Austria	15%	36%	29%	22%	17%	16%	11%	21%
Poland	10%	31%	15%	44%	9%	3%	1%	20%
Czech Rep.	9%	17%	18%	47%	3%	7%	3%	19%
Estonia	24%	4%	23%	16%	12%	8%	4%	19%
Italy	16%	22%	35%	11%	9%	16%	13%	18%
Spain	6%	11%	32%	19%	7%	7%	6%	16%
France	14%	14%	15%	12%	12%	2%	3%	13%
Sweden	15%	8%	25%	7%	5%	4%	2%	13%
Hungary	18%	8%	17%	9%	4%	7%	0%	12%
Belgium	16%	15%	13%	11%	5%	2%	3%	11%
Netherlands	9%	6%	13%	13%	7%	13%	4%	11%
Finland	9%	12%	11%	4%	16%	5%	1%	10%
Slovenia	15%	15%	16%	2%	6%	4%	10%	10%
Ireland	5%	17%	16%	10%	5%	5%	6%	9%
Germany	9%	16%	17%	6%	2%	5%	--	9%
Total	**16%**	**17%**	**22%**	**23%**	**11%**	**8%**	**5%**	**18%**

In the motorcyclist's sample, 16% of them said often, very often or always follow the vehicle in front too closely. Relatively high frequencies of this behaviour were observed in Greece (45%) and Cyprus (46%), and in general (global sample) in those younger than under 34 years old, those driving more than 5000 km per year and those owning sports motorcycles, scooters or off-road bikes. Moreover, 83% said often, very often or always give way to pedestrians at crossings. Below average scores were however observed in those who use the motorcycle less than 3 months per year, who do not fasten the helmet properly and who drive scooters. Twenty-two percent said often, very often or always drive through traffic lights on amber. Cyprus stands out with 54%. Twenty-three percent said often, very often or always overtake when they can just make it. The highest percentages were observed in Cyprus (68%), Serbia (58%) and Greece (50%). Across the entire sample, this behaviour appeared more frequent amongst motorcyclists from 25 to 34 years old. All risky behaviours taken together, the highest frequencies of risky behaviours were found in Cyprus, Greece and Serbia, whereas the lowest scores were observed in Germany, Ireland and Slovenia. Eleven percent said often, very often or always flashed lights or use the horn in anger. This behaviour is the most frequent in Cyprus, Israel and Serbia and the least in Germany, Hungary and Sweden.

Helmet telephone headsets and electronic toll systems are rarely used. Only 8% of motorcyclists use a helmet telephone headset often, very often or always and only 5% use electronic payment. The highest percentages of use were recorded in Serbia and Italy. Across the entire sample, the ITS systems were most frequently used by motorcyclists driving more than 10.000 km per year, those driving a touring or conventional street motorcycle.

In depth analyses

Mean risky behaviour scores

Based on a principal component analysis, two mean scores were calculated: one for risky behaviour (including all risky behaviours except giving way to pedestrians) and one for the use of ITS. Since the use of ITS varied little from country to country, further analyses of this factor is not included in this report. In Figure 1 the average risky behaviour score is depicted for the entire sample.

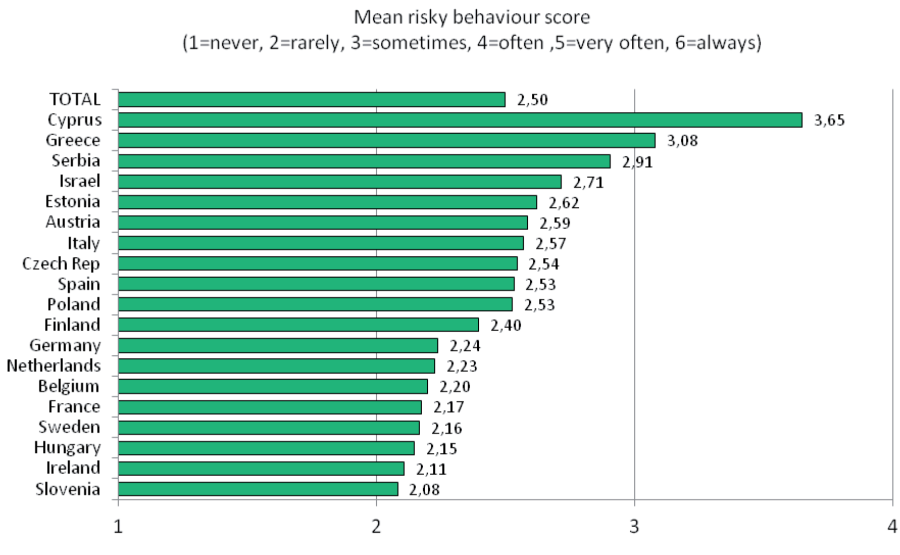

Figure 1: Mean risky behaviour scores for all countries and for the total sample.

This analysis generally confirms the ranking according to the mean percentage of frequent risky behaviour per country presented in Table 1. For the top and bottom three countries there is only one exception: according the mean risky behaviour score Germany is not in the bottom three anymore, whereas Hungary is in the third to last position in the present analysis.

An analysis of the mean risky behaviour score as a function of age showed that the effect of age was highly significant ($F(6,4451)= 6775$, $p< .0001$) with decreasing risky behaviour as a function of increasing age. All pairwise comparisons in Figure 2 apart from the internal differences between the two youngest and the two oldest age groups were significant ($p<.01$).

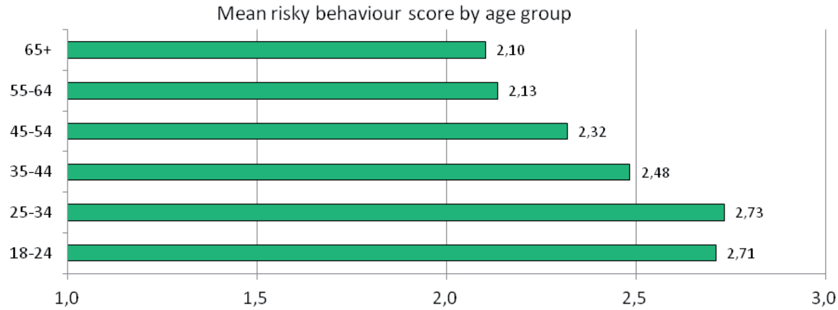

Figure 2: Mean risky behaviour score by age group.

As expected the effect of gender was also highly significant ($t(4450)= 6.1, p<.001$), with a higher mean score for males (2.53) than for females (2.3).

Effect of advanced motorcycle courses on risky behaviour

- International differences in completing advanced courses

The percentage of motorcyclists that completed advanced motorcycle courses differed greatly from one country to another. In the entire sample only a minority of 23% reported having completed such a course, but this figure ranged from only 6% in Serbia to 55% in Sweden. Figure 3 gives the results for all participating countries.

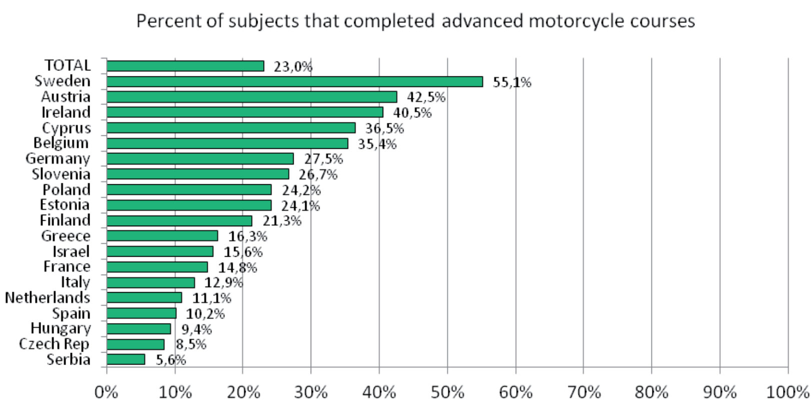

Figure 3: Percentage of motorcyclists that completed advanced motorcycle courses.

- Impact of completing advanced courses on risky behaviour

Figure 4 depicts the mean risky behaviour score as a function of completing advanced motorcycle courses (or not) for each of the countries and for the entire sample. In 8 out of the 19 countries (Austria, Cyprus, Czech Republic, Finland, France, Germany, Ireland and Sweden) motorcyclists who have taken an advanced training course show less risky behaviour. For Belgium, Hungary, Israel and Spain motorcyclists with an advanced training course display more frequent risky behaviour. A 2 x 19 ANOVA showed however, that only the main effect of country was significant ($F(18,4410)=39, p < .001$). The overall main effect of taking courses was not significant ($F<1$), nor was the interaction between country and taking courses ($F<1$). Despite of that, two countries with a more then 10 percent difference between course takers and non-course-takers stand out: Germany (where course takers behave less risky) and Hungary (where course takers behave more risky). Despite these relative large differences, however, only the effect in Germany proved significant [t(201)= -2.9, p<.01 - according to Cohen's-d (.5) this effect is of medium size], in none of all the other 18 countries the effect was significant.

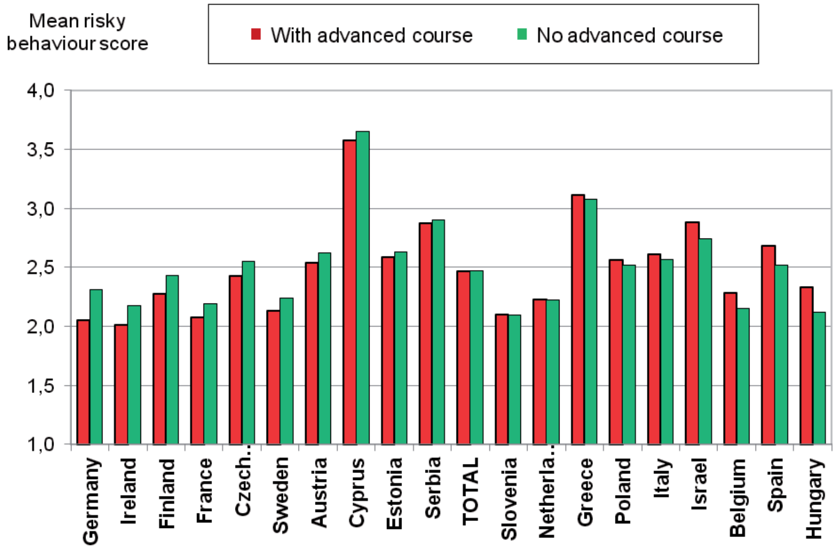

Figure 4: Mean risky behaviour score as a function of taking advanced motorcycle courses.

Altogether, this analysis revealed little impact of advanced courses on risky behaviour. The difference observed in Germany seems however promising. In order to understand this effect better, the qualitative characteristics of the courses should be considered. Since this result is obviously purely correlational, it might be worthwhile to analyse the specific characteristics of the motorcyclists that decide to take advanced courses as well.

Discussion

The results on risky behaviour revealed clear differences between countries as well as between subgroups of motorcyclists with different characteristics. Three countries stand out with a higher frequency of risky behaviour: Cyprus, Greece and Serbia. In the entire sample taken as a whole about 20% of motorcyclists admit to engage in risky behaviour, like following vehicles in front too closely or overtaking when they can just make it often or very often.

The frequency of risky behaviour appeared strongly dependent upon the age of the motorcyclists. As expected the younger age groups (<34 years old) displayed significantly more risky behaviour then the older and intermediate age groups. As expected as well, males admitted significantly more frequent risky behaviour then females. Regarding the other characteristics of motorcyclists, driving more than 5000 kilometres per year and owning sports motorcycles, scooters and off-road bikes also appeared to be risk factors.

A specific analysis of the impact of completing advanced motorcycles courses revealed no clear relationship between taking courses and the frequency of risky behaviour, with only one exception: in Germany motorcyclists that took advanced courses showed significantly less risky behaviour then those that did not complete advanced courses. Although this difference might in part be due to possibly different characteristics of people deciding to take advanced courses, the fact that the effect is clearly positive urges for a further analysis of the contents of advanced courses in Germany. Although not significant, the fact that in several countries course takers display more frequent risky behaviour then non course takers (e.g. Belgium, Spain and Hungary) also urges for a further analysis of this undesired effect.

Risk perception

Method

In order to analyze the differences in risk perception of motorcyclists across Europe, the respondents were asked to evaluate on a 4-point scale (1= very, 2= fairly, 3= not much, 4= not at all) whether they considered 4 different manoeuvres dangerous while driving a motorcycle: a) weaving in and out between cars when traffic is dense in urban areas, b) weaving in and out between cars on a highway, c) overtaking between lines on a highway/beltway and d) overtaking a vehicle on the right.

Since a principal component analysis revealed that all four questions reflect only one dimension of risk (after varimax rotation only one component had an eigenvalue > 1 and explained 67% of the variance - Cronbach's alpha was .83 - item intercorrelations varying from .49 to .67), the main analyses were performed on the average score for all four questions. Since pairwise comparisons, however, revealed that the absolute risk scores for each of the questions differed significantly from one another, the mean scores for each question are discussed first.

Results

Mean risk perception scores

- Overall mean scores

Overall the differences between the 4 items are relatively small, with averages on a 1-to-4 point scale ranging from 1.71 (for overtaking on the right) to 1.99 (for overtaking on the highway respectively). The mean perceived risk of weaving on the highway (1.78) and weaving in urban areas (1.84) lay within this small range. This means that for all four behaviours the perceived danger is somewhere between very and fairly, with very little variance. The differences between the items are however consistent, which is reflected in the fact that they are - in fact - significant. Obviously, mean scores hide the exact distributions of answers over the four possible categories. The figure below gives the exact distribution.

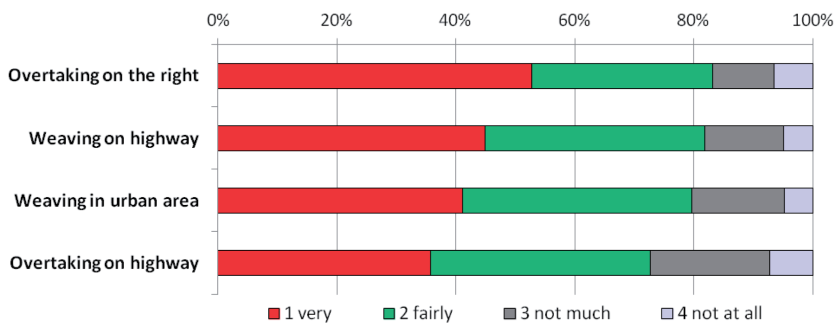

Figure 5: Perceived danger of 4 types of motorcycle behaviour.

Figure 5 clearly shows that the mean scores reflect the percentages of very and fairly responses well: 53% of the respondents considered overtaking on the right as very dangerous, whereas this was 43% for weaving on a highway, 42% for weaving in urban areas and only 35% for overtaking on the highway. The order of perceived risk for the four items according to these two categories is exactly the same as the rank order according to the mean scores. This is also the case for the sum of the two opposite ends of the spectrum. Only a separate analysis of the not at all category would lead to a different conclusion, but given the small percentages these results do not weigh much on the total results.

- Country comparisons

Since the factor-analysis revealed only one common factor for the four different questions, the differences between countries regarding risk perception were analysed on the basis of the mean score of all four questions for each participant. Despite the fact that an ANOVA showed that the main effect of country was significant (p<.001), the differences between all 19 participating countries appeared relatively small. At the extremely low risk perception end of the scale, Cyprus stands out, but post hoc comparisons showed that the difference with the next in line, Hungary, was not significant but the differences with all other countries proved significant. At the high risk perception end of the scale, France stands out, but did not even differ significantly from the sixth in line (Serbia). Detailed contextual data might give more insight into this effect.

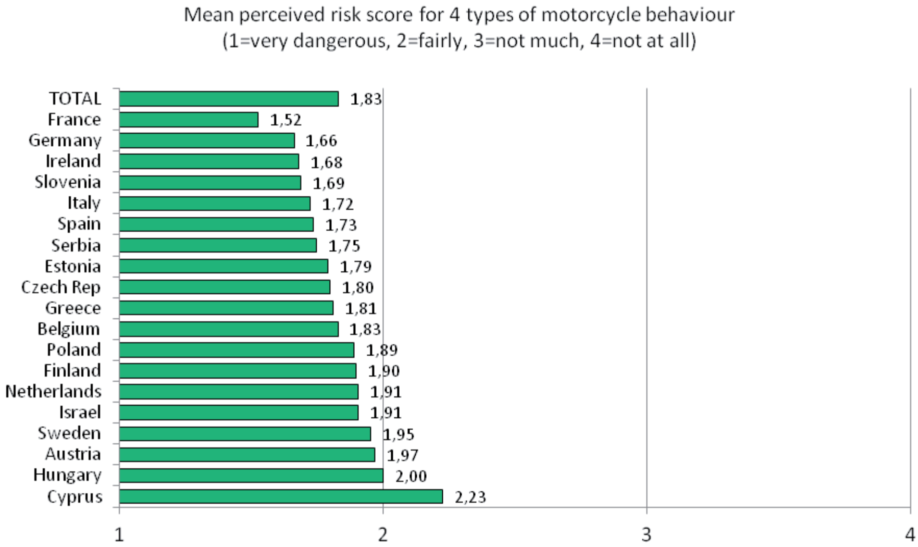

Figure 6: Average risk perception for all 19 participating countries.

- Effect of advanced motorcycle courses on risk perception

An analysis of the effect of completing advanced courses on risk perception revealed that this effect was in itself not significant (see Figure 6), but the interaction-effect of completing courses and country revealed however a marginally significant effect ($F(18,4412)= 1.54$, $p= .07$). As illustrated by the Figure 7, in some countries the motorcyclists that have completed advanced courses have a higher risk perception then those who did not, whereas in other countries the effect is just the other way around with a lower risk perception in the group that completed the advanced courses.

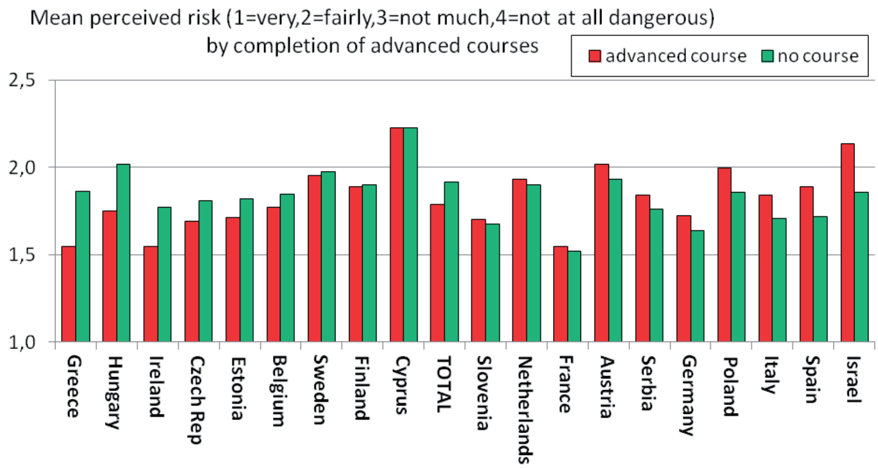

Figure 7: Mean risk perception as a function of completing advanced courses.

In three countries, following advanced courses was associated with a higher risk perception (Greece (t(200)= -2.86, p<.01), Hungary (t(201)= -1.29, p= .20) and Ireland (t(197)= -2.27, p<.05), where the value of course completers was below 80% of the value for the non-completers). In two countries (Israel (t(189)= 1.98, p<.05) and Spain (t(389)= 1.22, p= .22) the mean score of course completers was more than 110% of the mean score of non-completers, indicating a (tendency for a) lower perceived risk for course completers. Although some of the effects were not significant, the effect size of the significant effects shows that the association between risk perception and completing advanced courses is certainly important in some countries (Cohen's d was for instance .58 for Greece and .37 for Israel). But since it is beyond the scope of this project to study the contents and client characteristics of the courses and course takers in each of the country, we suggest that countries with substantial differences in risk perception between course takers and the other motorcyclists look into their courses with some more attention.

- Effects of motorcycle experience (in years) and age on risk perception

Effect of age on risk perception

Since age is a variable at interval level and the mean risk score can be considered as an interval level variable as well, the most straightforward way to test the effect of age on risk perception is to correlate the mean risk score with the age of the respondents. As expected, the correlation between age and risk was significantly negative (Pearson r= -.09, Spearman= -.11, both p < .001), indicating a higher level of risk perception with higher age. In order to get a clearer picture of this effect of age on risk perception, we analysed the mean risk score as a function of age group.

A one-way ANOVA of the effect of age-group on the mean risk score revealed that the older motorcyclists perceived the evaluated behaviours as more dangerous than the younger age groups (F(5,4452)= 7.5; p < .001). Post hoc comparisons (Tukey) showed that the two youngest groups differ from the two oldest groups (p < .05 for all pairwise comparisons), while the middle age group did only differ significantly from the 55-64 year old group (p < .05). A median split according to age (median age of motorcycling respondents being 38 years old - respondents for which no exact age was included (n=352) were excluded from the analysis) allowed to calculate Cohen's d to give an idea of the order of magnitude of the effect of age. As expected from the fact that age only accounts for 1% of the variance of the mean risk perception, the effect size appeared small (d= .14). As shown in the graph below, the relation is almost linear, apart from the youngest age group, which falls a little bit out of tone.

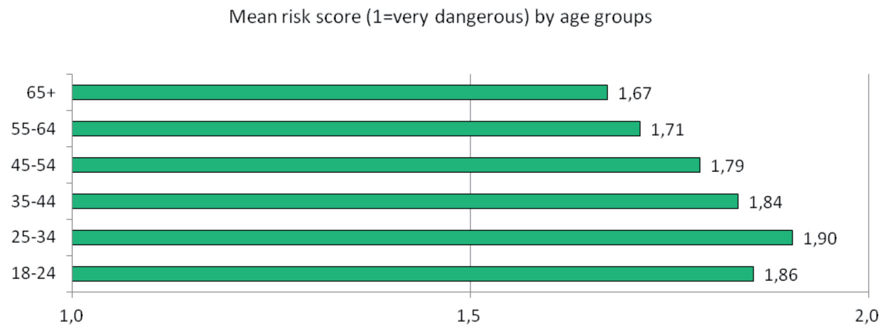

Figure 8: Mean risk score by age group.

Moreover, a further two-way ANOVA revealed that the significant interaction between age group and country on risk perception ($F(89,4452)= 1.51$; $p < .01$) was entirely due to a deviant group of n= 765+ motorcyclists in the Belgian sample (with a mean score of 3.14). Excluding these cases from the analysis turned the interaction into insignificance ($F(88,445)= 1.17$; $p= .135$), while the main effect of age group remained significant ($F(5,4445)= 8.2$; $p < .001$).

The effect of age was expected since attitudes towards road safety generally correlate with age - with the elder age groups having a more positive attitude towards safety than the younger age groups (e.g. Sanchez Martin & Lorga, 2004). This effect was already confirmed for risky behaviour in the previous chapter (cf. Figure 2) and is clearly confirmed for risk perception in the present analysis.

Effect of motorcycle experience in years on risk perception

Since the correlation between age and motorcycle experience was very large (.77 , $p<.001$), experience with driving a motorcycle was also a plausible mediating factor regarding risk perception. Further analyses, however, revealed that the relationship between experience and perceived risk was less straightforward than with age.

As with age, a simple regression analysis showed that the correlation between the perceived risk and the number of years of motorcycle experience was only slightly lower than with age (both Pearson and Spearman $r= -.06$, both $p < .001$). In order to examine this effect a bit further, we analysed the effect of experience for 4 levels according to quartiles for experience in the entire sample (>4, 4-10, 10-20 or 20+ years of experience).

Just like with age, a simple one way ANOVA revealed a significant relation between experience and perceived risk ($F(3,4418)= 3.2$, $p < .05$). A closer examination of the means, however, revealed that the differences were very small. Moreover, post hoc comparisons showed that this effect was entirely due to a higher risk perception in the 20+ group (reflected in a low mean score of 1.77) compared to all other groups, who did not differ significantly from one another (resp. means 1.86, 1.85 and 1.82 in increasing order of experience).

Contrary to the effect of age, the effect of experience disappeared when the interaction with country was included in the model. A two-way ANOVA with country and experience level as between-subjects factors revealed that only the effect of country remained significant ($F(18,4418)= 4.5$, $p < .001$), whereas both the effect of experience level ($F(3,4418)= 1.4$; $p= .24$) and the interaction effect ($F(54,4418)= 1.03$; $p= .41$) were not significant. Due to this, the abovementioned small effect of experience has to be interpreted with caution. The latter analysis indicates that this may in part be an artefact of the relation between country and level of experience.

Discussion

An analysis of the risk perception regarding two types of overtaking behaviour and of two types of weaving revealed very little differences in risk perception regarding the four types of evaluated behaviour. Overall, motorcyclists seem to perceive these manoeuvres as very to fairly dangerous. An analysis of the effect of country on the mean risk perception, however, revealed larger differences. The perceived risk appeared the highest in France, Germany and Ireland and the lowest in Cyprus and Hungary, but only for the case of Cyprus this effect was statistically significant.

An exploration of possible determinants of risk perception revealed that, as expected, risk perception tends to be higher with age. An exploration of the effect of experience as a motorcycle driver revealed that, despite the high correlation between age and experience in the entire sample, the effect of motorcycle experience on risk perception was less straightforward.

Motorcyclists' motives for driving a motorbike

Method

The importance of different motives for driving a motorbike (like for instance the pleasure of driving, saving time, etc.) were assessed with 11 items of question MC24. These questions were answered on 4-level scales (1= very, 2= fairly, 3= not much, 4= not at all).

The first section gives an overview of European motorcyclists' motives for using a motorbike based on an analysis of the results of the entire sample of motorcyclists. First, a principal component analysis was performed to identify factors representing groups of motives. In parallel, the overall importance of the different types of motives was evaluated on the basis of the global mean values.

In a second section, we investigated to which degree the motives for using a motorbike are country-dependant and which motives are important in which countries.

Results

European motorcyclists' motives for motorcycling

A principal component analysis with Varimax rotation showed that the 11 items can be aggregated in 3 different components (the 3 factors accounted for 63% of the total variance, and the Cronbach's Alpha of each component group confirmed the reliability of this solution). The results of this analysis are presented in Table 2.

Table 2: Principal component analysis of motives for driving a motorcycle.

Cronbach's Alpha	Variables (item n°)	Components		
		1	2	3
.832	Parking (MC24c)	0.815	0.063	0.006
	Cheaper (MC24d)	0.804	-0.068	0.111
	Saving time (MC24a)	0.773	-0.076	0.179
	Pollution reduction (MC24e)	0.719	0.032	0.052
	Avoid traffic jam (MC24j)	0.717	0.087	0.238
.722	Biker spirit (MC24f)	0.065	0.765	-0.028
	Freedom (MC24k)	0.024	0.763	-0.018
	Pleasure (MC24b)	-0.062	0.723	-0.184
	Acceleration (MC24g)	0.000	0.723	0.109
.754	No car (MC24h)	0.115	-0.027	0.882
	No choice (MC24i)	0.249	-0.060	0.851

The first component deals with motorcycling advantages for mobility (compared with a car) and accounted for 31% of the variance. Five items had a high factor loading on this component: avoiding traffic jam, saving time, easiness for parking, cheaper mean of transport and lastly, reduce CO2 pollution. The second component, accounting for 21% of the variance, contains the items related to biking feeling and spirit: riding pleasure, acceleration biker spirit, and freedom feeling. The third subset of motives, accounting for 12% of the variance, contained the items having no car and not having any other choice for mobility.

Motives hierarchy

The overall mean percentage of very and fairly answers depicted in Table 3 revealed three main motives shared by more than 80% of the riders: the pleasure of motorcycling (92%), freedom feeling (87%) and easiness to find parking (82%).

Table 3: Hierarchy of European motorcyclists' motives for using a motorbike.

Motives for Driving a Motorbike		Percentage of very and fairly answers
Level of importance	Type of Motive (item number)	
Highest	Pleasure (24b)	92 %
Highest	Freedom (24k)	87 %
Highest	Parking (24c)	82 %
Medium	Biker Spirit (24f)	69 %
Medium	Cheaper (24d)	66 %
Medium	Saving time (24a)	63 %
Medium	Avoid Traffic Jam (24j)	63 %
Medium	Acceleration and Speed (24g)	62 %
Medium	CO2 Pollution Reduction (24e)	48 %
Lowest	No Car (24h)	32 %
Lowest	No Choice (24i)	22 %

Constraints like having no other means of transport or no car only concern a limited number of motorcyclists (respectively 22% and 32%). The remaining items are important for about 60% of the motorcyclists (from 48% to 69%). These concern motorcycling advantages for mobility (saving time, avoid traffic jam, limit CO2 emission and saving money) and biking feeling and spirit (acceleration and speed and biker spirit).

Inter-country comparisons

Table 4 summarizes the inter-country differences regarding motives for using a motorbike. For each motive, the countries with the lowest percentage of very and fairly answers are presented in the left column, countries with the highest percentages on the right. The selection of low and high scoring countries was based on a ranking of countries according to the percentage of very and fairly answers and on post hoc Tukey tests for homogeneous groups in a one-way ANOVA of the scores for each motive. Detailed results of these analyses can be downloaded from the SARTRE 4 website (www.attitudes-roadsafety.eu). The motives are grouped according to the factors revealed by the principle component analysis presented in Table 2.

Table 4: Inter-Countries comparison concerning motives for using a motorbike (percentage of very and fairly answers).

Item (mean value)	Countries with lowest percentages	Countries with highest percentages
Saving Time (64%)	Finland (16%), Slovenia (18%), Germany (23%), Sweden (27%)	Greece (96%), Israel (94%), Spain (91%), Cyprus (86%), Italy (74%)
Easiness to park (81%)	Germany (44%), Finland (47%), Sweden (56%), Slovenia (69%)	Greece (99%), Israel (97%), Spain (96%), France (91%), Italy (89%),Belgium (89%), Eston. (89%)
Avoid Traffic Jam (64%)	Germany (20%), Finland (24%), Sweden (27%), Czech (33%), Slovenia (55%)	Greece (99%), Israel (96%), Cyprus (83%), Spain (81%), Italy (79%)
Cheaper transport (66%)	Finland (24%), Germany (34%), Slovenia (41%), Sweden (44%),	Greece (93%), Israel (82%), Spain (82%), Cyprus (74%), Ireland (89%)
CO2 pollution reduct. (47%)	Germany (11%), Finland (12%), Sweden (23%), Austria (26%), Slovenia (31%)	Spain (72%), Israel (70%), Italy (52%), Ireland (53%), Poland (66%), Hungary (54%)
Pleasure (94%)	Italy (80%), Greece (84%), Cyprus (85%), Spain (90%), Israel (91%)	Estonia (99%), Finland (98%), Belgium (98%), Sweden (97%), Poland (97%), Slovenia (96%), Netherlands (96%), France (96%), Ger. (95%)
Biker Spirit (70%)	Germany (41%), Greece (42%), Austria (49%), Italy (53%), Cyprus (55%), Hungary (57%), Israel (61%), Sweden (68%)	Estonia. (88%), Slovenia (87%), Czech (83%), Poland (82%), Ireland (79%)
Freedom (87%)	Serbia (69%), Israel (76%), Cyprus (78%), Spain (83%), Italy (83%), Greece (85%)	Netherlands (94%), Slovenia (94%), Sweden (93%), Ireland (91%), Czech (91%), Belgium (91%), Finland (91%)
Enjoy speed (62%)	Greece (50%), Italy (50%), Spain (52%),, Netherlands (55%), Poland (56%), Sweden (58%), Germany (58%)	Finland (77%), Slovenia (75%), Estonia (74%),, Hungary (74%), Austria (69%), Israel (68%),, Serbia (66%)
No Car (20%)	Slovenia (4%), Sweden (7%), Belgium (9%), Germany (9%), Estonia (11%), Finland (11%)	Israel (50%), Ireland (40%), Serbia (38%), Greece (31%)
No Choice (22%)	Slovenia (3%), Sweden (4%), Germany (5%), Finland (6%), Estonia (7%)	Greece (61%), Israel (52%), Ireland (44%), Cyprus (38%), Serbia (38%), Spain (23%)

All together the results in Table 4 allow to distinguish two opposite groups of countries, generally having opposite motives. The first group includes 5 Mediterranean countries (Greece, Israel, Cyprus, Spain and Italy), but also includes Ireland and Serbia for respectively 4 and 3 items. The second group includes 4 North and Central European countries (Finland, Sweden, Germany and Slovenia), but also includes Estonia for 3 items. The remaining countries (Hungary, Belgium, Austria, the Netherlands, the Czech Republic, Poland and France), are characterised by intermediate values for most of the motives. In the Mediterranean group motorcycle advantages for mobility are crucial motives, whereas these motives are less important for the North and Central European group. The opposite trend is observed for the importance of constraints, which are a relatively more important motive in the Mediterranean group then in the Northern European group. The opposition between both groups appeared less pronounced for motives regarding biking spirit.

On average, motorcycling advantages for mobility are important for about 85% of the Meditaranean group, but only for generally less than 50% of the Northern European group. This is very well illustrated by the importance of saving time, which is a key-motivation for more than 90% of Greek, Israeli, Spanish and Cypriot motorcyclists (and for 74% of Italians), but only concerns less than 25%

of Finnish, Swedish, German and Slovenian riders. Figure 9 below gives the exact distribution of this motive for all countries.

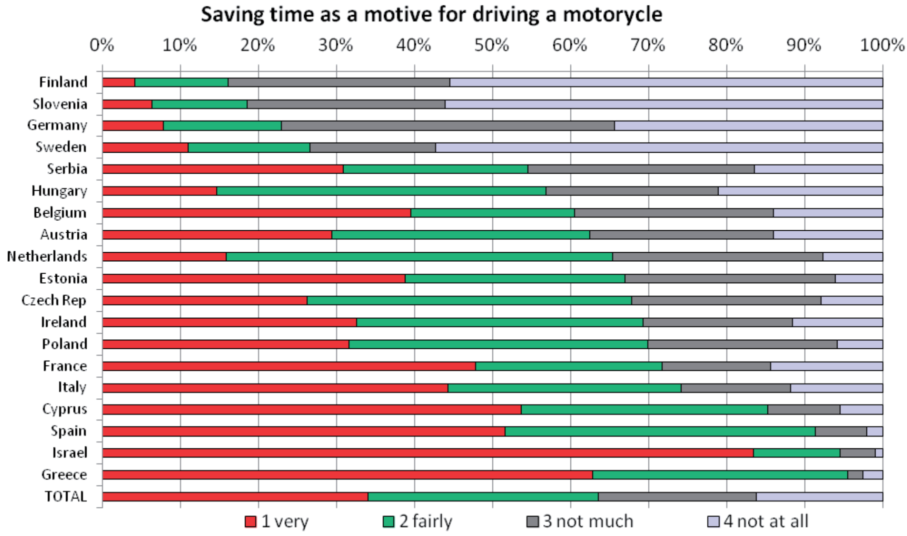

Figure 9: Inter country differences for saving time motive.

Similar results are obtained for easiness to park (more than 95% for Spain, Israel and Greece versus less than 60% for Germany, Sweden and Finland) and for avoiding traffic jams (percentages above or around 90% for Greece, Israel, Cyprus, Spain and Italy, but below 35% in Germany, Finland and Sweden - on this motive Slovenia tends to an intermediate position with 55%). Similar results were observed regarding travelling cost and CO2 reduction (cf. Table 4).

The same grouping of countries is observed regarding the constraint items, but for this factor Estonia belongs to the Northern European group, whereas Irish and Serbian motorcyclists (and in this case not Italy) belong to the Mediterranean group. Indeed, lack of car is a motive for more than 30% of the Israeli, Greek, Irish and Serbian riders, but only concerns less than 12% of motorcyclists in Finland, Germany, Slovenia, Sweden, Belgium and Estonia. Similarly, motorcycling is assessed as the only possible means of travel by more than 35% of Greek, Israeli, Cypriot, Spanish, Irish and Serbian riders, but concerns less than 6% of motorcyclists from Slovenia, Sweden, Germany and Finland.

The opposition between Mediterranean and Northern European countries is less contrasted with regard to biking spirit. The dichotomy is still globally valid for pleasure and freedom, even if these two motives are important for more than 75% of all European riders, except for Serbia (69%). Regarding biking spirit and enjoyment of speed, both groups are partially mixed.

Discussion

The present analysis shows clear differences between (groups of) countries regarding (groups of) motives to drive a motorcycle. These differences are however liable to be correlate with other parameters, such as the type of motorbike (MC28) and the modality of use (MC25a to MC25f). These parameters are discussed in detail in chapter 7, dedicated to motorcyclists' profiles.

Conclusion

The analysis of self-reported risky driving behaviour, such as for instance following the vehicle in front too closely or overtake when you can just make it, revealed that on average one of five motorcyclists admitted to engage in these behaviours often, very often or always. A comparison of the mean score for four types of risky behaviours revealed that the Southern European motorcyclists (Greece, Cyprus, Israel, Serbia) behave more risky than average and that the Western European countries (Germany, Ireland, France, Sweden, The Netherlands and Belgium) tend to drive less risky than average. On an individual level, male motorcyclists under the age of 34 and motorcyclists whose annual use of the motorcycle is high tend to be more risky.

The analysis of the international differences in the risk perception for four types of behaviour (regarding overtaking and weaving) revealed that overtaking on the highway was perceived as dangerous by about 70% of the motorcyclists, whereas all other the behaviours were perceived as dangerous by about 80%. An international comparison of the mean risk score revealed that the perceived risk is the highest in France, Germany and Ireland and the lowest in Cyprus and Hungary. On an individual level, risk perception increases with age.

In the first chapters a similar analysis was made of the impact of following advance motorcycle courses on risky behaviour and risk perception. The results of both analyses proved similar and revealed that - although the effects were small - in some countries these courses increase risk whereas in other countries the opposite effect was found. Moreover, the effect on risky driving proved sometimes the adverse of the effect on risk perception. Obviously, this effect might be the consequence of the characteristics of the types of motorcyclists that decide to take courses in any particular country. Nevertheless, this result urges for a thorough analysis of the content of certain advanced courses, especially for those countries in which the advanced courses seem to promote risky behaviour (Germany) or to decrease risk perception (Israel).

A detailed analysis of the motives for driving a motorcycle showed that overall, the pleasure of motorcycling, the feeling of freedom and the easiness to find parking are the most important motives. Motives regarding motorcycling advantages for mobility and biking spirit revealed to be important secondary motives. On the basis of an international comparison of high and low national scores on the different motives, two opposite groups of countries, generally having opposite motives, were identified: a group of five Mediterranean countries (Greece, Israel, Cyprus, Spain and Italy) and a group of four North and Central European countries (Finland, Sweden, Germany and Slovenia). Motorcycling advantages for mobility appeared to be crucial reasons for using a motorbike in the Mediterranean group, but less important for the Northern group. Similarly, imposed constraints like not having a car or having no choice revealed more crucial for the Mediterranean group then for the others. Northern and Southern countries proved partially mixed concerning biking spirit and speed enjoyment.

Chapter 2.5

Use of safety equipment

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Introduction

The safety of motorcyclists in Europe is an issue of great importance, particularly so in recent years. The increase in traffic congestion in specific European areas, mainly in the Southern parts, has led an increasing number of commuters to opt for powered two-wheel vehicles for their daily trip to and from work, as an alternative to other means of transport. The increased number of motorcyclists, mainly riders of scooters and predominantly in urban areas, has contributed to increased concerns for the safety of this vulnerable category of road user [2].

Technological development in the automotive field has reached such heights in recent years enabling extraordinary levels of both active and passive safety, contributing to helping drivers avoid road accidents (active safety) and to reducing the severity of consequences for car occupants in case of accidents (passive safety). Even though many improvements have also been made in the motorcycling sector concerning active and passive safety, the gap with the automotive sector is intrinsically wide; what is possible for the safety of a vehicle can be far from easy to apply for a powered two wheeler. Given these premises, in order to enhance the safety of motorcyclists it is of crucial importance to focus both on the safety of the transport infrastructure and on the use of safety equipment by the motorcycle riders.

The positive impact of using appropriate helmets and other safety equipment on achieving a reduction in the number and seriousness of injuries for the motorcyclist has already been demonstrated in many studies. All studies agree on the protective effectiveness of helmets, and there is no evidence of negative effects due to the use of such devices [8].

Although the helmet-wearing rates are increasing and some estimates of helmet wearing are over 90% [8], the situation is not consistent across all countries and in all groups of users. General safety awareness in various countries is of course one of the most important issues, as well as the level of enforcement, but also social and demographic characteristics of the user, and the purpose of riding the motorcycle, all affect the attitudes and actual behaviour of the motorcyclist.

In the current chapter the declared use of safety equipment by different motorcycle users will be presented, ranging from popularity of wearing safety equipment to opinions and attitudes towards/against their use, and associations between these inputs are described and explained.

Method

The key questions selected for further analysis in this chapter related to:

- Use of a safety helmet for different types of roads (MC06a-d);
- Use of other safety equipment (e.g. motorcycle jacket, boots) (MC07a-f;MC21f)
- Safety-related behaviour (e.g. carrying a passenger without a helmet) (MC07g-h);
- Opinions about the need and use of safety equipment)MC08a-e;
- Punishment for not wearing a helmet (MC09).

Descriptive statistics are presented first and then significance tests that were used to test for differences between groups:

- Chi-square test for differences in contingency tables
- ANOVA for differences in means between groups

Adjusted standardised residuals analysis giving the difference between the observed and expected values is reported, so any value with magnitude greater than 1.96 is statistically significant.

Finally, a cluster analysis on questions concerning attitudes on helmets' wearing is presented.

Results

Helmet wearing by motorcyclists

According to our respondents, their safety helmet wearing rate is high with less than 2% reporting that they "never" or "rarely" wear a helmet. The type of road that the motorcyclist uses is one factor affecting helmet use with the highest rate on motorways ("always" wear a helmet 91,4%) while it is the lowest in built-up areas ("always" wear a helmet 84,6%). However, the proportion of the riders always wearing a helmet is not satisfactory.

Age

The lowest rate for those "always" wearing a helmet is, unsurprisingly, found in the youngest age-group - 18-24 years old – with a rate of 88% on motorways, but only 77% in built-up areas. In contrast, the highest rate (95,2%) for those "always" wearing a helmet is found in the oldest age-group (65+) for motorways, but for the 45-54 age-group for built-up areas (89,1%) (Figure 1).These age-groups are significantly different from the mean values of answers *(on motorways: adjusted residuals of the age-group 18-24 is: -3,2; in built-up areas: adj.res. of age-group 18-24 is: -5,3, age-group 45-54 is: 4,1; the* χ^2 *tests are significant).*

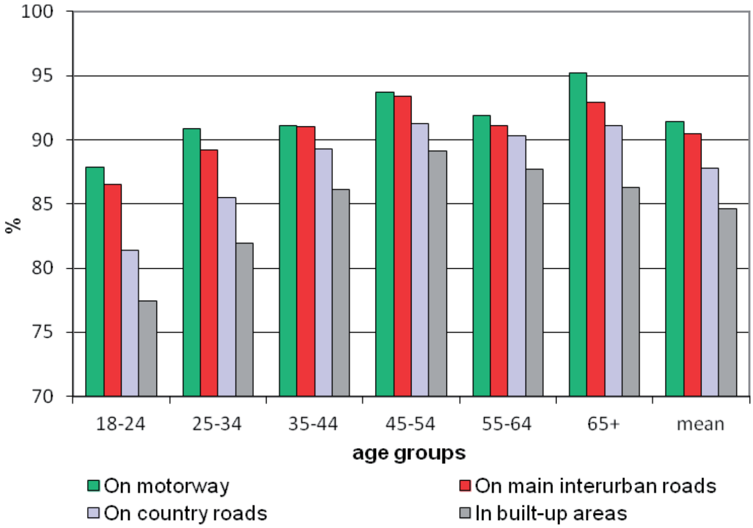

Figure 1: Percentage of respondents who "always" wear a helmet for different road types by age-groups.

In general, there is a steady increase in compliance for all road types through the 45-54 age-group. Then, there is a slight decline for all roads for the 55-64 age-group with a general rise except for urban areas for those aged 65+.

Gender

The percentage of females "always" wearing a helmet is somewhat higher (consistently greater than 2% higher) than that of males for each of the four road categories. The difference on motorways is not significant, but on all other road categories the proportion of female motorcyclists always wearing a helmet is significantly higher than the means *(main roads: χ^2= 6,044; df= 1; p= 0,014; adj.res. of females is: 2,5; country roads: χ^2= 5,505; df= 1; p= 0,019; adj.res. of females is: 2,3; built-up areas: χ^2= 5,202; df= 1; p= 0,023; adj.res. of females is: 2,3).*

Annual mileage

The percentage "always" wearing a helmet is somewhat lower among those who drive more than 5000 kilometres a year on a motorcycle compared to those who drive less than 5000 kilometres a year. However the helmet wearing rate is significantly lower if the motorcycle vehicle-kilometres are over 10 000 km/year (Figure 2) (adjusted residuals of 10000 km+: respectively from -2,0 to -3,8).The helmet wearing rate for motorcyclists with 1 000 – 5 000 km annual mileage is significantly higher on all road categories *(adj.res. of 1000-5000 km: built-up areas: 2,6, motorways and country roads: 2,7, main roads: 4,0).*

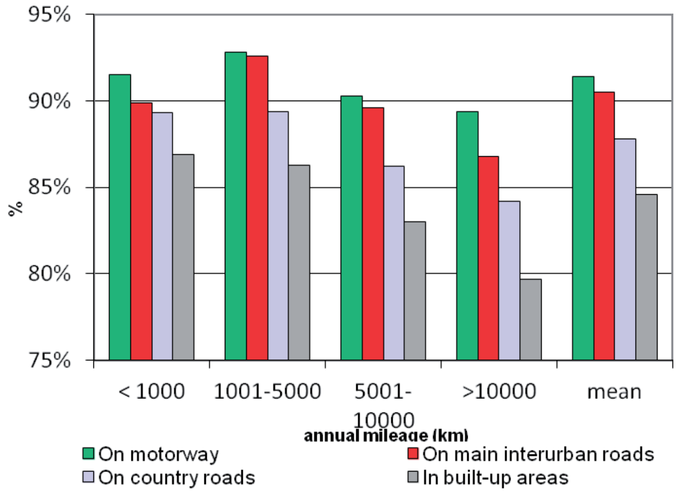

Figure 2: Helmet wearing rates of motorcyclists on different road types by annual mileage (percentage "always" wearing a helmet).

Engine size

The helmet-wearing rate is higher among drivers riding motorcycles with an engine size greater than 250 cc, consequently with higher performance and faster (Figure 3). Over 600 cc engine size, the helmet wearing rate is significantly higher on all road types *(adj. resid. of engine size 600-1000 cc on motorways is: 4,9; main roads: 4,8, country roads: 5,0; built-up areas: 5,5)*. The 0-125 cc category consists mostly of scooters. In this motorcycle category the helmet wearing rate is significantly lower than the mean values *(adj. resid. motorways: -4,3; main roads: -2,9, country roads: -3,0; built-up areas: -4,5)*. In case of motorcycles with 126-250 cc engine size the helmet wearing rate is the lowest in all other categories *(adj.resid. motorways: -5,9; main roads: -6,6, country roads: -8,9; built-up areas: -7,3)*.

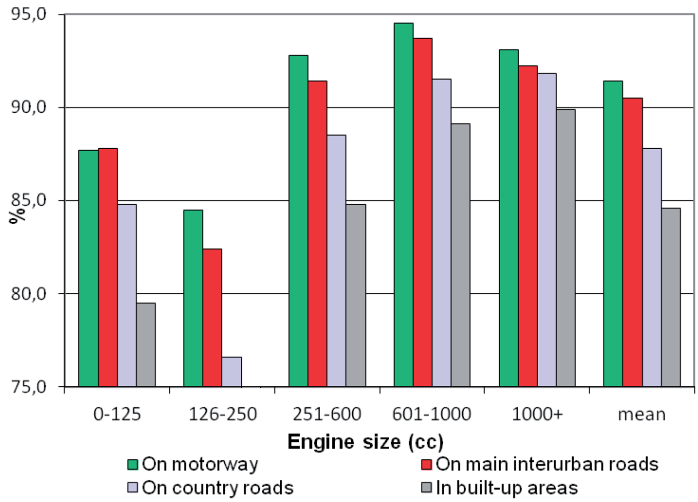

Figure 3: Percentage of motorcyclists who "always" wear a helmet by engine size.

Inter-country differences

The distribution of those "always" wearing a helmet for the countries for the four road types can be seen in Figure 4.

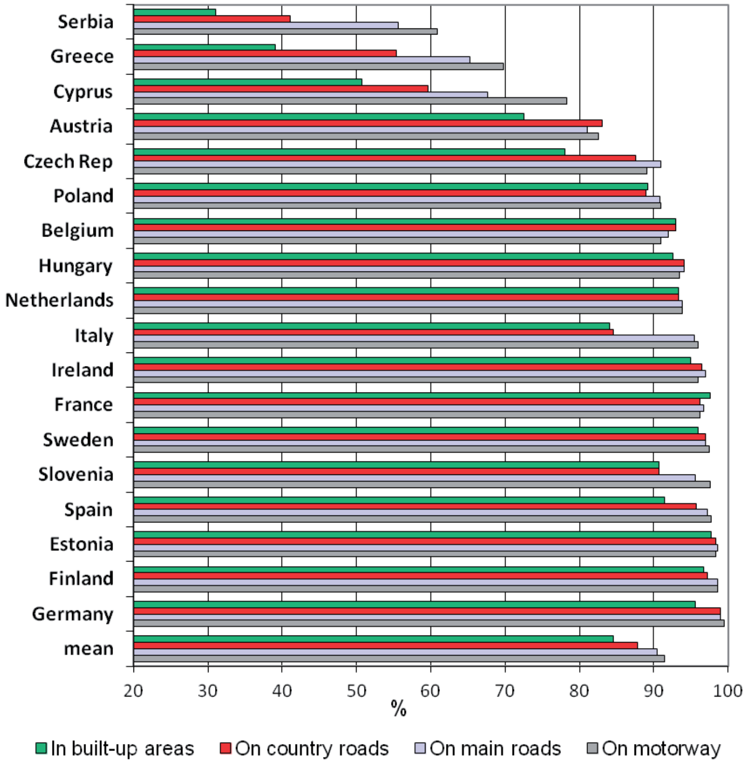

Figure 4: Percentage of motorcyclists "always" wearing a helmet in the different countries by different road types.

A significant relationship between the countries and helmet wearing has been found for all road categories (motorways: χ^2= 473,692, p= 0,001, df= 17, main roads: χ^2= 631,221, p= 0,000, df= 17, country roads: χ^2= 826,125, p= 0,000, df= 17, built-up areas: χ^2= 1071,922, p= 0,000, df= 17).

The rate of riders "always" wearing safety helmets is the highest in Germany (adj.res. from 4,2 to 5,0), Finland (adj.res. from 3,8 to 5,0) and Estonia (adj.res. from 4,8 to 7,0). For the Mediterranean countries included in the survey, the proportion of those "always" wearing a helmet is the highest in Spain followed by Italy. In Italy, on motorways and on main roads outside built-up areas, the proportion of those "always" wearing their safety helmets is high, but it is relatively low on other roads outside built-up areas and in built-up areas.

The helmet-wearing rate is the lowest in Serbia (adj.res. from -13,6 to -18,5), Greece (adj.res. from -11,2 to -18,3) and Cyprus (adj.res. from -6,8 to -13,7). It is surprising that the proportion of riders who always wear a helmet is also relatively low in Austria, where rather strong safety compliance was expected; this might be explained by the relatively high proportion of "sport riders" in the population of Austrian riders (see more in Chapter 7). Austrian statistics from 2007 suggest a figure of 95% of helmet wearing [Global Status Report on Road Safety (WHO, 2009)]; this discrepancy suggests a problem with the SARTRE sample or the methodology in Austria.

Helmet wearing of motorcyclists' passengers

Passengers' helmet-wearing rate is somewhat poorer than that of the drivers with 78,5% of the motorcycle drivers "never" carrying a passenger without a helmet. 16,9% of the responding motorcyclists "never" carried passengers, 27,0% rarely, 34,7% sometimes, 18,7% often+very often and 2,6% "always" did.

Table 1: Percentage of motorcyclists by annual mileages that "never" and "sometimes" carry a passenger.

%	Number of kilometres driven in the last 12 months				Mean
	0-1000	1001-5000	5001-10000	10000+	
Never carry a passenger	24	18,7	12,7	11	16,9
Sometimes carry a passenger	30	33,7	36,7	39,7	34,8

The frequency "sometimes" is shown in Table 1 because the highest proportion of responses belongs to this category. The less a motorcyclist drives, the more likely it is that they never carry a passenger. The most frequent category (sometimes) that relates to the carriage of passengers supports this correlation, i.e. the frequency of passenger transport increases with the increase of the annual vehicle-kilometres driven.

The proportion of motorcycle riders who report "never" carrying passengers without a helmet is the lowest for the youngest age-group (18-24 years of age); as age rises the proportion of those not carrying passengers without helmet increases. The age-groups 18-24 and 45-54 show a significant variance from the average *(adj.res. of age-group 18-24 is -4,8, and age-group 45-54 is +2,4, where the χ^2 test is significant, with value of 58,563, p= 0,000, df= 25)*.

Table 2: Percentage of passenger-carrying motorcyclists by age-groups that "never" carry a passenger without a helmet.

	Age-groups						Total
	18-24	25-34	35-44	45-54	55-64	65+	
Never carry a passenger without helmet (%)	70,9	77,3	80,3	81,8	81,3	82,9	78,5

Among female motorcyclists the proportion of those "never" carrying passengers without a helmet is a little higher (female 79,4%; male 78.4%), but this difference is not significant.

Table 3: Percentage of passenger carry motorcyclists by annual mileages that "never" carry a passenger without a helmet.

%	Number of kilometres driven in the last 12 months				Mean
	0-1000	1001-5000	5001-10000	10000+	
Never carry a passenger without helmet	77,2	80,2	79,1	74,8	78,5

Among motorcyclists who drive 1001-5000 kilometres per year and especially over 10000 kilometres, the proportion of those who "never" carry a passenger without a helmet significantly differs. The former is higher *(adj.resid. is 2,1 from the crosstabs)*, the latter is lower *(adj.resid.: -2,5)*, than the average (Table 3).

Drivers of motorcycles with less than 250 cc cylinder capacity are more permissive with regard to passengers' helmet-wearing than those of motorcycles with a higher engine performance (Table 4). Motorcyclists with 250-600 cc cylinder capacity carry passengers without a safety helmet at an average rate; the responses of the motorcyclists belonging to all other categories vary significantly from that (*adj. resid. of 0-125 cc is -4,6; 126-250 cc: -5,2; 601-1000 cc: +4,2; 1000+ cc: 3,9)*.

Table 4: Percentage of motorcyclists by engine sizes that never carry a passenger without a helmet.

%	Engine size (cc)					Mean
	0-125	126-250	251-600	601-1000	1000+	
Never carry a passenger without helmet	72,2	69,1	79,0	82,7	84,6	78,5

Helmet types

Two helmet types are considered: the full face helmet and the jet helmet. A full face helmet covers the entire face of the motorcyclist whereas the jet helmet covers half the face but leaves the chin uncovered.

Table 5: Percentage use of helmets' types by motorcyclists.

%	Never	Rarely	Sometimes	Often	Very often	Always
Wear a full face helmet	12,6	3,5	4,6	4,9	7,8	66,6
Wear a 'jet' helmet	52,9	10,6	9,7	5,6	4,8	16,4

Table 6: Percentage use of jet helmets by full face helmet among all motorcyclists.

%	jet helmet wearing			
full face helmet wearing	Never	rarely to very often	Always	Total
Never	1,7	1,6	9,5	12,8
rarely to very often	2,3	16,1	2,5	20,9
Always	49,0	13,0	4,2	66,3
Total	53,0	30,8	16,2	100,0

The most important results to be noted from Table 6 are: 1,7% of the interviewed motorcyclists never wear the safety helmet, 49% use the full face helmet and 9,5% always wear the jet type helmet. All the other motorcyclists (approximately 40%) occasionally use both helmet types.

From the responses given to the usage of the two helmet types a combined variable has been formed including always the responses of either the full face helmet or the jet helmet wearers only, and mixed, i.e. responses of those never wearing a helmet. The wearing practices of the different helmet types were examined using this variable according to the motorcyclists' gender, age, their distance driven and the cylinder capacity as well as the type of the motorcycle.

For the age-group 18-34, as the age increases, the rate of the wearers of the full face helmet decreases *(those responding "always" answers' adj.resid. of age-group 45-54: -2,7; age-group 55-64: -2,3; and age-group 65+ -4,3)* and that of the jet helmet wearers increases *(adj.resid.: 4,9; 2,9; and 4,7)*. With regard to gender, the number of jet helmet wearers is significantly higher among women *("always" adj. resid.: +2,7)*, while the mixed usage of the two helmet types is more characteristic for men.

Taking into consideration cylinder capacity one can see that the jet type safety helmet is mostly used on motorcycles of lower capacity *(<250 cc, "always" adj.resid. of 0-125 cc is 4,9; 126-250 cc: 4,0)*, while the full face one is worn on motorcycles of medium performance (250-1000 cc). For those driving less than 5 000 km per year, the jet helmet is significantly more popular *(e.g. 0-1000 km adj. resid.: 3,6)*. Over 10 000 km the rate of a mixed helmet use is higher.

If helmet wearing is examined according to the type of the motorcycle, it may be ascertained that the jet type helmet is used by scooter- and chopper-riders, while its usage rate is significantly lower on sports, touring and enduro types. The full face helmet is significantly more frequently worn on sports motorcycles in comparison with the other types; its use on the chopper is below the average.

In international comparison one may conclude that the percentage of wearers of the full-face helmet is highest in Slovenia, Germany, Sweden and Estonia. In contrast, jet helmets are mostly used in Italy, Poland, Belgium and France. In case of a mixed use one can say that the wearing rate is the highest in Serbia, the Czech Republic, Austria and Greece (eta= 0,285).

Attitudes affecting helmet wearing

In the compilation of the questionnaire it was important not only to ask the interviewed motorcyclists about their habits and their experience of police enforcement measures, but also to determine their helmet wearing attitudes. Our respondents were asked to express their attitude to several statements concerning helmet wearing. In the tables the significantly different values are highlighted.

Table 7: Percentage agreement with statements about helmet wearing.

%	Very or fairly	Not much, not at all
In most accidents helmets reduce the risk of serious injury for drivers and passengers	96,1	3,9
If you drive carefully it is not really necessary to fasten helmet	10,7	89,3
I enjoy driving without wearing a helmet	16,3	83,6
Most of my friends use a helmet when driving a motorcycle	90,3	9,7
I only wear a helmet because it is the law	19,9	80,1

In the questions above, there were two, to which – due to wording – most respondents gave the answer "very or fairly", while in the case of the other three "not much, not at all" was the most frequent answer.

Table 8: Mean of the motorcyclists' agreement rate with the statements about helmet wearing.

	mean
In most accidents helmets reduce the risk of serious injury for drivers and passengers	1,27
If you drive carefully it is not really necessary to fasten helmet	3,59
I enjoy driving without wearing a helmet	3,44
Most of my friends use a helmet when driving a motorcycle	1,44
I only wear a helmet because it is the law	3,31

Table 9: Mean of the motorcyclists' agreement rate by age-groups with the statements about helmet wearing.

	Age category						Mean of means
	18-24	25-34	35-44	45-54	55-64	65+	
In most accidents helmets reduce the risk of serious injury for drivers and passengers	1,30	1,28	1,27	1,24	1,29	1,25	1,27
If you drive carefully it is not really necessary to fasten helmet	3,49	3,60	3,64	3,62	3,56	3,54	3,59
I enjoy driving without wearing a helmet	3,27	3,35	3,49	3,51	3,57	3,59	3,44
Most of my friends use a helmet when driving a motorcycle	1,53	1,43	1,40	1,41	1,44	1,46	1,44
I only wear a helmet because it is the law	3,20	3,28	3,32	3,34	3,40	3,35	3,31

Responses were transformed into mean values (Table 9) to enable effective comparison. For the two questions ('If you drive carefully it is not really necessary to fasten helmet' and 'I enjoy driving without wearing a helmet') there is a significant difference by the age-group averages (F= 3,177; p= 0,007; eta^2= 0,004; F= 11,546 p= 0,000; eta^2= 0,013). In the event of an accident, 96.1 % of motor riders agree that helmet wearing decreases the risk of serious injury, i.e. there are many who on a cognitive level admit the benefit of helmet-wearing, while there are also relatively many who are on the opinion – especially young people under 35 (mean: from 3,27 to 3,35 below the overall mean 3,44) – that it is enjoyable to ride without a helmet (Tables 7, 8 and 9). For many motorcyclists, reason and feeling are conflicted. They recognize that the helmet protects, but they also feel that it would be more pleasant and enjoyable to ride without it. Therefore a relatively high (19,9%) percentage of those who wear a helmet do so just because it is mandatory. There are practically no differences between the attitudes of females and males; the greatest difference is that males have a much higher the rate of those who find driving without a helmet more enjoyable.

Table 10: Mean of the motorcyclists' agreement rate by engine size with the statements about helmet wearing.

	Engine size (cc)					
	0-125	126-250	251-600	601-1000	1000+	Mean of means
In most accidents helmets reduce the risk of serious injury for drivers and passengers	1,27	1,36	1,28	1,25	1,24	1,27
If you drive carefully it is not really necessary to fasten helmet	3,54	3,37	3,60	3,67	3,65	3,59
I enjoy driving without wearing a helmet	3,44	3,26	3,42	3,48	3,51	3,44
Most of my friends use a helmet when driving a motorcycle	1,61	1,60	1,43	1,33	1,33	1,44
I only wear a helmet because it is the law	3,21	3,06	3,32	3,40	3,40	3,31

Concerning the differences between motorcyclists of various engine size, the group of 126 - 250 cc engine size (Table 10) seems to stand out, especially regarding statements "If you drive carefully it is not really necessary to fasten helmet", "*I enjoy driving without wearing a helmet"* and"I only wear a helmet because it is the law". These differences are examined further in Chapter 7 (Motorcyclists' Profiles). On the basis of the ANOVA analysis by engine size the averages for every attitude question are significantly different.

Correlation analysis affecting attitudes helmet wearing

Correlations of the replies given to the questions concerning the helmets' wearing attitudes were examined. We calculated the correlation matrix including all these five attitudes questions (Table 11).

Table 11: Pearson correlation matrix of the motorcyclists' agreement rate for helmet wearing statements.

	If you drive carefully it is not necessary to fasten helmet	I enjoy driving a motorcycle without wearing a helmet	Most of my friends use a helmet when driving a motorcycle	I only wear a helmet because it is the law
In most of accidents helmets reducethe risk of seriousinjury for drivers and passangers	-0,226	-0,175	0,232	-0,177
I enjoy driving a motorcycle without wearing a helmet		0,348	-0,202	0,353
I enjoy driving a motorcycle without wearing a helmet			-0,200	0,458
Most of my friends use a helmet when driving a motorcycle				-0,149

Note: All correlations significant at the 0.01 level (2-tailed).

Accordingly, the following conclusions can be drawn: the strongest correlation is between the answers “I enjoy driving a motorcycle without wearing a helmet” and “I only wear a helmet because it is the law” (r= 0,458, p= 0,000) followed by “If you drive carefully it is not necessary to fasten helmet”. The less the respondents agree with the statement that riding without a safety helmet is enjoyable, the stronger is their conviction that a safety helmet should not be used just because it is the law.

The five questions put were not homogeneously phrased, therefore the replies given to the questions “In most accidents helmets reduce the risk of serious injury for drivers and passengers” and “Most of my friends use a helmet when driving a motorcycle” give a negative, but a less remarkable relationship as far as the answers given to the other three questions are concerned with correlation coefficients between -0.149 and -0,226 (Table 11).

Inter-country differences

Differences between countries (Figures 5 and 6) are substantial (particularly for anti-safety statements) as the result of diverse general safety awareness and variations in the motorcyclist population. There are many who agree that in case of accident wearing a helmet decreases the risk of serious injury, even in countries where the rate of those wearing always the helmet is lower (e.g. Greece, Hungary). The proportion of those who agree with the statement “I enjoy driving a motorcycle without wearing a helmet” is the highest in Italy, Greece, Cyprus, Serbia; it is lowest in Estonia, Germany, Finland, Spain – i.e. in countries where a cooler and rainier weather prevails, except Spain. The proportion of those agreeing with “I only wear a helmet because it is the law” is the lowest in Estonia, Slovenia, Germany and France, whereas the highest in Austria, the Czech Republic, Greece, Cyprus and Serbia.

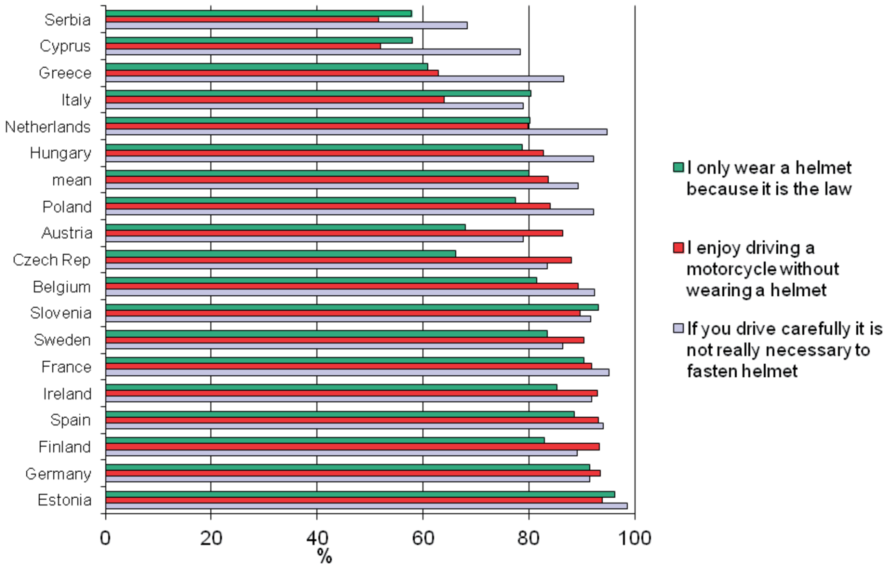

Figure 5: Percentage agreement of motorcyclists by country with statements about helmet wearing (‘not much’ + ’not at all’ responses).

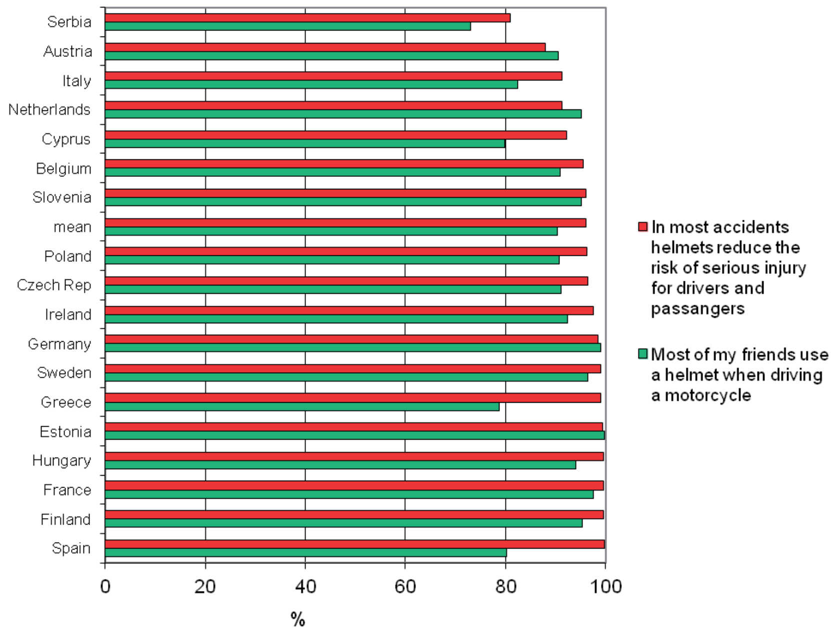

Figure 6: Percentage agreement of motorcyclists by country with statements about helmet wearing ('very' + 'fairly' responses).

Table 12: Grouping of countries by helmet wearing attitudes.more significantly disagree more significantly agree

	In most of accidents helmets reduce the risk of serious injury for drivers and passangers	If you drive carefully it is not necessary to fasten helmet	I enjoy driving a motorcycle without wearing a helmet	Most of my friends use a helmet when driving a motorcycle	I only wear a helmet because it is the law
«Safety reluctant» countries	Serbia, Austria, Netherlands, Italy	Serbia, Cyprus, Austria, Italy, Czech Rep	Cyprus, Serbia, Greece, Italy	Serbia, Spain, Greece, Cyprus, Italy	Cyprus, Serbia, Greece, Czech Rep, Austria
«Safety conscious» countries	Spain, Estonia, Finland, France, Hungary, Greece, Sweden	Estonia, Spain, France, Netherlands, Poland	Estonia, Spain, Finland, Germany, Ireland, France, Sweden, Slovenia, Belgium	Estonia, Germany, France, Sweden, Finland, Netherlands, Slovenia	Estonia, Slovenia, Spain, Germany, France

more significantly disagree　　　　more significantly agree

In order to examine relationships between countries and the attitude questions, cross-table analysis has been used and each country has been grouped on the basis of significant residuals. For all cases the correlation by countries was significant (p= 0,000 for all questions). According to the attitude questions the following two groups of countries were formed: “Safety reluctant” and “Safety conscious” (Table 12). It is clear that, also on the basis of the attitude questions, the motorcyclists in most of the Mediterranean countries and in Serbia fell in a similar (safety reluctant) group.

Cluster analysis

The respondents’ reported helmet wearing in the four different situations (motorway, main roads, country roads and in built-up areas) were combined with their beliefs concerning helmets in a TwoStep cluster analysis performed using SPSS 20.

Three clusters were identified:

Cluster 1 (34%) are “safety conscious” who are very safety conscious and always follow best safety practice.

The safety conscious always wear a helmet in all road conditions and report that they do not only wear a helmet because it is the law, do not enjoy driving a motorcycle without a helmet, agree that most of their friends use a helmet when driving a motorcycle, completely disagree that if you drive carefully it is not really necessary to fasten a helmet and agree strongly that in most accidents helmets reduce the risk of serious injury for drivers and passengers.

Cluster 2 (52%) are “safety compliant” who wear a helmet, but are more permissive in their attitudes to safety.

The safety compliant very nearly always wear a helmet in all road conditions (minimum 95% “always”) and less than half report that they do not only wear a helmet because it is the law, just under half do enjoy driving a motorcycle without a helmet, a quarter “fairly” agree that most of their friends use a helmet when driving a motorcycle (with almost an eighth responding “not at all” or “not much”), with just two-thirds completely disagreeing that if you drive carefully it is not really necessary to fasten a helmet (with one eighth agreeing “very” or “fairly”) and agree that in most accidents helmets reduce the risk of serious injury for drivers and passengers (but with a quarter only “fairly” agreeing).

Cluster 3 (14%) are “safety reluctant” who are less likely to wear a helmet and are far more permissive in their attitudes to safety

The safety reluctant show a more complicated pattern of helmet with a low proportion reporting they always wear a helmet on motorways (43%), main roads (34%), country roads (16%) and built-up areas (6%). Indeed, a notable minority report never wearing a helmet on motorways (6%), main roads (5%), country roads (6%) and built-up areas (8%). Similarly just a fifth reports that they do not only wear a helmet because it is the law, with two-thirds reporting that as their reason either “fairly” or “not much”. Just a fifth does not enjoy driving a motorcycle without a helmet, with almost two-thirds reporting that as their reason either “fairly” or “not much”. Just over a quarter agree that most of their friends use a helmet when driving a motorcycle, with almost half only “fairly” agreeing with that statement. Just over a third completely disagree that if you drive carefully it is not really necessary to fasten a helmet. Just over half of respondents in this cluster agree strongly that in most accidents helmets reduce the risk of serious injury for drivers and passengers with almost an eighth of this group claiming that helmets reduce the risk of serious injury either “not at all” or “not much”.

Females are slightly more common than men in the safety compliant cluster (55% vs. 52%) and slightly less common than in the overall sample for the safety reluctant cluster (12% vs. 14%). The prevalence of safety compliant and safety reluctant among those aged 18-24 is almost the same, but for 45-54 safety compliant is more than four times as common as safety reluctant, although the gap lessens for older age-groups (Figure 7).

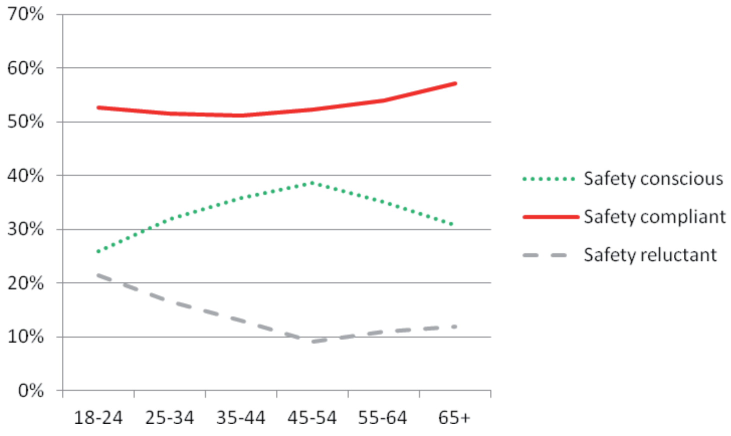

Figure 7: Percentage cluster membership by age-group.

Those travelling less than 1000 kilometres per year are slightly less likely to be safety reluctant compared to all respondents (12% vs 14%) and slightly less likely to be safety conscious compared to all respondents (28% vs 34%). In contrast, those travelling more than 10 000 kilometres per year are slightly more likely to be safety reluctant compared to all respondents (19% vs 14%). Those with less than two years experience of motorcycling are slightly more likely to be safety reluctant compared to all respondents (17% vs 14%) and slightly less likely to be safety conscious compared to all respondents (32% vs 34%). In contrast, those with more ten years of motorcycling experience are slightly less likely to be safety reluctant compared to all respondents (12% vs 14%) and slightly more likely to safety conscious compared to all respondents (36% vs 34%). Those who report using a motorcycle for five months or less are slightly less likely to be safety reluctant compared to all respondents (11% vs 14%), but those who report using a motorcycle every month are slightly more likely to be safety reluctant (18% vs 14%).

Safety reluctant and safety conscious are found almost equally for engine sizes up to 250 cc. However, at larger engine sizes safety reluctant are much less common falling to less than 10% while safety compliant rises to more than 40% (Figure 8).

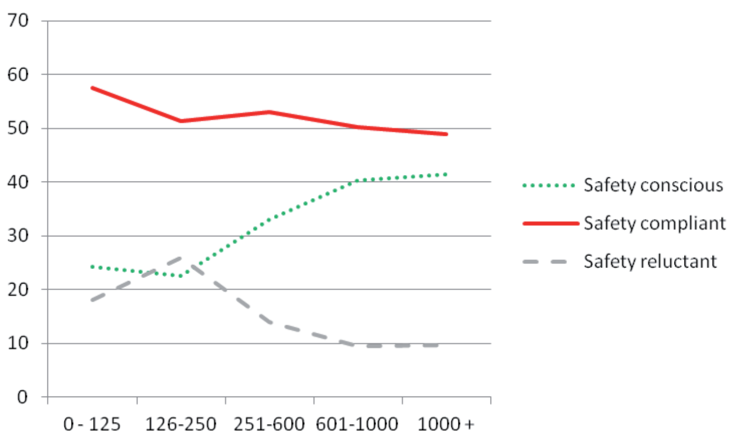

Figure 8: Percentage cluster distribution by engine size (cc).

There are some notable differences in the distribution of the different clusters across countries (Figure 9). The safety reluctant are rare in northern countries (less than 3%), account for about a fifth of respondents in Italy and Austria, is almost the largest group for Cyprus (45%), and accounts for the majority in Greece (54%) and Serbia (67%).

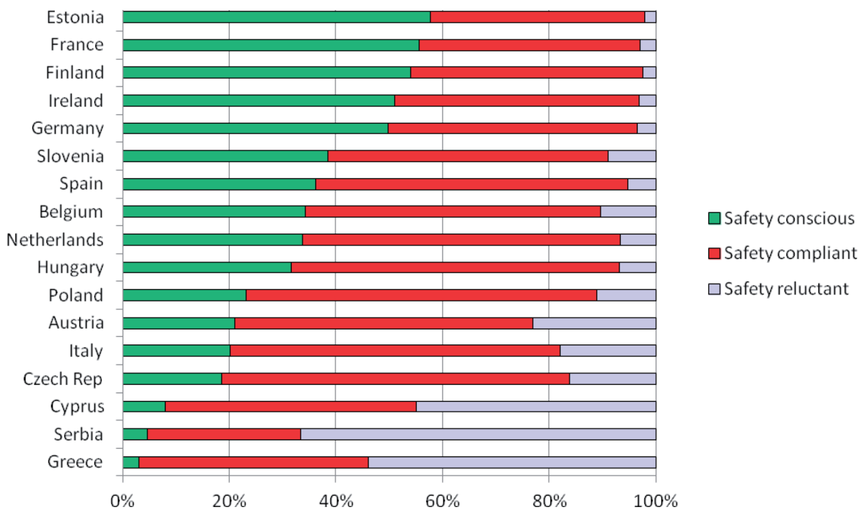

Figure 9: Percentage cluster distribution by country.

In total 92% of the safety conscious report that they "always" wear either a full face helmet or jet helmet compared to 87% of the safety compliant and just 45% of the safety reluctant. However, just 41% of the safety reluctant "always" fasten their helmet compared to 97% of the safety conscious and 86% of the safety compliant. Similarly, the safety reluctant are unlikely to "always" wear other safety equipment such as: technical jacket (15%), back protection (11%), technical shoes (12%). In contrast rates are relatively high for the safety conscious (66%, 45%, 51%) and to a lesser extent for the safety compliant (43%, 27%, 32%).

The three types of motorcyclists are fairly equally likely to carry a passenger at some time with percentages for those reporting that they "never" carry a passenger of 19% for the safety conscious, 17% for the safety compliant and 13% for the safety reluctant. However, those reporting that they "never" carry a passenger without a helmet varying from 95% for the safety conscious, 85% for the safety compliant down to 38% for the safety reluctant.

With regard to interaction with other users, 'good' behaviour varies in line with expectations across the three groups. Those who "never" follow the vehicle in front too closely make up 28% of the safety conscious, 21% of the safety compliant but just 12% of the safety reluctant. Those who "always" give way to a pedestrian at a pedestrian crossing make up 46% of the safety conscious, 36% of the safety compliant but just 18% of the safety reluctant. Those who "never" drive through a traffic light that is on amber make up 16% of the safety conscious, 12% of the safety compliant and 11% of the safety reluctant. Those who "never" overtake when they think they can just make it comprise 33% of the safety conscious, 22% of the safety compliant and just 9% of the safety reluctant. Finally, those who "never" flash their lights or use the horn in anger make up 45% of the safety conscious, 39% of the safety compliant and just 26% of the safety reluctant.

Punishment for not wearing a helmet

In the past three years just 4.5% of the motorcyclists were fined for not wearing a helmet or for not having fastened it or, in addition to being fined, received some other penalty as well. The relationship between age-groups and punishment for not wearing a helmet is linear, but the proportion of those punished for not wearing a helmet is significantly the highest among drivers younger than 35, and the lowest among motorcyclists older than 55 years old *(χ^2= 39,022; df= 5; p= 0,000; adj.res. of age-group 18-34: 3,6-3,9; adj.res. of age-group 45+: -2,5 -2,1)*. The proportion of those punished for not wearing a helmet with yearly vehicle mileage of 5000-10000 kilometres is significantly higher *(χ^2= 21,819; df= 3; p= 0,000; adj.res. of annual mileage 0-1000 km: -2,6,1000-5000 km: -2,5, 5000-10000 km: 3,6)*; the less a motorcyclist drives, the less is the probability of being punished for not wearing the safety helmet, as well as the drivers of motorcycles equipped with engines smaller than 250 cc. The proportion punished for not wearing a helmet is significantly highest among those driving motorcycles with 126-250 cc cylinder capacity *(χ^2= 34,884; df= 4; p= 0,000; adjusted residuals of engine size category 0-125 cc: 2,9; 126-250 cc: 3,9; 600-1000 cc: -3,5; 1000+: -2,7)*.

In the past three years very few of the safety conscious (1%) or the safety compliant (3%) had either been fined or punished in any other way for not wearing/fastening their helmet. In contrast the equivalent figure for the safety reluctant is 20%.

The proportion punished is significantly highest in those countries where inclination to wear a safety helmet is the lowest: Cyprus, Serbia and Greece. No-one was punished for motorcycling without a helmet in the German and French samples (Figure 10) *(χ^2= 341,813; df= 17; p= 0,000; adj.res.: Cyprus: 132,2; Serbia: 7,7; Greece: 7,3)*.

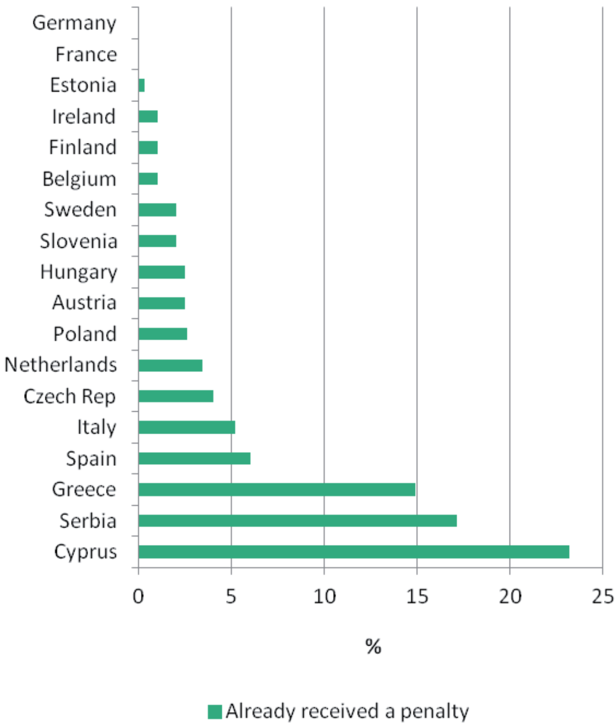

Figure 10: Number of motorcyclists having received a penalty for not wearing a helmet.

Use of other safety devices

The frequency of use of other safety devices listed in the questionnaire is presented in the table 13:

Table 13: Percentage use of other safety devices by motorcyclists.

%	Never	Rarely	Sometimes	Often	Very often	Always
Wear a technical jacket	15,6	5,8	9,9	9,3	13,0	46,4
Wear back protection equipment	36,3	7,9	9,7	7,7	7,7	30,6
Wear technical shoes/boots	26,2	8,1	10,9	9,1	11,0	34,7
Use in helmet phone system	75,9	9,0	7,1	3,9	1,8	2,2

The most frequently used device is the technical jacket followed by the technical shoes/boots and back protection equipment. The least used technical device is the phone system integrated in the helmet.

In order to analyse the use of other safety equipment, the answers given to all questions about **safety devices,** the use of different devices were grouped into two categories ("never" use and "at least rarely or more frequently" use other safety devices) which as respondent-categories were examined by the motorcyclists' gender, age-group, annual performance and the engine cylinder capacity of the motorcycle.

Concerning the use of other safety equipment by different age-groups it can be stated that their rate of use is significantly lowest in the age-group of those over 55; the technical jackets and back protection equipment are mostly used by the age-group of 25-34 years old (Table 14). This younger age group may be more able to afford the equipment (due to a relatively high disposable income) and perhaps due to perceived fashionability of such equipment. The use of technical shoes/boots is more characteristic for middle-aged motorcyclists (35-54 years old), the wearing of such safety equipment is significantly more characteristic for them. They ride the touring style and the chopper motorcycles more often than does the younger age-group. It can be assumed that they use such safety equipment for prestige reasons and on the basis of their safety experience and safety awareness.

The in helmet phone system is not strictly safety equipment, notwithstanding that it has an important traffic safety role because use of mobile communication while driving is more and more prevalent. Its usage rate is significantly higher in the age-group of young motorcyclists of 18-34 years old and the reason could be the ever increasing importance of communication devices among the young.

Table 14: Frequency of use of other motorcycle safety devices by age-group ('Always'+'very often'+'often'+'sometimes'+'rarely').

	Age category						Mean
	18-24	25-34	35-44	45-54	55-64	65+	
Wear a technical jacket	82,8	87,6	85,8	85,0	78,5	72,5	84,4
Wear a back protection equipment	64,7	67,1	65,8	63,1	55,0	50,0	63,7
Wear technical shoes/boots	69,7	74,8	77,1	77,5	67,9	59,0	73,8
Use phone system in the helmet (MC21 f.)	27,4	27,5	25,0	20,0	19,2	16,1	24,1

(technical jacket: χ^2= 42,713; df= 5; p= 0,000; adj.resid.: age-group 25-34: 3,5; 55-64: -3,8; 65+:-4,3; back protection equipment: χ^2= 37,458; df= 5; p= 0,000; adj.resid.: age-group 25-34: 2,9; 55-64: -4,2; 65+:-3,7; technical shoes: χ^2= 45,637; df= 5; p= 0,000 adj.resid.: age-group 35-44: 2,8; 55-64: -3,1; 65+:-4,4; phone system in the helmet: χ^2= 32,455; df= 5; p= 0,000 adj.resid.: age-group 18-24: 2,2; 25-34: 3,3;55-64: -2,6; 65+:-2,5).

The proportion of users of the technical jacket, the back protection equipment and the technical shoes/boots is significantly higher for males, for those travelling a lot by motorcycle (eta= 0,13-0,16) and using high-performance motorcycles equipped with high capacity engines (eta= 0,24-0,36). The proportion of users of a phone system installed in the helmet is significantly highest among males, which increases significantly with annual mileage; however it is not dependent on the motor's engine size (Tables 15 – 17).

Table 15: Frequency of use of other motorcycle safety devices by gender ('Always'+'very often'+'often''sometimes'+'rarely').

	Gender		Mean
	Male	Female	
Wear a technical jacket	85,7	75,8	84,4
Wear a back protection equipment	64,6	58,1	63,7
Wear technical shoes/boots	75,0	65,9	73,8
Use phone system in the helmet (MC21 f.)	24,9	18,7	24,1

(technical jacket: χ^2= 37,994; df= 1; p= 0,000; adj.resid.: males: 6,2; back protection equipment: χ^2= 97,317; df= 1; p= 0,002; adj.resid.: males:3,1; technical shoes: χ^2= 21,797; df=1; p= 0,000 adj.resid.: males:4,7; phone system in the helmet: χ^2= 10,840; df= 1; p= 0,000; adj.resid.: males:3,3).

Table 16: Frequency of use of other motorcycle safety devices by annual mileage ('Always'+'very often'+'often''sometimes'+'rarely').

	Number of kilometres driven the last 12 months				Mean
	0-1000	1001-5000	5001-10000	10000+	
Wear a technical jacket	74,5	83,6	88,5	90,6	84,4
Wear a back protection equipment	50,0	62,5	68,0	74,6	63,7
Wear technical shoes/boots	62,8	74,0	76,9	80,4	73,8
Use phone system in the helmet (MC21 f.)	20,0	19,7	27,4	34,0	24,1

(technical jacket: χ^2= 96,504; df= 3; p= 0,000; adjusted residuals: annual mileage: 0-1000 km:-8,5; 5000-10000 km: 4,4;10000km+:5,1; back protection equipment: χ^2= 113,183; df= 3; p= 0,000 adj. resid.: annual mileage: 0-1000 km:-8,9; 5000-10000 km: 3,4;10000km+:6,8; technical shoes: χ^2= 72,755; df= 3; p= 0,000; adj. resid.: annual mileage: 0-1000 km:-7,8; 5000-10000 km: 2,7;10000km+:4,5; phone system in the helmet: χ^2= 72,880; df= 3; p= 0,000; adj. resid.: annual mileage: 0-1000 km:-3,0; 1000-5000 km: -5,6;5000-10000 km: 3,0;10000km+:6,9).

Table 17: Frequency of use of other motorcycle safety devices by motorcycle engine size ('Always'+'very often'+'often''sometimes'+'rarely').

%	Engine size (cc)					Total
	0-125	126-250	251-600	601-1000	1000+	
Wear a technical jacket	64,9	72,5	89,2	94,1	94,2	84,4
Wear a back protection equipment	45,0	52,5	67,9	73,4	72,9	63,7
Wear technical shoes/boots	48,7	57,8	78,5	86,2	89,1	73,8
Use phone system in the helmet (MC21 f.)	21,2	28,6	24,9	22,3	26,2	24,1

(technical jacket: χ^2= 485,264; df= 4; p= 0,000; adjusted residuals: engine size: 0-125 cc:-18,1; 125-250 cc: -8,4;251-600 cc:4,6;601-1000 cc: 11,7; 1000+: 7,7; back protection equipment: χ^2= 254,953; df= 4; p= 0,000; 0-125 cc:-13,1; 125-250 cc: -6,0; 251-600 cc:3,0; 601-1000 cc: 8,8; 1000+: 5,4; technical shoes: χ^2= 72,755; df= 3; p= 0,000; adj. resid.: 0-125 cc:-13,1; 125-250 cc: -6,0; 251-600 cc:3,0; 601-1000 cc: 8,8; 1000+: 5,4; phone system in the helmet: χ^2= 15,065; df= 4; p= 0,005; adj. resid.: 0-125 cc:-2,3; 125-250 cc: 2,7).

Analysis by countries

Table 18: Frequency of use of other motorcycle safety devices by countries ('Always'+'very often'+'often''sometimes'+'rarely').

	Technical jacket		Back protection equipment		Technical shoes/ boots		Phone system in the helmet	
	%	adj.res.	%	adj.res.	%	adj.res.	%	adj.res.
Austria	98,5	5,6	84,0	6,1	92,5	6,2	42,5	6,2
Belgium	95,0	4,2	72,6		85,9	4,0	16,6	
Cyprus	77,4	-2,7	59,4		64,7		29,4	
Czech Rep	87,6		63,7		76,6		24,0	
Estonia	97,1	6,8	73,6		90,1	7,1	27,7	
Finland	93,4	3,7	64,9		86,3		10,4	
France	84,7		58,9		63,2		5,3	-6,5
Germany	96,1	4,7	69,1		90,2	5,5	18,9	
Greece	56,4	-11,2	39,1	-7,4	46,0	-9,2	17,8	
Hungary	73,0	-4,6	51,0	-3,9	64,7		13,9	
Ireland	95,5	4,4	85,0	6,4	92,0	6,0	17,6	
Israel	79,1		54,3		64,6		52,0	9,4
Italy	59,8	-9,6	36,1	-8,2	34,0	-12,9	31,4	
Netherlands	95,7	4,6	68,3		94,2	6,9	26,9	
Poland	74,7	-6,7	53,2	-5,4	65,7		31,0	
Serbia	85,5		75,7		59,9	-4,0	59,2	10,3
Slovenia	89,7		75,6		86,6		9,8	-4,9
Spain	77,9	-3,7	58,5		60,6	-6,3	17,1	
Sweden	98,0	5,4	85,4	6,5	93,5	6,5	8,5	-5,2
Total	84,4		63,7		73,8		24,1	

Each countries' responses to the questions use of other motorcycle safety devices differ significantly by countries *(technical jacket: χ^2= 487,865; df= 18; p= 0,000; back protection equipment: χ^2= 335,387; technical shoes: χ^2= 626,986; phone system in the helmet: χ^2= 401,990).*

The percentage of motorcyclists wearing a technical jacket is highest in Austria, Sweden, Estonia, and the lowest in Greece, Italy and Hungary. Back protection equipment is most used in Sweden, Ireland and Austria and the lowest use is found in Italy, Greece and Hungary. The use of technical shoes/boots is most often found in the Netherlands, Sweden and Austria, while less often in Italy, Greece and Serbia. Finally, use of a phone system installed in the helmet is highest in Serbia, Israel and Austria, while the lowest usage is in France, Sweden and Slovenia.

Discussion and conclusions

The results of the survey revealed important differences between various groups of motorcyclists and also various countries in usage of helmets and other safety devices. Besides general safety awareness of individual countries, there are complex factors affecting wearing rates.

The helmet wearing rate is generally high, although still not satisfactory – 84.6% of motorcyclists in towns and 91,4% on motorways always wear their helmet. The rate is considerably lower in the youngest age group, in group with annual mileage over 10 000 km per year, and with engine size up to 250 cc. Concerning differences between countries, the lowest rates for all types of roads are in Serbia, Greece, Cyprus, and Austria; for country roads and in built-up areas the lower rates are also seen in the Czech Republic and Italy.

The motorcyclists riding motorcycles equipped with less powerful engines mostly use the roads in built up areas and the country roads; their rate of helmet wearing is below average and similar to urban usage and they more often neglect the wearing of helmets on motorways as well. The motorcyclists having a high engine capacity motorcycle wear the safety helmet more often; consequently the usage rate of helmet wearing is higher than the average in the urban and on country roads' user groups of the riders of 1000+ cc capacity motorcycles and as a result they are less frequently fined for non-wearing of the helmet.

To describe better the situation, cluster analysis was carried out, including the attitudes of motorcyclists towards helmets. Three clusters were identified: safety conscious users, always following best safety practice (34%); safety compliant users, who wear helmet, but their attitudes are less responsible (52%), and safety reluctant motorcyclists (14%). The representation of the groups differs significantly by countries, with the highest percentage of safety reluctant users again in Serbia, Greece, and Cyprus (in those countries experience of punishment is the most frequent), and to certain extent also Austria, Italy and the Czech Republic.

Concerning use of other safety equipment, such as technical jacket, back protection, or technical boots, the highest wearing rates we can find in Austria, Sweden, Estonia, Ireland and Netherlands, and the lowest in Italy, Greece, Hungary and Serbia. There is a relation to styles of motorcycling typical for individual countries, but also to weather conditions.

Chapter 2.6

Injury accidents

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Introduction

Motorcyclists are at high risk of being involved in an accident. Their risk of getting killed or severely injured in an accident is much higher than the risk of car drivers. The risk of motorcyclists to be killed in an accident in European countries is about 5-25 times higher than the risk of car drivers in relation to the kilometers driven (Huang & Preston, 2004; Phan et al., 2010; SWOV, 2010).

To illustrate the accident involvement of the participating motorcyclists within the last three years there have been done some descriptive analyses and group comparisons which are shown below. Furthermore there have been done comparisons of motorcyclists who have been involved in an injury accident to motorcyclists without an injury accident to illuminate those factors that are correlated with a higher risk of accident involvement. These comparisons were made in respect of risky riding behaviour, violation tickets, attitudes towards riding under the influence of alcohol and the use of helmets, risk perception, and extra motives. Additionally the participating countries have been divided into northern and southern European countries. Accident involvement has been analyzed for both regions.

Method

In the following chapter all graphs show the percentage of the answers. In part several answer categories are added to one category, for example “often”, “very often” and “always”.

To calculate differences between groups we used mean score comparisons like t-tests. Because statistical calculations become significant even for small effects, when the number of participants is high, the comparisons between groups are significant at the majority of cases. To get a better valuation of the amount of effects there has been calculated a cohen’s d effect size (Cohen, 1969) for all comparisons announced between groups. A cohen’s d from .2 is defined as a small effect, from .5 as a medium effect and from .8 as a stron effect.

Below the group of motorcyclists with an accident involvement within the last three years is labeled as “accident involved motorcyclists”, the remainder as “non accident involved motorcyclists”.

Results

Descriptives

Overall 11% of the interviewed motorcyclists have had an injury accident within the last three years. Car drivers in comparison to motorcyclists have a total involvement rate for injury accidents of 6%. Separated into countries there are significant differences in the accident involvement of the participating motorcyclists. The highest rates of accident involvement can be found for Israel (33%), followed by Cyprus (25%) and Italy (20%), the lowest rates can be found for Hungary (3%), Netherlands (4%), Germany (5%) and Poland (5%). In comparison to car drivers` accident rates there are strong differences especially for Israel, Cyprus and Italy but also for Estonia, Sweden and France (see Figure 1).

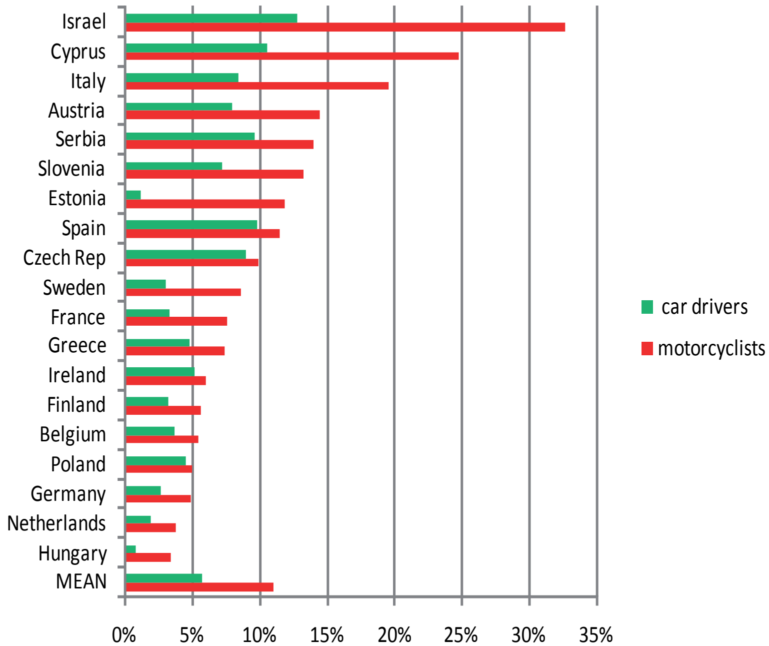

Figure 1: Injury accident involvement by country for motorcyclists and car drivers (in %).

Gender and age

Concerning the whole group of each gender there is no significant difference in the accident rate for male (11%) and female (9%) motorcyclists. But these proportions differ highly between the 19 countries (see Table 1). High proportions of female accident involved motorcyclists can be found for Israel (42%), Italy (24%), Cyprus (17%) and Slovenia (15%). A very high deviation from the mean score may be due to small numbers of motorcycling women in each country.

Regarding age the highest rates of accident involvement can be found for the age groups 18-24 years (14%), 25-34 years (14%) and for 65 years or older (11%) in comparison to the whole group of motorcyclists at that age. Again there are strong differences between the countries. For Israel there is no accident involvement for motorcyclists older than 44 years and its youngest age group has the highest accident rate (47%). High rates for this age group can also be found for Slovenia (25%) and Cyprus (21%). In contrast Austria has the highest rate of accident involvement for motorcyclists older than 65 years (44%) as well as Belgium (29%) and Estonia (25%).

Table 1: Accident involvement by gender respectively age and country (in % of gender respectively age group).

	Male	Female	18-24	25-34	35-44	45-54	55-64	65+
Israel	31%	42%	47%	33%	17%	0%	0%	
Slovenia	13%	15%	25%	15%	11%	8%	8%	14%
Cyprus	26%	17%	21%	28%	28%	20%	14%	0%
Italy	18%	24%	19%	30%	14%	21%	10%	27%
Sweden	8%	11%	18%	9%	9%	4%	10%	0%
Belgium	6%	0%	18%	10%	2%	2%	0%	29%
Austria	15%	11%	16%	18%	12%	8%	19%	44%
Finland	5%	8%	14%	4%	4%	6%	3%	13%
Ireland	6%	8%	14%	2%	8%	3%	8%	13%
Estonia	13%	3%	13%	11%	17%	0%	9%	25%
France	9%	4%	9%	13%	5%	7%	6%	0%
Poland	5%	3%	8%	2%	8%	2%	6%	4%
Spain	12%	8%	8%	15%	12%	13%	7%	0%
Hungary	4%	0%	7%	3%	3%	0%	0%	13%
Greece	8%	4%	7%	9%	5%	10%	6%	0%
Serbia	15%	0%	5%	15%	28%	40%	0%	0%
Netherlands	5%	2%	5%	9%	4%	2%	3%	0%
Germany	6%	0%	4%	13%	6%	2%	0%	10%
Czech Rep	11%	3%	3%	19%	7%	0%	8%	0%
MEAN	11%	9%	14%	14%	10%	8%	6%	11%

Motorcycle type and engine size

Considering all motorcyclists who have been involved in at least one injury accident within the last three years 23% ride a scooter or a sport style motorcycle respectively, 17% ride a conventional street motorcycle or an enduro or offroad motorcycle respectively, 12% ride a touring style machine and another 7% ride a chopper (see Figure 2). Compared to the distribution of all motorcyclists (see chapter 1 “Introduction”) scooter, sport style motorcycles and enduro or offroad motorcycles are slightly overrepresented in the distribution of accident involvement. Split into countries it comes clear that there is a high proportion of scooter riders involved in accidents in Southern countries like Israel, Italy, Greece and Spain. In Northern countries there are the highest proportions of accident involved motorcyclists for riders of sport style machines.

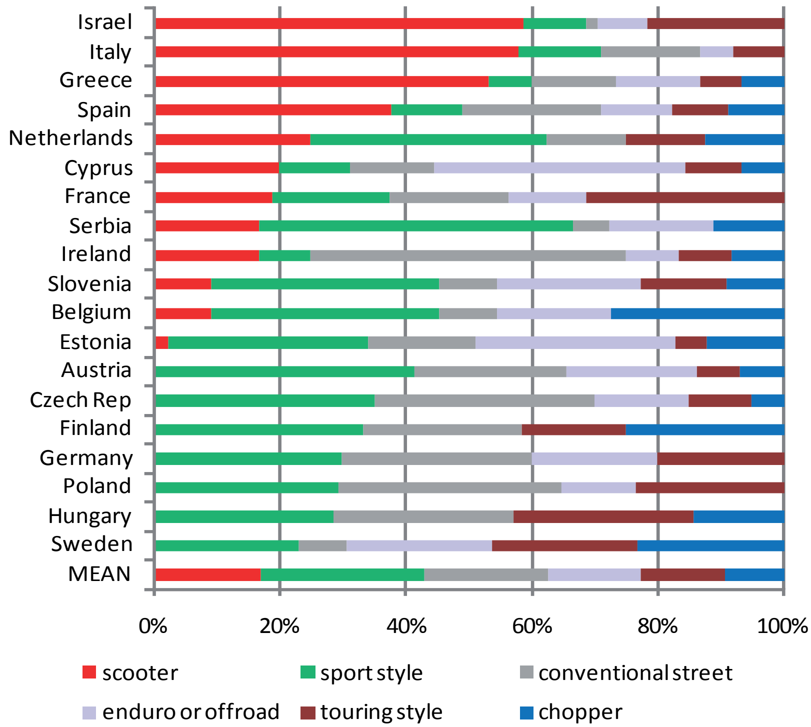

Figure 2: Injury accident involvement by country for motorcycle type (in % of accident involved motorcyclists).

With regard to the engine size there are again differences between the Southern and the Northern European countries (see Table 2, Figure 3). While in the Southern European countries there is a high proportion of small sized motorcycles up to 250 cc involved in accidents (e.g. Israel 66%, Greece and Spain 60%), in Northern countries the highest proportion of accident involved motorcycles has an engine size of more than 750 cc (e.g. Finland 75%, Estonia 59 % and Sweden 47%).

Table 2: Injury accident involvement by country for motorcycle engine size (in % of accident involved motorcyclists).

	-125	126-250	251-500	501-750	751+
Austria	7%	17%	21%	17%	38%
Belgium	27%	0%	27%	18%	27%
Cyprus	21%	11%	6%	28%	34%
Czech Rep	20%	25%	15%	15%	25%
Estonia	5%	0%	10%	28%	56%
Finland	9%	0%	0%	18%	73%
France	31%	6%	13%	13%	38%
Germany	10%	10%	20%	20%	40%
Greece	33%	27%	20%	0%	20%
Hungary	29%	29%	0%	29%	14%
Ireland	17%	17%	25%	17%	25%
Israel	23%	44%	29%	2%	2%
Italy	24%	26%	11%	21%	18%
Netherlands	0%	14%	14%	29%	43%
Poland	27%	4%	12%	27%	31%
Serbia	11%	28%	0%	50%	11%
Slovenia	19%	8%	12%	27%	35%
Spain	38%	22%	11%	18%	11%
Sweden	6%	6%	6%	35%	47%
MEAN	19%	15%	13%	22%	31%

Comparison of accident involved motorcyclists with non accident involved motorcyclists

In the following section accident involved and non accident involved motorcyclists are compared regarding a number of variables. Comparisons show differences between these groups concerning age, family status, risky riding behaviour, traffic violations, driving under the influence of alcohol, attitudes towards helmet use, risk perception and motives to ride a motorcycle.

For some topics it is interesting to differ between northern and southern European countries. Therefore the 19 participating countries are divorced into north and south. The northern countries are Austria, Belgium, Czech Republic, Estonia, Finland, Germany, Ireland, Netherlands, Poland and Sweden and the southern countries are Cyprus, France, Greece, Hungary, Israel, Italy, Serbia, Slovenia and Spain. The proportions of accident involved motorcyclists differ between these two groups. In mean 8% of the motorcyclists from northern Europe have been involved in an accident whereas this proportion is 15% for southern Europe.

Figure 3: Participating countries separated into northern and southern European countries.

Age

Within the group of accident involved motorcyclists the two youngest age groups have a higher proportion than within the group of non accident involved motorcyclists (see Figure 4). Within the group of accident involved motorcyclists 18-24 year-olds have a proportion of 20% and 25-34 year-olds 35%, whereas within the group of non accident involved motorcyclists 18-24 year-olds have a proportion of 14 % and 25-34 year-olds of 26%. A t-test revealed significant differences between both groups and the calculation of the effect size cohen’s d showed a small effect of d= .32.

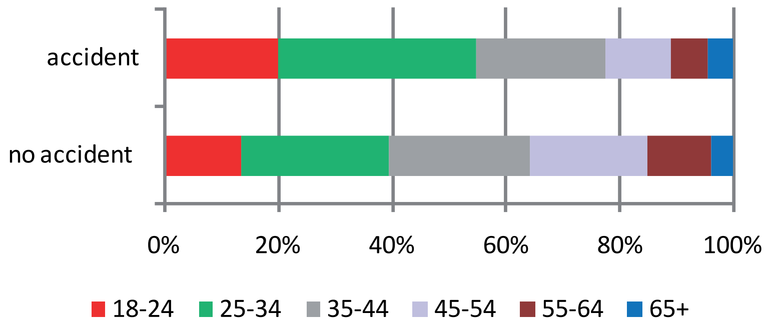

Figure 4: Proportion of age groups for accident involved and non involved motorcyclists (in %).

Family Status

The majority of accident involved motorcyclists is single (41%), followed by married (31%) and as married living motorcyclists (20%). In comparison to the distribution among all motorcyclists (see Chapter 1 “Introduction” & Figue 6.5), single and as married living motorcyclists are overrepresented in the distribution of accident involved motorcyclists.

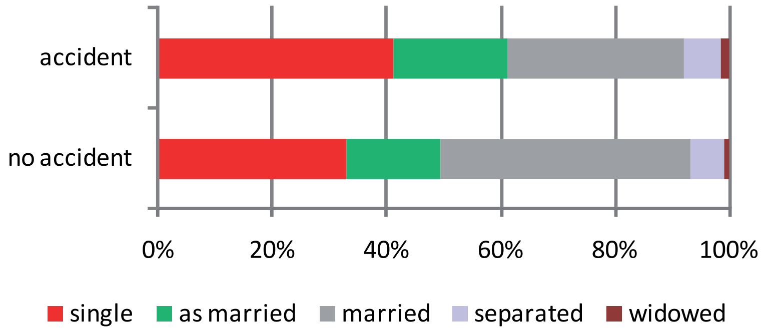

Figure 5: Proportion of family status for accident involved and non involved motorcyclists (in %).

Risky riding behaviour

A higher proportion of accident involved compared to non accident involved motorcyclists indicate that they often, very often or always ride in a riskier respectively more aggressive way like flashing the light or using the horn when angered or following the vehicle in front too closely (see Figure 6). The effect sizes of the mean differences lie between d= .33 and d= .46, which reflect small effects.

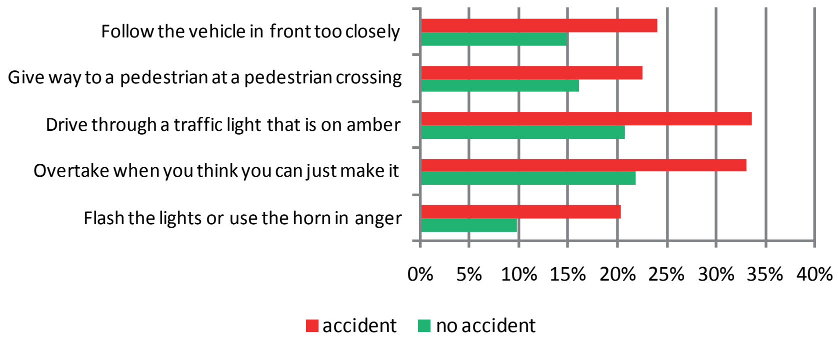

Figure 6: Behaviour when motorcycling. Accident involved compared to non involved motorcyclists (often, very often and always in %, * never, rarely and sometimes in %).

Although there are differences between the age groups there is no interaction between age and accident involvement for riskier riding behaviour, except for the item "Give way to a pedestrian at pedestrian crossing" (see Table 3). Allover younger motorcyclists state more risky behaviour than older motorcyclists. In the group of non accident involved the younger motorcyclists less often give way to a pedestrian, in the group of accident involved motorcyclists it's the other way round, older motorcyclists less often give way to a pedestrian.

Table 3: Behaviour when motorcycling. Accident involved compared to non involved motorcyclists by age group (often, very often and always in %, * never, rarely and sometimes in %).

		18-24	25-34	35-44	45-54	55-64	65+	total
Follow the vehicle in front too closely	no accident	20%	19%	15%	11%	8%	5%	15%
	Accident	27%	27%	21%	21%	17%	15%	24%
Give way to a pedestrian at a pedestrian crossing*	no accident	22%	19%	15%	12%	12%	16%	16%
	Accident	14%	23%	24%	28%	24%	30%	23%
Drive through a traffic light that is on amber	no accident	26%	27%	20%	16%	11%	12%	21%
	Accident	42%	38%	25%	42%	17%	5%	34%
Overtake when you think you can just make it	no accident	26%	30%	21%	16%	13%	16%	22%
	Accident	37%	38%	33%	30%	7%	20%	33%
Flash lights or use the horn in anger	no accident	14%	14%	9%	6%	5%	4%	10%
	Accident	46%	24%	16%	13%	7%	5%	20%

Traffic violations

There are significant more motorcyclists who have got a ticket for any traffic violation out of the following four violations – speeding, helmet use, alcohol or medicines – within the group of the accident involved motorcyclists than in the group of non accident involved motorcyclists (see Figure 7). The effect sizes for speed ticket (d= .38), helmet ticket (d= .39) and alcohol ticket (d= .39) show a small effect when accident involved and non accident involved motorcyclists are compared.

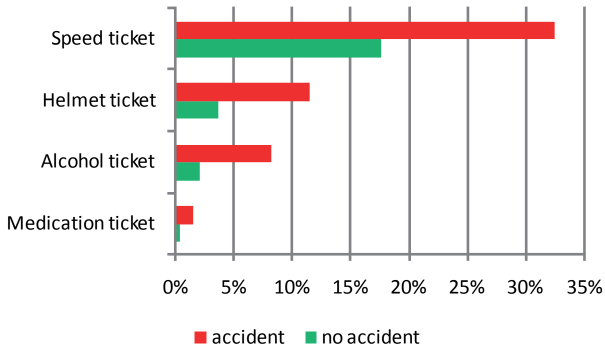

Figure 7: Proportion of motorcyclists with a fine. Accident involved compared to non involved motorcyclists (in %).

If the region is taken into account it comes clear that motorcyclists from Northern Europe more often are fined for speeding than for other violations and than motorcyclists from Southern European countries (see Figure 8). The latter are also most often fined for speeding, but additionally they are more often fined for not wearing a helmet or riding under the influence of alcohol than Northern motorcyclists. In both regions accident involved motorcyclists have more tickets for traffic violations than non involved. Possibly there is an underestimation of speeding and alcohol violations in Southern European countries because there are on average fewer checks for speeding and alcohol in this region than in Northern European countries (ETSC)[16]. So the regional difference for speeding tickets may be smaller than described and the difference for alcohol tickets may be higher. There is no background information about the frequency of checks for wearing a helmet and driving under the influence of medicines.

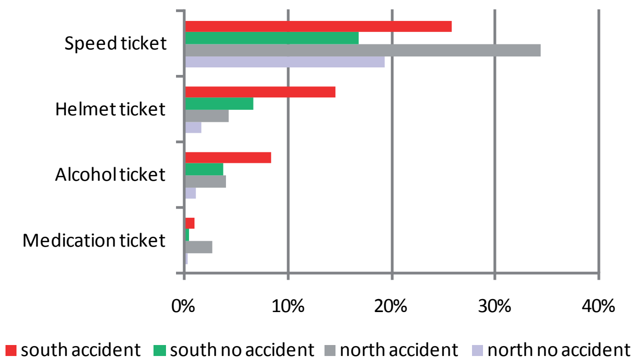

Figure 8: Proportion of motorcyclists with a fine. Accident involved compared to non involved motorcyclists separated for Northern and Southern European countries (in %).

16 - There is no information about the amount of speed checks available for Belgium, Estonia, Germany, Greece and Serbia and no information about the amount of alcohol checks for Czech Republic, Germany, Ireland, Netherlands and Serbia.

Driving under the influence of alcohol

There is a higher proportion of motorcyclists who never or rarely drive after drinking few alcohol or more alcohol than permitted within the non accident involved group than in the accident involved group (see Figure 9). This fact mirrors the result of question MC14 (see Figure 10): A higher percentage within the non accident involved group compared to the accident involved group has the opinion that the legal alcohol limit should be restricted to zero. For all three questions there are medium effect sizes (d= .46, .37 and .37) for the mean score differences between the groups.

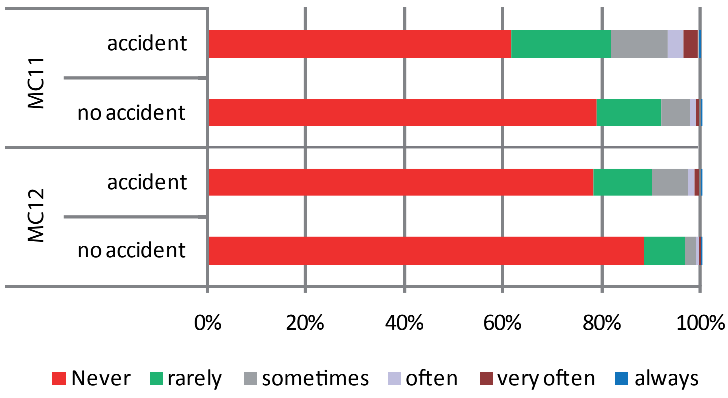

Figure 9: Driving with few alcohol (MC11) and Driving with more alcohol than permitted (MC12). Accident involved compared to non involved motorcyclists (in %).

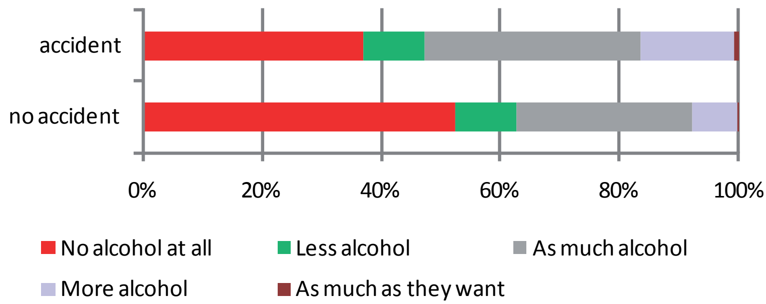

Figure 10: Attitude towards legal alcohol limit (MC14). Accident involved compared to non involved motorcyclists (in %).

Attitudes towards helmet use

Accident involved motorcyclists have a significant riskier attitude towards helmet use (see Figure 11). A higher proportion of accident involved motorcyclists would very or fairly agree to riskier statements like "I enjoy driving a motorcycle without wearing a helmet" (d= .19), "If you drive carefully it is not really necessary to fasten a helmet" (d= .13) or "I only wear a helmet because it is the law" than the proportion of non accident involved motorcyclists. On the other hand they less agree with statements like "In most accidents helmets reduce the risk of serious injury for drivers and passengers" (d= .12) and "Most of my friends use a helmet when driving a motorcycle" (d= .17).

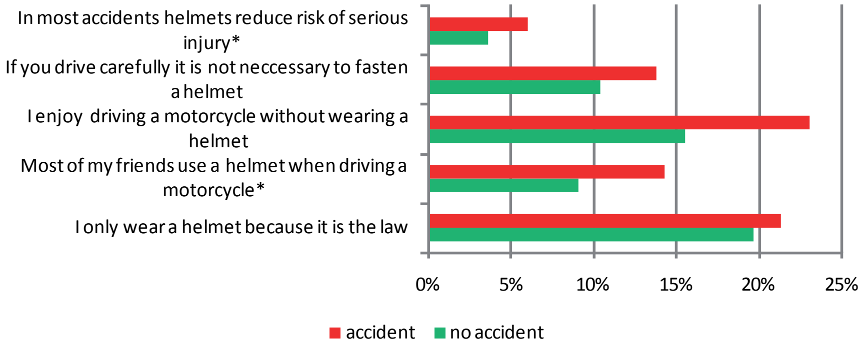

Figure 11: Attitudes towards helmet use. Accident involved compared to non involved motorcyclists (fairly and very in %, *not much and not at all in %).

Figure 12 shows that for Southern European countries the difference between accident involved and non involved motorcyclists is bigger than for northern European countries. Accident involved motorcyclists from southern European countries have the highest rates on all questions and they especially enjoy riding without a helmet, wear a helmet only because it is the law and their friends more often wear no helmet.

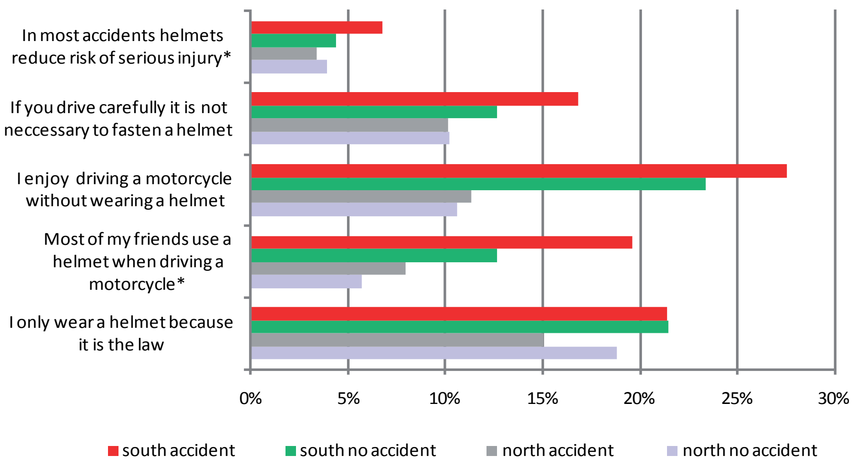

Figure 12: Attitudes towards helmet use. Accident involved compared to non involved motorcyclists separated for northern and southern European countries (fairly and very in %, *not much and not at all in %).

Risk perception

Accident involved and non accident involved motorcyclists differ in their perception of risk in specific situations (see Figure 13). Accident involved motorcyclists perceive specific situations like “overtaking on the right”, “weaving between lanes on highways” and “weaving between lanes on urban streets” less risky than non accident involved motorcyclists. But those differences between the two groups are very small (d between .11 and .16) so that it is only a tendency.

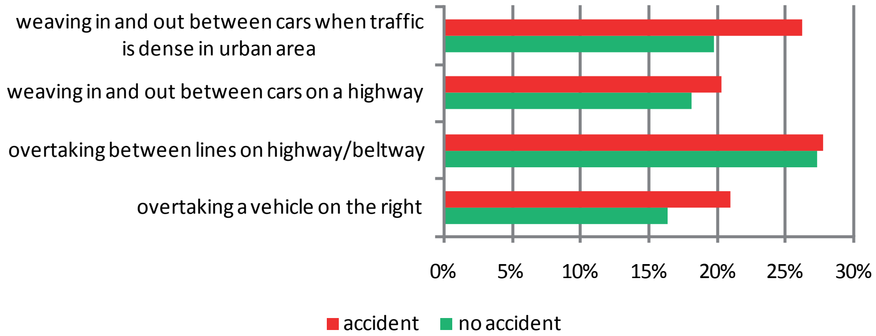

Figure 13: Risk perception. Accident involved compared to non involved motorcyclists (not much and not at all in %).

Motives to ride a motorcycle

Motorcyclists have different motives for using their motorcycle depending on the purpose they ride it for (see Figure 14). Asked for their reasons to ride a motorcycle a significant higher proportion of accident involved motorcyclists indicate that they ride a motorcycle because they enjoy acceleration and high speed than the proportion of non accident involved motorcyclists (d= .17). Again this is only a small effect. The two groups don’t differ in their motivation by the feeling of freedom, pleasure and biker spirit.

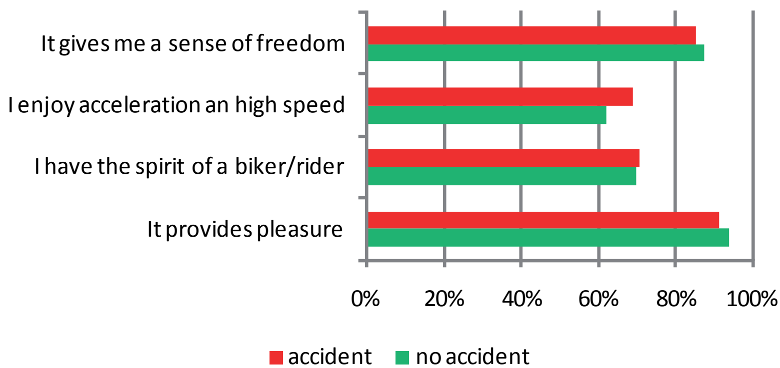

Figure 14: Motives for riding a motorcycle (Extramotives). Accident involved compared to non involved motorcyclists (very and fairly in %).

The comparison separated for Northern and Southern European countries reveals that motorcyclists from northern European countries are more motivated to ride a motorcycle because of the so called extra motives (see Figure 15). Only for motorcyclists from Northern countries there are higher rates for the motives freedom and biker spirit for accident involved than non accident involved motorcyclists.

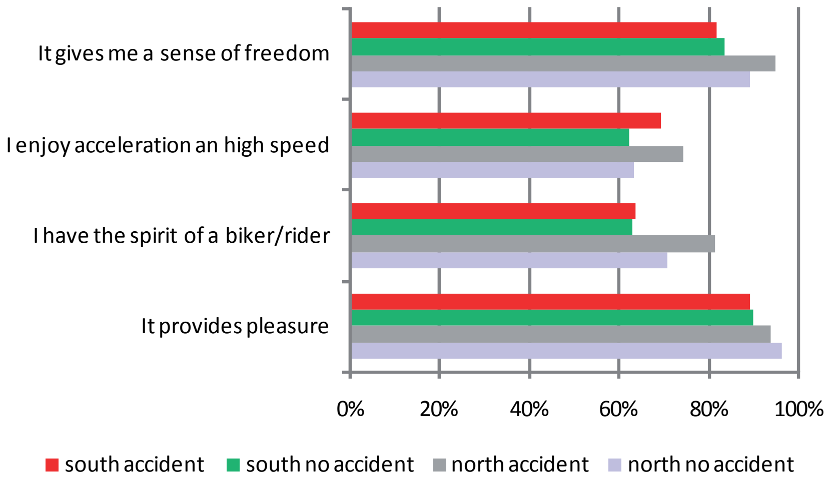

Figure 15: Motives for riding a motorcycle (extra motives). Accident involved compared to non involved motorcyclists separated for Northern and Southern European countries (very and fairly in %).

Conclusion

The results of the survey revealed considerable differences in self-related accidents for the total number of accidents as well as the contribution within several subgroups (age, gender, motorcycle type and engine size) in the different countries.

Several risk factors are related to accident involvement of motorcyclists in the literature. Besides the lack of experience also younger age (even if corrected for experience), alcohol consumption and speeding behaviour are factors which affect the accident risk of motorcyclists (Moskal, Martin & Laumon, in press).

In comparison to non accident involved motorcyclists, the group of accident involved motorcyclists (I) is distributed of a higher proportion of young motorcyclists between 18-34 years of age, (II) scores higher on questions about risky behaviour, (III) has more tickets for traffic violations, (IV) indicates to have a riskier attitude towards driving under the influence of alcohol and towards helmet use, (V) scores lower on questions about risk perception and (VI) indicates more often to enjoy acceleration and high speed.

Overall the most important factors in the comparison of accident involved and non accident involved motorcyclists are age, risky riding behaviour, tickets and drink driving. Motorcyclists attitudes, motives to ride a motorcycle and risk perception do not highly affect the accident risk of motorcyclists in this survey. One possible explanation for this fact might be an interaction effect with country and according to this with different cultures and value systems. Because of small numbers of accident involved motorcyclists in each country comparisons of accident involved and non accident involved motorcyclists separated for each country are not reliable.

Therefore the participating 19 countries have been divided into a group of Northern European countries and a group of Southern European countries (plus Israel). Depending on the region there seem to be different risk factors relating to the accident involvement of the motorcyclists. In general the Southern European countries have a higher accident rate than the Northern European countries. Whereas Northern European motorcyclists more often offend speed limits and ride because of extra motives, Southern European motorcyclists have a more risky attitude towards helmet use. Both aspects seem to differ between accident involved and non involved motorcyclists in the corresponding region.

All effect sizes referred in this chapter are small. The reason for this is that accidents are and have several sources. Common sources of motorcyclists' accidents are besides a risky behaviour of the involved motorcyclist, misbehaviour of another road user or bad road conditions. Therefore a prediction of accidents by the motorcyclist's behaviour can only be valid in parts.

Chapter 2.7

Motorcyclists' Profiles

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Introduction: theoretical background and research questions

This chapter aims to investigate the population of motorcyclists by considering the relationship between riders' profiles on one side, and attitudes towards risk and risk taking on the other side. Having a better knowledge of motorcyclists' attitudes towards risk according to their respective profiles could be interesting in order to potentially adapt future road safety countermeasures to each sub-populations of riders.

Motorcyclists are not a homogeneous group of road users, both in terms of motorcycling practices and concerning their motivations for using a motorbike. For some riders, motorcycling is above all a source of pleasure associated with a particular "biking spirit" and "freedom feeling". For others, motorcycle is primarily a cheaper mode of transport compared to a car, easier to park and easy to manoeuvre in congested urban areas. These different profiles of motorcyclists, having different motivations for using a motorbike and specific motorcycling practices, may also have different attitudes towards road safety and risk taking when riding (Sexton et al, 2006; Chen 2009; Elliott, 2010).

Past studies have shown that several groups of riders having specific social identities can be distinguished, regarding both attitudes and risky motorcycling practices. For example, in an Australian survey, Krige (1995) proposed a typology of 5 profiles of motorcyclists distinguishing (1) *Boys Wonders,* who ride a motorcycle because they love the challenge to push their limits and ride fast, high powered Japanese bikes, (2) *Dirts* driving ride-off bikes, belong to a club, (3) *Commuters* riding for practical reasons rather than the pleasure of riding, (4) *Weekend Warriors* who are club enthusiasts and made up of motorcyclist sub-groups such as the HOGS ("Harley Owners Group"), the European (own European bikes) or the Ulysses (over 40s), and (5) *Outlaws* who ride Harley Davidson, who are sometimes member of criminal-gang, and who correspond to the stereotypical "Bikers" image.

Christmas et al. (2009) surveyed 1019 riders in Great Britain and identified 7 profiles of motorcyclists: (1) *Riding Hobbyists* are older and summer-only riders, who enjoy social interaction with other motorcyclists almost as much as the riding itself, (2) *Performance Disciples* are all-year riders with a total focus on high performance riding and a strong dislike for any measure that gets in the way of it, (3) *Performance Hobbyists* are solitary and summer-only riders, and for whom riding is all about individual experiences and sensations and who are not concerned about what other riders are doing, (4) *Look-at-me Enthusiasts* are generally young riders with limited experience but limitless enthusiasm for whom riding is all about self-expression and looking cool, (5) *Riding Disciples* are passionate riders from whom motorcycling is a way of life, built on strong relationship with the bike itself and membership of the wider fraternity of riders, (6) *Car Aspirants* are young people looking forward to getting their first car when age/finance allow, and lastly (7) *Car Rejecter* (with a higher proportion of women than in other groups) using a motorbike for escaping traffic jams, parking difficulties, fuel cost or other problems of car use, and who don't care for motorcycles but care for low-cost and efficient mobility. Regarding accidents-per-year and accident-per-mile rates for each of these groups, Christmas et al. (2009) have shown that *Riding Disciples* and *Riding Hobbyists* have lower mean accident propensity scores than other groups. At the other end of the spectrum, *Car Aspirant* and *Look-at-me Enthusiasts* have a highest accident propensity on either measure.

A French laboratory study (Banet, 2010) among 72 French riders, assessed *Risk Awareness* (i.e. ability to detect hazards in video films of traffic scenes) and attitudes towards risk taking when motorcycling (assessed through questionnaires) compared three social groups of experienced motorcyclists: *Commuters* (using every day a 125cc Scooter for home-work travels), *Bikers* (using Harley Davidson and having a very affirmative identity of riders) and *Sport Riders* (who like sport motorbike and high speed practices on open road, as well as on race tracks). Sport riders have a more positive attitude towards particular risks and risk taking manoeuvres when riding (concerning speed or high acceleration, for example) than Commuters and Bikers. But they are, by contrast, more aware than other groups of alcohol dangerousness when riding. Regarding Cognitive abilities in hazard perception, Commuters are significantly less efficient than Sport Riders and Bikers to detect hazards and to adequately assess the situational criticality when motorcycling. Another typical difference between Commuters and the two other groups concerned awareness of potential risks associated with particular riding manoeuvres. It seems that Sport riders take more deliberate risks than other groups regarding speed and stunt practices, for example, but Commuters take more frequently unintended risks i.e. without being aware of the effective dangerousness associated with particular riding manoeuvres (like using bus lanes in urban areas, or riding on hard shoulders on motorways). A similar tendency to underestimate the situational risk was also found among un-experienced motorcyclists (e.g. Liu, Hosking & Lenné, 2009; Bellet & Banet, 2012). Bellet et al. (2010; 2011) used the same Banet's video-based methodology in an experiment implemented in the European Project 2BeSafe. They tested 116 European motorcyclists (Middle-Age experienced male riders, including 55 Commuters versus 61 Sport Riders) from 6 different countries (Austria, France, Germany, Greece, Portugal and Sweden). The results showed similar tendencies of differences between Commuters and Sport Riders across Europe, as in the earlier French study. However, differences were small, perhaps due to the small sample of motorcyclists in the study. There is, consequently, a great advantage to explore these issues in the data collected in SARTRE 4, given the large and diversified sample of motorcyclists (more than 4400 participants) in the survey.

Method

The research question to be investigated in this chapter is whether motorcyclists' profiles impact or not their on attitudes towards risk and risk taking when motorcycling. The core items available in SARTRE 4 survey for motorcyclists profiling are MC25 items (from MC25a to MC25f), allowing the participants to provide a "self-definition" of themselves as a motorcyclist (respectively as a *Sport rider*, a *Commuter*, a *Rambler*, a *Traveler*, a *Green Driver* or as a *Member of a Bikers Community*). However, as each rider's profile may be associated with different *motivations for using a motorbike* (i.e. MC 24 items, as previously investigated in Chapter 4), a first step will be to study statistic correlations between MC25 and MC24 items. According to these correlations results, sub-groups of motorcyclists were identified and in-depth statistical analyses based on inferential methods were used in order to compare these different sub-groups of motorcyclists.

The statistical methods included descriptive methods (mean values comparisons, and Principal Component Analysis) and inferential methods (MANOVA and post-hoc tests). In order to use the inferential methods, it was necessary to consider participants' answers as binary responses, i.e. positive *versus* negative. Thus, items measured through 4-levels scales (1= very, 2= fairly, 3= not much, 4= not at all) and with 6-levels scales (1= never, 2= rarely, 3= sometimes, 4= often, 5= very often, 6= always) were converted and recoded to binary judgements 1 and 2 (i.e. *very* and *fairly= 1= pos.;* not much and not at all= 2= neg.).

The first part of the following 'Results' section will examine correlations between motorcyclists' initial profiles (i.e. MC25 items on 'purpose of using your motorcycle') and their motivations for using a motorbike (i.e. MC24 items). Then, we improve the profiling of sub-groups by jointly considering MC25 and MC24 items. Finally, we examine the characteristics of profile sub-groups in terms of attitudes towards risk (concerning speed, alcohol, helmet or safety equipment wearing), risky practices when riding (e.g. risky manoeuvres), and accidental exposure.

Results

Cross-analysis of motorcyclists' profile and motivations for using a motorcycle

This section is focused on motorcyclist groups identification, by jointly combining participant's answers for both MC25 (i.e. Profiles based on modalities of motorbike use) and MC24 items (Motivations for motorcycling[17]). Principal Component Analysis with Varimax rotation was applied to the joint distributions of MC25 and MC24. Table 1 shows that **4 main motorcyclist profiles emerge.**

Table 1: Principal Component Analysis combining MC25 and MC24 items.

Items (code)	Components				
	1	2	3	4	5
Parking (MC24c)	.805	.077	.009	-.011	-.017
Cheaper (MC24d)	.785	-.012	-.005	.150	-.144
Saving time (MC24a)	.764	-.136	-.012	.111	.121
Avoid traffic jam (MC24j)	.733	-.024	.028	.151	.243
Pollution reduction (MC24e)	.682	.078	.200	.112	-.255
* Commuter (MC25a)	.497	-.349	.037	.145	.369
Pleasure (MC24b)	-.043	.774	.004	-.141	.054
Freedom (MC24k)	.074	.731	.026	.005	.213
Biker spirit (MC24f)	.082	.674	.272	.017	.139
* Rambler (MC25c)	-.298	.612	.277	-.096	-.082
Biking Group (MC25d)	-.124	.193	.730	-.008	.115
* Traveller (MC25f)	.039	.118	.708	-.027	.268
Green Driver (MC25e)	.370	.047	.653	-.014	-.096
No car (MC24h)	.109	-.032	-.022	.897	-.020
No choice (MC24i)	.264	-.134	-.024	.826	.083
* Sport Rider (MC25b)	-.031	.161	.196	.028	.738
Acceleration (MC24g)	.023	.498	.096	.012	.627

17 - Results previously presented in Chapter 4 concerning motivations for driving a motorbike as assessed through MC24 items (based on a Principal Component Analysis with Varimax rotation) have shown that these 11 motivations can be aggregated in 3 different components (the rotated factors accounted for 63% of the total variance, and the different values of Cronbach's Alpha statistics confirmed the reliability of these 3 groups of items). The first component deals with motorcycling advantages for mobility (compared with a car). Five items loaded on to this component 1, which accounted for 30.6% of the variance: avoiding traffic jam, saving time, easiness for parking, cheaper mean of transport and lastly, motivation to reduce CO2 pollution. The second sub-set of motivations (component 2, accounted for 20.6% of the variance) is related with biking feeling and spirit and integrates 4 items: riding pleasure, acceleration and speed, biker spirit, and freedom feeling). At last, a sub-set of motivations (accounted for 11.7% of the variance) is related with imposed constraints and includes 2 items: not having any car or other choice for mobility.

The profile of ***Commuter*** (item MC25a) is strongly correlated with motivations regarding *motorcycling advantages for mobility* (i.e. items MC24*a*, *c*, *d*, *e* and *j*) like *saving time*, *parking easiness* or *traffic jam avoidance*. By contrast, ***Rambler*** profile (corresponding to item MC25c and MC25f) is more correlated with three *feelings and spirit* motivations (MC24*b*, *f* and *k*, i.e. *pleasure*, *biking spirit*, and *freedom feeling*). The profile of ***Traveller*** (item MC25f) is more correlated with the *biking in group* item (MC25d) and *green driving* (MC25e). Lastly, the profile of ***Sport Rider*** (item MC25b) is primarily correlated with enjoying *acceleration and speed* (item MC24g).

Items MC24h and MC24i (*having no car* or *no choice)* were not correlated with a particular profile of motorcyclist.

Further statistical analyses classified motorcyclists into one four subgroups, defined by the profiles identified above (i.e. *Commuters*, *Sport Riders*, *Ramblers* and *Travellers)* and described the characteristics of each subgroup.

Subgroups of Motorcyclists and their Characteristics

Classification of Motorcyclists into profile subgroups

Participants' profiling was primarily based on their answers for MC25 items (i.e. *Are you using your motorbike* as a (i) ***Commuter*** *for home-work travels* [MC25a], as a (ii) ***Sport-rider*** *liking high speeds on road* [MC25b], as a (iii) ***Rambler*** *for fun* [MC25c], or as a (iv) ***Traveller*** *for long distance travel* [MC25f]). Participants' responses for these items were given through 6-levels scales (1= never, 2= rarely, 3= sometimes, 4= often, 5= very often, 6= always), so the responses were not exclusive.

Therefore, it was required to identify the ***dominant profile*** of each participant in order to classify him/her in one of the four profile subgroups. If only one item was rated (e.g. Traveller= 4), participant was categorised as members of that group. More commonly, different ratings were given by a respondent to various MC25 items (profiles). The decision rule was that item given the highest rating was considered the profile chosen. In case of a tie (e.g. Sport= 6 and Commuter= 6), a set of secondary items where considered for making the decision, like the *type of motorbike* used (more particularly Sport Type for identifying Sport riders, and Scooter for identifying Commuters) or their main *motivations* for using a motorbike (e.g. *saving time* for Commuter, *pleasure* for Rambler, *acceleration and speed* for Sport riders, and *biking group* for Travellers). Lastly, in case of "No Answer", or if the highest value(s) for MC25 items was "Never", participants were considered as *unclassifiable*, and then excluded of our sample (50 cases, 1.1% of the respondents, could not be classified).

Table 2 shows the results of the classification of the motorcyclists in the sample into the four profile subgroups. The size composition of the subgroups represents the total SARTRE 4 sample and not necessarily a particular country. In the next sections we compare the four profile sub-groups in terms of rider and motorcycle characteristics, training and experience.

Table 2: Classification of motorcyclists into four Profile Groups.

Profiles	Number of participants per group (N)	Percentage
Commuters (C)	1339	30.2%
Ramblers (R)	1670	37.7%
Sport Riders (S)	925	20.9%
Travellers (T)	499	11.3%
Total	4433	100%

Riding and Driving Experience

Table 3 presents profile group means for amount of riding and driving a motorcycle and a car, respectively, years of experience riding a motorcycle, and age. With the exception of MC km travel by Ramblers, which is significantly lower than compared to other groups, other characteristics are not impressively different across profiles groups (even as several pairwise differences are statistically significant due to the large number of cases involved).

Table 3: Driving experience, per profiles.

Profiles	MC01 (Km/year Riding MC)	MC02 (Km/year Driving car)	MC29 (MC years of experience)	Age Mean Years (SD)
Commuters (C)	7588	7268	13	38 years (SD : 12)
Sports (S)	8225	13795	12	36 years (SD : 12)
Ramblers (R)	4652	15855	15	42 years (SD : 14)
Travellers (T)	9472	13890	15	40 years (SD : 13)
*Sig. Diff.	C≠R,S,T R≠S,T & S≠T	C≠R,S,T R≠S	C,S≠R,T	C≠R,S,T R≠S,T & S≠T

**Legend: in Significant Differences cells, C means Commuter, R means Rambler, S means Sport Riders and T means Traveller*

Kind of Motorbikes used

Table 4 presents the type of motorbikes used per each groups of motorcyclists. First at all, it must be noted that "Conventional Street" motorbikes are used by a large part of the members of each groups (from 20 to 31.5%). It is however the dominant type of motorbike used by *Ramblers*.

Table 4: types of motorbike, per profiles.

Profiles (N)	Kind of Motorbike used (%, N)						Total
	Conv. Street	Sport Style	Touring	Enduro	Chopper	Scooter	
Commuters	23.6% (306)	2.9% (38)	11.8% (153)	13.6% (176)	6.1% (79)	42% (545)	100%
Ramblers	31.5% (483)	18.1% (278)	16.2% (249)	12.8% (196)	14.7% (226)	6.7% (103)	100%
Sport Riders	20.8% (184)	44.8% (396)	11.3% (100)	13.7% (121)	6.6% (58)	2.7% (24)	100%
Travellers	22.3% (105)	17.2% (81)	18.7% (88)	19.1% (90)	13.6% (64)	8.9% (42)	100%
Mean (N=4185)	25.8% (1078)	18.9% (793)	14.1% (590)	13.9% (583)	10.2% (427)	17.1% (714)	100% (4185)

On the other side, Scooters are the typical motorbike used by *Commuters* (used by 42% of them against by less of 9% of the members of the other groups) and sport style motorbikes are mainly driven by *Sport Riders* (45% of them). Moreover, a highest percentage of *Ramblers* and *Travellers* - in comparison with *Commuters* and *Sport Riders* - ride Touring motorbikes and Choppers. Lastly, Enduros (Off-road bikes) are proportionally more associated with the group of *Travellers*.

Table 5: Engine size, per profiles.

Profiles (N)	Engine Type			Mean Engine Size (MC27)	Sign Diff.
	0-125 cc	126-500cc	More than 500cc		
Commuters (N=1306)	37.2 % (486)	31.5% (411)	31.3 (409)	401 cc	C ≠ R,S,T
Ramblers (N=1637)	15% (245)	20.6% (337)	64.4% (1055)	670 cc	
Sport Riders (N=897)	11.4% (102)	22.3% (200)	66.3% (595)	659 cc	
Travellers (N=488)	11.1% (54)	18.2% (89)	70.7% (345)	735 cc	
Mean (N=4328)	20.5% (887)	24% (1037)	55.5% (2404)		

Table 5 shows that *Commuters* ride on less powerful motorbikes than others groups of motorcyclists (400cc as mean value, against 659-735 cc). This mean value is indeed due to the highest proportion (about 70%) of 125cc and 126-500cc motorbikes used in the group of *Commuters*. The other three groups clearly ride larger motorcycles.

Advanced motorcycle skill courses

Table 6 shows another significant difference between Commuters subgroup and the three other groups. A smaller percentage of Commuters (18.9%) reported having completed advanced motorcycling courses compared to all other groups (23%-29%).

Table 6: Participants having completed advanced motorcycle skill courses.

Profiles	Percentage of participants having completed advanced motorcycle skill courses			
	YES	NO	Total	Significant Differences
Commuters	18.9%	81%	100%	C ≠ R,S,T
Ramblers	23.3%	76.7%	100%	
Sport Riders	24.5%	75.5%	100%	
Travellers	28.9%	71.1%	100%	
Mean	22.9%	77.1%	100%	

Average number of months a motorbike is used per year

Table 7 shows differences in the extent of using motorcycles over a year. First at all, *Ramblers* used their motorbike during the shortest period of a year (58% of them riding between 5-8 months/year; mean duration of 6 m/y) and *Commuters* during the longest period (50% of them riding throughout the year; mean duration of 10 m/y). At the intermediate level, *Sport Riders* and *Travellers* use their motorbikes in mean 8 m/y.

Table 7: Number of months/year motorcycle is used, per profiles.

	Number of months when riding (MC30)													Mean Duration
	0	1	2	3	4	5	6	7	8	9	10	11	12	
C	0.3%	0.5%	1.1%	2%	2.8%	4.3%	8.5%	5.8%	6.8%	4.9%	8.7%	4.4%	49.9%	10 m/y
R	0.1%	2.9%	3.2%	7.6%	9%	14.3%	22%	12.1%	9.6%	4.9%	3.3%	0.9%	10.2%	8 m/y
S	0.4%	1.4%	1.9%	4.8%	8.1%	8.4%	15.4%	9.7%	9.9%	5.1%	7.8%	2%	25%	6 m/y
T	0%	0.6%	1.2%	4.7%	6%	11.3%	19.2%	9.5%	11.5%	3.3%	7.8%	1.6%	23.1%	8 m/y
Mean	0.2%	1.6%	2.1%	5%	6.6%	9.7%	16.3%	9.4%	9.1%	4.8%	6.3%	2.3%	26.6%	100%

Synthetically, it appears that Commuters use the MC primarily for daily mobility to work, school, or other regular functions, so they use the machine all year round. Ramblers, on the other hand, ride bikes primarily for pleasure, so there is an element of selection and choice in their riding, depending on having leisure time and appropriate weather and other conditions, all which serve to limit the amount of riding.

Motivations for using a motorbike (from MC24a to MC24k)

As discussed in chapter 4, Motives for driving a motorbike is assessed in SARTRE 4 survey through 11 items that can be aggregated in 3 main dimensions that are (i) *motorcycling advantages for mobility* (including *avoiding traffic jam*, *saving time*, easiness for *parking*, *cheaper* mean of transport and lastly, *reduce CO2 pollution*), (ii) *biking feeling and spirit* (that integrates 4 items: riding *pleasure*, *acceleration and speed*, *biking spirit*, and *freedom* feeling) and (iii) *imposed constraints* (based on 2 items: having *no car* or *not* any other *choice* for mobility). Table 8 (MANOVA comparing participants' positive answers), presents inter-profiles differences observed at this motivational level.

Table 8: Motivations for using a motorbike per profiles.

Profile	SaveTime (MC24a)	Pleasure (MC24b)	Parking (MC24c)	Cheaper (MC24d)	Pollution (MC24e)	Bik spirit (MC24f)	Accel. (MC24g)	No Car (MC24h)	NoChoice (MC24i)	Traf Jam (MC24j)	Freedom (MC24k)
C	86.6%	85.7%	93.3%	82.3%	58.4%	54.5%	51.8%	31.6%	37.7%	83.5%	78.7%
R	45.7%	98.5%	72.2%	52.8%	38.1%	74.3%	59.8%	12.1%	8.8%	46.5%	91.6%
S	63.2%	95.4%	80.5%	62.4%	46.1%	78.6%	82.3%	20.2%	20.4%	66.1%	90%
T	62.1%	93%	83.1%	65.9%	51.1%	80.3%	67.1%	16.6%	19.9%	69%	85.1%
Mean	63.6%	93.4%	81.5%	65.2%	47.3%	69.9%	62.9%	20.2%	21.2%	64.3%	86.7%
Sig. Diff.	C≠R,S,T R≠S,T	C≠R,S,T R≠S,T	C≠R,S,T R≠S,T	C≠R,S,T R≠S,T	C≠R,S,T R≠S,T	C≠R,S,T R≠S,T	C≠R,S,T R≠S,T; S≠T	C≠R,S,T R≠S,T	C≠R,S,T R≠S,T	C≠R,S,T R≠S,T	C≠R,S,T T≠S,R

Synthetically, similar significant differences between the 4 groups appear for the 7 items corresponding to 2 categories of motivations: *motorcycling advantages for mobility* (i.e. items MC24a, MC24c, MC24d, MC24e, MC24j) and imposed Constraint (MC24h, MC24i). These 7 types of motivations for using a motorbike are significantly more important for the group of *Commuters* and, by contrast, significantly less important for the group of *Ramblers*. Groups of *Travellers* and *Sport Riders* have in between opinions. Opposite results are found for the 4 items corresponding to "*biking feeling and spirit"* motivations (MC24b, MC24f, MC24g, MC24k). For this last set of motivations, *Commuters'* answers systematically correspond to the lowest values, against max values collected among *Ramblers* for Pleasure (intermediary values for *Sport Riders* and *Traveller*), or against *Sport Riders* - sometimes with *Travellers* and/or *Ramblers* - for Acceleration, Freedom feeling and Biking Spirit.

Inter-profiles comparisons regarding attitudes towards risk and risk taking

The following tables (based on MANOVA) presents inter-profiles differences concerning attitudes towards risk and risk taking, by successively considering speed, safety equipment wearing, alcohol and risky behaviour when riding.

Attitudes and practices concerning speeding

Table 9 summarises what MC riders thought about speeding behaviour of "other motorcyclists" on various types of roads, and their own experience of being checked for speed or given a speeding ticket in the last three years. Motorcyclists of all profile groups had essentially similar opinions about the speed limit braking by other motorcyclists (that 50% of MC brake speed limits on urban roads, 68% on country roads, and 72 - 73% on major inter-urban roads and motorways).

Table 9: Inter-profiles comparisons concerning others MC speeding attitudes and practices*.

ITEMS	Speed limits braking (Mc03)				Speed Check (probability)	Speed Ticket (during the last 3 years)
GROUPS	Mc03a (Motorway)	Mc03b (Inter-town)	Mc03c (Country)	Mc3d (Urban)	Mc04	Mc05
Commuters	71.2%	72%	66.7%	52.9%	20%	16.1%
Ramblers	74%	71.7%	69.9%	48.2%	14.7%	15.6%
Sports	75.4%	73%	68%	51.6%	23.1%	28.7%
Travellers	71.2%	66.5%	60.5%	51%	23.4%	23.2%
Mean	73.1%	71.5%	67.5%	50.6%	19%	19.3%
Sig. Dif.	C ≠ S	T ≠ C, R, S	T ≠ C,R, S	C ≠ R	R ≠ C, S, T	S≠C,R,T & T≠C, R

**(% answering that other MC Often to Always brake speed limit; % of positive answers for speed check/ticket).*

The overall rate of observing speed checks and receiving speed tickets was similar (19% of the sample) but, as might be expected, riders in the Sport and Travellers profiles reported significantly higher rates of speed checks and tickets, compared to Commuters and Ramblers. As we have seen in section C2.2, Sports and Travellers profile-groups, use more powerful and sporty MC machines (which they typically ride on inter-urban roads), and accumulate fairly large annual kilometrage. All these factors may increase the probability of speeding and being checked or ticketed for speeding.

Use and opinions about helmets and other protective clothing

Table 10 shows that the majority of riders (about 95%) from all sub-groups report wearing helmets often or always on all types of roads. Sports riders report a slightly lower rate than others. Most riders (94-98%) believe in the efficacy of helmets, only 8-13% agree that helmets are not necessary if one drives carefully, 11-22% enjoy riding without a helmet (not clear if this implies actual practice or a wishful statement), majority (87-94%) believe that their friends also wear helmets, yet 15-23% of the riders agree with the statement “I only wear a helmet because it is the law”.

Table 10: Inter-profiles comparison concerning Helmet*.

ITEMS	Helmet wearing practices (Mc06)				Opinion concerning Helmet wearing (Mc08)					Helmet Ticket
GROUPS	Mc06a (highway)	Mc06b (Inter)	Mc06c (Cntry)	Mc06d (Urb.)	Mc08a (R. risk)	Mc08b (Carful)	Mc08c (no h.)	Mc08d (friend)	Mc08e (law)	Mc09
Commuters	96.1%	96.2%	94.9%	91.3%	97%	12%	18.5%	87.9%	23.3%	5.9%
Ramblers	98.2%	98.4%	98.4%	97.9%	97.5%	7.6%	11.1%	93.6%	15.2%	1.8%
Sports	94.3%	94%	92.9%	89.9%	93.7%	13.1%	22%	87.5%	22.4%	7.2%
Travellers	97.1%	96.7%	96.7%	95.4%	93.8%	13.3%	19.1%	90.9%	22.8%	4.6%
Total	96.6%	96.7%	96.1%	94.1%	96.2%	10.6%	16.4%	90.4%	19.9%	4.4%
Sig. Dif.	S≠C,R,T R≠C	S≠C,R,T R≠C	S≠C,R,T R≠C	S,C≠R,T	C,R≠ S,T	R≠C,S,T	R≠C,S,T S≠C	R≠C,S	R≠C,S,T	R≠C,S,T S≠T

**(Helmet wearing: % saying Often to Always; Opinions: % saying agree Very to Fairly)*

Only small proportion of riders reported receiving tickets for not wearing a helmet (from 1.8% by Ramblers to 7.2% by Sports riders). Several of the differences between profile groups in reported helmet wearing rates, ticketing rates and opinions about helmet use significant, as shown in Table 10. In general, the Ramblers group exhibit a slightly more ‘pro helmet’ behaviour and opinions, while the opposite is true for the Sports group of riders.

Table 11 shows what type of helmet, if fastened, and what other protective gear are used most often by riders in the four profile groups. Also shown the percentage of motorcyclists habitually carrying a passenger with them and how the passenger lacks a helmet.

Table 11: Type of helmets and use of other protective clothing*.

ITEMS	Safety equipment wearing (Mc07)							
GROUPS	Mc07a (Full face)	Mc07b half)	Mc07c (Fasten)	Mc07d (Jacket)	Mc07e (Back pr.)	Mc07f (Shoes)	Mc07g (Passenger)	Mc07h (Pas. helmet)
Commuters	76.6%	31.4%	90.5%	53.2%	32%	34.4%	23.9%	8.4%
Ramblers	78.2%	25.3%	96.7%	74.8%	47.7%	62.1%	15.6%	3.1%
Sports	84.2%	22.2%	89.7%	75.7%	56.6%	63.3%	23.6%	9.7%
Travellers	82.3%	27.4%	94.4%	79.1%	60.9%	71.5%	29.9%	8.1%
Total	79.4%	26.7%	93.1%	68.9%	46.2%	55.1%	21.4%	6.6%
Sig. Dif. (MANOVA)	C≠ S,T S≠R	C≠R,S S≠T	C,S≠R,T	C≠R,S,T S≠R,T	C≠R,S,T R≠S,T	C≠R,S,T T≠R,S	R≠ C,S,T T≠C,S	R≠C,S,T

**(% answering using item (or drive with a passenger) Often to Always)*

Majority of helmets in frequent use are full-face helmets (77-84%) but also half-helmet are common (22- 31%). Some riders use both types. Most riders (90-97%) claim they fasten the straps of the helmet when used, many (53-79%) use a special jacket when riding a motorbike, about half (48-61%) use a back support, and more than half wear riding shoes (34-71%). In all the categories of personal protective clothing the group of Commuters stands out as the one with the lowest values of use, while the group of Travellers has tends to have higher use rates compared to the remaining groups, but the differences are smaller and less consistent.

Most motorcyclists' rides are solo. In the Ramblers profile group 15.6% reported frequent trips with a passenger while in the Travellers group the rate was almost doubler (29.9%) and in the Sports and Commuters groups the rate was reported about 24%. Over 90% of the passengers in bike riding wore helmets, according to the respondents. The highest level of head protection for passengers was actually in the Ramblers group, where only 3.1% of riding passengers did not wear a helmet. Perhaps this is related to the fact that this group is has the smallest habit (15.6%) of taking passengers, compared to other Profile Groups.

Attitude and practices concerning alcohol

Table 12 summarises the mean rider Group responses for survey items dealing with attitudes and opinions, about drinking and driving, drinking experience, and drink-driving enforcement experience.

Table 12: Drink driving attitudes, opinion and experience*.

ITEMS	Drinking Attitude (Mc10, Mc11, Mc12)				Few Drink	Much Drink	Legal limit	Alcohol Control	Alcohol Ticket	Check Prob.
GROUPS	Mc10a (Carfu.)	Mc10b (Accid.)	Mc10c (Police)	Mc10d (Friend)	Mc11	Mc12	Mc14	Mc15	Mc16	Mc17
Commuters	8.5%	93.5%	74.4%	17.8%	4%	1%	45.2%	38.2%	3.2%	10.1%
Ramblers	3.4%	94.6%	80.1%	7.3%	0.7%	0.4%	30.9%	34.9%	1%	7.9%
Sports	9.3%	91%	74.9%	19.3%	3.8%	1.8%	42.5%	41.1%	5.1%	11.8%
Travellers	8.4%	91.4%	78.4%	21.2%	4.2%	2.2%	41.2%	40.6%	3.2%	11.3%
Total	6.7%	93.2%	77.1%	14.5%	2.7%	1.1%	38.8%	37.9%	2.8%	9.8%
Sig. Dif. (MANOVA)	R≠C,S,T	R≠S,T	R≠C,S	R≠C,S,T	R≠C,S,T	C,R≠S,T	R≠C,S,T	R≠S,T	R≠C,S,T	R≠C,S,T

**(% answering Often to Always, Very often to Fairly, or got a ticket).*

The Ramblers group displays the highest awareness for the risks of drink- driving and the highest acceptance of control measures, compared to the three other groups of motorcyclists, particularly compared to Sport Riders and Traveller. Only 3.4% of the Ramblers group (against 8.5-9.5% for others MC) believe that it is possible to drink and drive if carefully driving, 80% believe that Drinking and Driving results in being stopped by police (against 74.5 to 78.5% for other groups), only 7.3% accept that their motorcycle rider friends drink and drive (against 18-21% for other MC), less than 1% admit to have driven often after drinking just a little (versus 4% for other groups), less than a 0.5% admit to drive often after possibly drinking over the limit (versus from 1% to 2.2% for others), and only 31% of them supported and increase in the legal alcohol limit (against 41-45% for other profiles).

The group of Ramblers has also less contact with police enforcement: 35% of them (compared to 38-41% in other groups) have been checked for alcohol by a police control, only 1% reported being ticketed for alcohol offence (compared to 3.2% and 5.1% in the other groups), and in agreement with their personal experience, they assess with the lowest rate the probability to be checked for alcohol on their typical motorcycle journey (8% compared to about 11% by other groups).

Self-reported risky riding actions and assessment of their dangerousness

MC riders reported how often they engaged in certain behaviours in traffic, and in a separate question they assessed the riskiness of such actions.

Table 13: Engaging in risky traffic behaviours and danger values of such behaviours*.

ITEMS	Risky Manoeuvres Implemented (Mc21)				Manoeuvres Dangerousness Assessment (Mc23)			
GROUPS	Mc21a (Close)	Mc21b (Pedst)	Mc21c (Amber)	Mc21d (Overtk.)	Mc23a (Weav Urb)	Mc23b (Weav Mot)	Mc23c (Overt. L.)	Mc23d (Overt. R)
Commuters	19.3%	85.5%	25.7%	24%	80.4%	84.6%	77.5%	82.9%
Ramblers	10.2%	85.2%	15.4%	18.5%	80.2%	82.1%	70.7%	85.1%
Sports	21.3%	76.6%	29.7%	30.4%	73.8%	76.4%	69.9%	80.6%
Travellers	15.9%	84.3%	20.8%	23.9%	80.7%	82.7%	70.7%	81.7%
Mean	16%	83.4%	22.1%	23.3%	79.6%	81.8%	72.6%	83.1%
Sig. Dif. (MANOVA)	R≠C,S,T S≠ T	S≠C,R,T	R≠C,S,T S≠C,T ; T≠C	S≠C,R,T R≠C	S≠C,R,T	S≠C,R,T	C≠R,S,T	R≠S

**(% answering Often to Always acting so, Very to Fairly dangerous)*

Table 13 presents the mean group values (and MANOVA) of proportion of riders who frequently committed the actions and the corresponding proportion of riders who deemed such actions as Very or Fairly dangerous. Sports riders consistently and significantly reported larger proportion of riders committing risky actions (‘yielding to pedestrian’ should be read as a reversed scale) compared to riders in other groups, and particularly compared to the Ramblers group. In a similar way Sport Riders assess as less dangerous, than the other groups, motorcycling maneuvers such as weaving (in urban area or on motorway) or overtaking cars between lines or on the right.

Accidents rates of the four Profile groups

Table 14 presents the incidence of accidents in each group, the mean number of accidents per group, and the accident rates per 100.000 km, all based on self-reported injury accidents in three years and self- reported kilometrage. The only significant difference between the groups in accidents rates, with or without out considering exposure, is a lower rate for the Ramblers groups compared to the three other groups.

This result must be however considered with caution, according to the fact that *Ramblers* covered a significant lowest number of kilometres per year with a motorbike, comparing with the 3 other groups (only 4652 km/year, against 7588 for *Commuters*, 8225 for *Sport Riders* and 9472 for *Travellers*; see Table 3) and – more significant - ride their bike during a shortest period (6-months per year, against 8 months for *Sport Riders* and *Travellers* and 10 months for *Commuters*; see Table 7), potentially excluding motorcycling practice under bad weather conditions. If the rate of accident per 100.000 km covered seems to confirm a lowest accident risk for *Ramblers* (1.72, against a risk of 2.3 for *Sport Riders* or *Travellers* and of 2.63 for *Commuters*), this MC group probably mainly use their motorbike during the summer period and/or under better weather conditions than others groups. By contrast, *Commuters* ride their bike 10 months per year including autumn and winter periods (in-between values were collected among *Sport Riders* and *Travellers*). Accident risk differences observed between groups could be thus potentially explained by such differences in riding practices (or not) under bad weather conditions.

Table 14: Inter-profiles comparison concerning the number of accident.

Groups (N=4351)	Number of accident when motorcycling during the last 3 years(MC19)			Mean values and rates	
	No accident	1 accident	2 and more accidents	Mean accidents number during the last three years	Mean accident Rate per 10^5 km
Commuters	87.8% (N=1139)	9.4% (N=122)	2.8% (N=36)	0.20	2.63
Ramblers	93.9% (N=1564)	5.0% (N=83)	1.1% (N=19)	0.08	1.72
Sports	86.0% (N=772)	11.2% (N=101)	2.8% (N=25)	0.19	2.31
Travellers	86.5% (N=424)	8.4% (N=41)	5.1% (N=25)	0.22	2.32
Mean	89.6% (N=3899)	8% (N=347)	2.1% (N=105)	0.17	2.17
Sig. Dif. (ANOVA)		R ≠ C,S,T			

Discussion concerning Motorcyclists' profiles

By considering the results presented, it appears that the 4 profiles of motorcyclists identified through this SARTRE 4 survey are very contrasted according to their motivations for driving a motorbike and to their attitude towards risk and risk taking when motorcycling. Indeed, if they are *in means* globally comparable concerning their general characteristics like *Age* (39 years old more or less 3 years) and *Motorcycling Experience* (from 4500 to 9500 km/year and around 14 years of riding practice), they are by contrast very different regarding other dimensions investigated in this survey. The following section gives a synthetic overview of each one of these 4 profiles.

Commuters: by contrast with the 3 other groups, Commuters typically ride Scooters (used by 42% of them against by less of 9% 3 other motorcyclists) and less powerful motorbikes, due to the highest proportion of 125cc and then 126-500cc motorbikes used in by 70% of the *Commuters* (versus 35% for the other groups). Moreover, a lowest number of Commuters (against the 3 other groups) have completed advanced motorcycle skill courses. From the other side, a large part of them (50%) use their motorbike during all the year, that is significantly from 2 to 4-months more of use than of the 3 other groups. Their motivations for driving a motorbike primarily concern *motorcycling advantages for mobility* (i.e. *avoiding traffic jam*, *saving time*, easiness for *parking*, *cheaper* mean of transport and lastly, *reduce CO2 pollution*) and, for one third of them, because of imposed constraints (i.e. having *no car* for 32% of them or *not* any other *choice* for mobility for 38% of them). In any case, pleasure of riding is significantly less important for this group of motorcyclists against the others, and they are clearly not interested in *biking spirit* or *acceleration feeling*. Concerning their attitudes towards risk and risk taking when riding, they had a lowest number of speed tickets (16.1%) than Sport Riders (28.7%) and Travellers (23.2%), but they seems not very different of these 2 other sub-groups concerning both attitudes towards speed (except for speed limit breaking in urban area) and alcohol when riding. They generally wear a helmet when they drive a motorbike (95%) and they are well aware of helmet positive effect for their safety in case of accident. However, 8.4% of them sometime ride a passenger without helmet (against only 3% of the Ramblers, but not more than Sport riders and Travellers). Moreover, and in contrast with the 3 other groups, they significantly less frequently used other safety equipment when riding (like jackets, back protections and motorbike shoes). In terms of risky manoeuvres implemented when motorcycling, they are mainly concerned (against Ramblers and Travellers) by too close car-following distance keeping and critical overtaking *(i.e. overtaking when they think they can just make it)*. By contrast, they seems very aware of the dangerousness of riding manoeuvres like *weaving* (in urban area or on motorway) or *overtaking cars between lines*.

Sport Riders: by contrast with the 3 other groups, a highest proportion (45 %) of the Sport Riders ride Sport style powerful motorbikes (670 cc), and 25% of them (against 19% of the Commuters) have completed advanced motorcycle skill courses. Their motivations for driving a motorcycle primarily concern the pleasure of riding (95%), freedom feeling (90%) and acceleration sensations (82%). Biking spirit is also very important for this group (79%; highest values collected for this group and for travellers). Moreover, and even if less essential, *motorcycling advantages for mobility* (more particularly *avoiding traffic jam*, *saving time*, and easiness for *parking*) are also very important motivations for a large part of Sport Riders (around 60%). By contrast, *imposed constraints* like having no car or not any other choice for mobility, is not relevant for 80% of these motorcyclists. Concerning their attitudes towards risk and risk taking when riding, they surely like speed and acceleration when riding, and they have had a significantly highest number of speed tickets (28,7%) than other groups. They are aware of alcohol risk when riding, and like the other groups, they generally not ride their bike when they have drunk, even if 5% of them have been fined or punished in any other way for driving a motorcycle under the influence of alcohol during the past three years (not any significant difference with other groups, except for Ramblers). They also generally wear a helmet when they ride (90%) and they are well aware of helmet positive effect for their safety in case of accident (93,5%). Moreover, like Ramblers and Travellers (but against Commuters) they frequently used specific jackets, back protections and motorbike shoes when riding. In terms of risky manoeuvres implemented when motorcycling, they have more risky practices than the others groups regarding MC21 items and they seems also less aware of the dangerousness of *weaving* manoeuvres (in urban area or on motorway) and *overtaking vehicles on the right*.

Ramblers: Conventional Street Power full motorbikes is the main type of motorbike drove by this group of motorcyclist (32%), but a significant number of ramblers also ride Sport Style motorbikes (18%), Touring motorbikes (16%) or Choppers (15%). Against Commuters (but like Sport Riders and Travellers), 23% of them (against 19% for the Commuters) have completed advanced motorcycle skill courses. From the other side, and by contrast with the 3 other groups, ramblers significantly less used their motorbike during the year (only 6 months in means, against 8 for Sport Riders and Travellers and 10 for Commuters). Their main motivations for driving a motorbike were clearly fun and pleasure of riding (98,5%) and freedom feeling (90%). However, Biking spirit (74%) and Acceleration enjoying (60%) were also important for this group of riders. On the contrary, and against the 3 other groups, *motorcycling advantages for mobility* (more particularly *avoiding traffic jam*, *saving time*, and easiness for *parking*) were clearly not important motivations for a large part of them (around 50%) and *imposed constraints* - like having no car or not any other choice for mobility – are totally marginal motivations for this group of motorcyclists. In the same way, economical motivations (i.e. cheaper mean of transport) are clearly less important for this group than for the others. Concerning their attitudes towards risk and risk taking when riding, they have had a lower number of speed tickets (15.6%) than Sport Riders (28.7%) and Travellers (23.2%) and they seemed more aware than Commuters of speed risk in urban area. They had also a very careful attitude towards alcohol when riding and, with the group of Travellers, they had the highest positive attitude towards helmet wearing when they drove a motorbike, and they were very aware of helmet interest for riders' safety, for themselves as well as for their passenger (less than 2% of helmet Tickets, against 5 to 7% for other groups). In terms of risky manoeuvres implemented when motorcycling, they obtained the lowest values concerning all the risky practices investigated in this survey and they seemed also very aware of the dangerousness of *weaving* manoeuvres (in urban area or on motorway) and *overtaking vehicles on the right* as well as *between lines*.

Travellers: This is the group of riders having the highest level of motorcycling experience of our sample, in terms the number of kilometres covered per year with a motorcycle. Like the group of ramblers, Conventional Street motorbikes was the main type of motorbike driven by this group of motorcyclist (22%), but a high number of travellers ride Touring motorbikes (19%) and then Choppers (14%). Moreover, a significant highest proportion of them (19% against 13% for the other groups) ride Off-Road bikes (Enduro). It was also the group with the highest number of motorcyclists having completed advanced motorcycle skill courses. As Sport Riders and Ramblers, their main motivations for driving a motorbike were clearly pleasure of riding (93%) and freedom feeling (85%) and Biking spirit (80%; highest value collected). In contrast with Ramblers, but like Sport Riders, *motorcycling advantages for mobility* (more particularly for *saving time*, *avoiding traffic jam*, and *parking* easiness) were also important motivations for a large part of them (from 62 to 83%). By contrast with about 35% of Commuters, *imposed constraints* like having no car or not any other choice for mobility, was not relevant for 82% of these motorcyclists. They ride above all because they like it. Concerning their attitudes towards risk and risk taking when riding, they seemed less interested by speed than other groups, but especially Sport Riders, even if 23% of them had been fined or punished in any other way for speed limit breaking during the last past years. They seemed globally aware of alcohol risk when riding and they had a very positive attitude towards helmet wearing, and were also fully aware of helmet interest in case of accident. Moreover, like Sport Riders and Ramblers (against Commuters), but in a more important way, they frequently used specific jackets, back protections and motorbike shoes when riding. Lastly, in terms of risky manoeuvres implemented when motorcycling, they less often followed vehicle with a too close distance than Commuters or Sport Riders, and they less often implemented critical overtaking manoeuvres (i.e. when they think they can just make it) than these 2 other groups of motorcyclists. Lastly, they were also more aware than Sport Riders of the dangerousness of weaving manoeuvres (in urban area or on motorway) and overtaking vehicles on the right.

Conclusion and perspectives

As a general conclusion of this chapter, results obtained through SARTRE 4 survey concerning motorcyclists profiling show that significant differences exists between sub-groups of riders, regarding both their motivations for driving a motorbike, their motorcycling practices, and their respective attitudes towards risk and risk taking while motorcycling. Countermeasures among motorcyclists liable to be implemented for increasing road safety (in terms of awareness campaign, training, riding licences or traffic laws, for example) should probably take into account these sub-groups characteristics and their respective specificities, in order to be specifically adapted according to each motorcyclist's profile. Such type of dedicated "target approach" per profile may be a more efficient way for road safety than general countermeasures among all the riders.

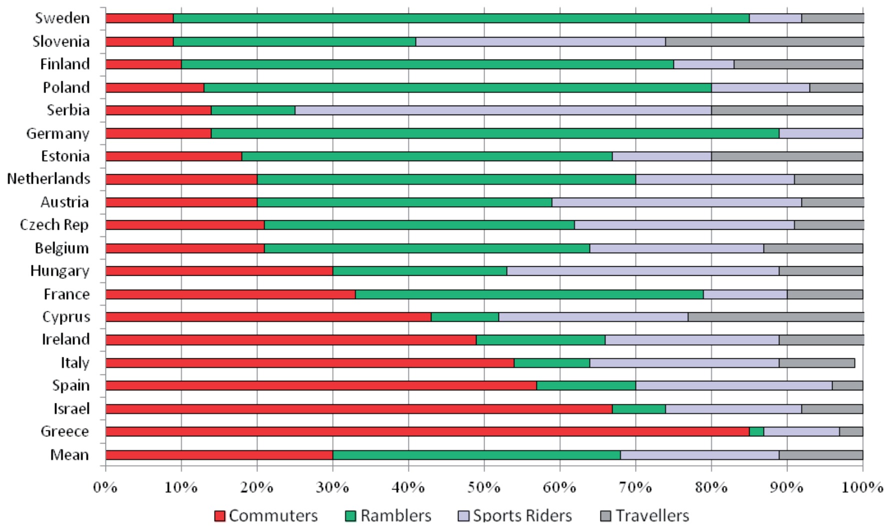

Figure 1: Percentages of each profile per country.

Moreover, it is also important to precise that the percentages of motorcyclists of each profile are country-dependant. The Table 15 shows, for example, that Commuters represent a high proportion of motorcyclists in Greece (85%), Israel (67%), Spain (57%), Italy (54%) and then Cyprus (43%). By contrast, less than 15% of motorcyclists are Commuters in Sweden, Slovenia, Finland, Poland, Serbia and Germany. On the contrary, highest rates of Ramblers are observed in Sweden (76%), Germany (75%), Poland (67%), Finland (65%), Netherlands (50%) and then France (49%), against lowest rates for Greece (2%), Israel (7%), Cyprus (9%), Italy (10%), Serbia (11%) and Spain (13%). From their side, Sport Riders are over-represented in Serbia (55%), Hungary (36%), Slovenia and Austria (33%), but they only represent a lowest percentage of motorcyclists in Sweden (7%), Finland (8%), Greece (10%), France and Germany (11%). Lastly, Travellers are overrepresented in Slovenia (27%), Cyprus (24%), Serbia (20%), Estonia (20%) and Finland (17%), but represent less than 5% of motorcyclists from Germany, Greece or Spain.

According to these inter-countries specificities, road safety approaches should be also adapted per country by considering dominant profiles of their respective populations of motorcyclists. In several South countries (like Greece, Israel, Spain, or Italy) but also in Ireland, Commuters represents the dominant group (from 50 to 85% of the motorcyclists), and countermeasures in terms of road safety regarding motorcyclists should be consequently primarily focused on this group of riders. From another side, Ramblers are the dominant group (from 50 to 76%) in Sweden, Germany, Poland, Finland, and Netherlands and this profile could be the primary “target group” to be considered in this countries. By contrast, Sport Riders are the dominant group in 3 central European countries that are Serbia, Hungary and Slovenia, but they also represent between 10 and 20% of the motorcyclist in each country. Lastly Travellers is a very marginal profile in several countries, like Germany, Greece or Spain, and is only an important group of motorcyclists in 4 countries (i.e. more than 20% of the riders): Slovenia, Cyprus, Serbia, and Estonia (and then 17% in Finland). According to these last set of results, it seems that potential based-profiles countermeasures dedicated to motorcyclist safety should be also adapted to each country.

Chapter 2.8

Summary and recommendations for Powered Two Wheelers

Hardy Holte (BASt)

Motorcycles (MC) take 2% to 25% share of motorized personal vehicles, in different EU countries. As expected more men than women and more young than old people ride a motorcycle. The consideration of age composition of MC driver population is particularly important in comparing motorcycling attributes and safety between countries. This is because many other attributes of motorcycling may be linked to user's age (e.g. MC type & size, riding experience, MC usage patterns, amount of driving, safety attitudes). The basic attributes of motorcycling (type, size, rider age, and usage) vary considerably between countries. High proportion of scooter riders is more typical in Mediterranean countries, high proportions of conventional street machines in northern countries. In Mediterranean countries smaller engine size up to 250cc will be found; in northern countries higher engine size above 750cc is used. Nearly daily use of motorcycle most frequently occurs in southern countries than in northern countries. There are large differences between the countries concerning education of motorcyclists.

Speeding is a crucial cause of motorcyclists being involved in road accidents. This is also true for the majority of the respondents. 73% of MC drivers considered speeding as a 'cause of motorcyclists being involved in road accidents'. About 70% believed that speeding by other motorcycle riders was very prevalent on motorways, major inter-urban roads and country roads, and 41% thought they speed also in built-up areas. 10% of motorcyclists reported receiving a speeding ticket (in the three last years) and 19% believe there is a good chance of them being checked for speeding. Basic motorcycling attributes, in particular frequency and amount of use, MC type and rider age, were associated with receiving speeding tickets. Proportion of speed-ticketed MC drivers in different EU countries ranged from 5% to 35%. There were no self-evident country characteristics to explain the differences. As in MC reported accidents, interpretation of differences in speed reported ticketing between countries needs to consider the variation in basic motorcycling attributes, such as MC use patterns and rider age distribution. A total of 40% of MC drivers were in favor of using in-vehicle speed limiters, 59% supported regular speed cameras, 49% supported zone based speed cameras, and 42% were in favor of increasing the use of 30 km zones in built-up areas. The support increased with age. In countries with already strong speed control measures, for all or part of the roadway system, MC drivers were less inclined to support further implementation of such measures, whereas in countries lacking strong controls drivers were in favor of adopting them.

Concerning the problem behaviour ***driving a motorcycle while impaired*** a number of results have been revealed: The proportion of motorcyclists who declared that they drove, at least once during the last month, after they had drunk even a small amount of alcohol is 23%. Frequent motorcyclists reported drink-driving more often. A regional pattern was identified: Northern and Eastern countries have declared very low frequencies of drink-driving, whereas Southern countries have a significant number of motorcyclists declaring some drink-driving during the last month. This may be partly attributed to the increased use of motorcycles in Southern Europe, making driving behaviour more lenient, and partly to the poorer road safety culture in these countries compared to the rest of Europe. As we found young and male motorcyclists, and riders of small motorcycles, reported more frequent drink-driving, especially in Southern countries. This confirms existing research findings, as these groups are often associated with reckless and risk taking behaviour, and negative road safety attitudes in general.

European motorcyclists reported a relatively low rate of alcohol controls in their countries (62% were never controlled in the last 3 years). They also reported a very low perceived risk of apprehension (i.e. probability of being controlled). This suggests that the existing levels of enforcement in most countries are not sufficient and more systematic enforcement (in time and in space) is required. As expected, more frequent motorcyclists appear to be more frequently controlled. Only 3% of the participants have been fined for alcohol in the last 3 years, although the results vary from <1% to 6% in different countries. It was also found that motorcyclists fined for alcohol were also fined for speeding. However, European motorcyclists believe that they are very likely to be fined when drink-driving, if controlled. Their attitudes towards changes in BAC limits are clearly affected by the current limits in each country. In countries where the current legal BAC is zero, the proportion of those who think that motorcycle drivers should be allowed to drink "no alcohol at all" and "less alcohol than at the present", was higher than the average. In countries that allow a single unit BAC, the majority of respondents reported that they were in favour of more restrictive legal BAC. Southern countries were less in favour of more restrictive BAC legislation than Northern and Eastern countries.

Riding a motorcycle while impaired is one of the most dangerous situations known in road safety. The impact of alcohol on riding skills is even greater than for driving skills. Motorcyclists seem to be aware of this and often decide, when they know that they are going to drink heavily, to go by car rather than by motorcycle (Syner & Vegega, 2000). Indeed, motorcyclists are also car drivers. Unfortunately, from a road safety point of view, this adaptation is clearly not a good decision: we would have preferred that they decide not to drive or not to drink. This point is important to mention because it shows that motorcyclists are already aware of the risk associated with drink-riding. Thus, using a campaign which primarily focuses on risk awareness appears to be ineffective and other means of deterrence have to be used. Furthermore, our results also showed that punishment may not be a good way to prevent recidivism. It is possible that the effect of punishment has reached a ceiling making the implementation of more severe legal sanctions ineffective in SARTRE countries. With regards to campaigns our analyses revealed that some other messages could be used: the feeling of control ("I will be careful"), the self evaluation of BAC ("I feel good, I am certainly under the threshold") and descriptive norms ("my friends do it").

However, those results have to be moderated by cultural and geographical considerations. The type of motorcycle, the profiles of motorcyclists, the frequency of use and the number of motorcyclists differs widely between those European regions. Moreover, the above mentioned potential action targets seem to have different impacts depending on the country location. The impact of self-evaluation of BAC is greater in southern and eastern countries than in northern. The effect of friends' behaviour appeared to be more important for southern countries than for others. Finally, the feeling of control had a greater effect in eastern and northern countries. We thus recommend considering different enforcement strategies depending on the geographical situation of the target country. Southern countries should be regarded as priority targets as they cumulate a high proportion of motorcycle use within local population and a high frequency of drink-driving.

Concerning driving style, risk perception and motives for driving a motorcycle a number of results have been shown. The analysis **of *self-reported risky driving behaviour***, such as for instance following the vehicle in front too closely or overtake when you can just make it, revealed that on average one of five motorcyclists admitted to engage in these behaviours often, very often or always. A comparison of the mean score for four types of risky behaviours revealed that the southern European motorcyclists (Greece, Cyprus, Israel, Serbia) behave more risky than average and that the Western European countries (Germany, Ireland, France, Sweden, The Netherlands and Belgium) tend to drive less risky than average. On an individual level, male motorcyclists under the age of 34 and motorcyclists whose annual use of the motorcycle is high tend to be more risky. The analysis of the international differences in the ***risk perception*** for four types of behaviour (regarding overtaking and weaving) revealed that overtaking on the highway was perceived as dangerous by about 70% of the motorcyclists, whereas all other types of behaviour were perceived as dangerous by about 80%. An international comparison of the mean risk score revealed that the perceived risk is the highest in France, Germany and Ireland and the lowest in Cyprus and Hungary. On an individual level, risk perception increases with age. Advance motorcycle training correlate with risky behaviour and risk perception. These correlates differ in the European countries: In some countries these courses correlate with higher risk whereas in other countries the opposite was found. Moreover, the correlation with risky driving proved sometimes the adverse of the correlation on risk perception. Obviously, this correlation might be the consequence of the characteristics of the types of motorcyclists that decide to take courses in any particular country. Nevertheless, this result urges for a thorough analysis of the content of certain advanced courses, especially for those countries in which the advanced courses seem to promote risky behaviour (Germany) or to decrease risk perception (Israel).

A detailed analysis of the ***motives*** for driving a motorcycle showed that overall, the pleasure of motorcycling, the feeling of freedom and the easiness to find parking are the most important motives. Motives regarding motorcycling advantages for mobility and biking spirit revealed to be important secondary motives. On the basis of an international comparison of high and low national scores on the different motives, two opposite groups of countries, generally having opposite motives, were identified: a group of five Mediterranean countries (Greece, Israel, Cyprus, Spain and Italy) and a group of four North and Central European countries (Finland, Sweden, Germany and Slovenia). Motorcycling advantages for mobility appeared to be crucial reasons for using a motorbike in the Mediterranean group, but less important for the Northern group. Similarly, imposed constraints like not having a car or having no choice revealed more crucial for the Mediterranean group then for the others. Northern and Southern countries proved to be partially mixed concerning biking spirit and speed enjoyment.

The results of the survey revealed considerable differences between various groups of motorcyclists and also various countries in ***usage of helmets and other safety devices***. Besides general safety awareness of individual countries, there are complex factors affecting wearing rates. The helmet wearing rate is generally high, although still not satisfactory – 84.6% of motorcyclists in towns and 91,4% on motorways always wear their helmet. The rate is considerably lower in the youngest age group, in groups with annual mileage over 10 000 km per year, and with engine size up to 250 cc. Concerning differences between countries, the lowest rates for all types of roads are in Serbia, Greece, Cyprus, and Austria; for country roads and in built-up areas the lower rates are also seen in the Czech Republic and Italy. The motorcyclists riding motorcycles equipped with less powerful engines mostly use the roads in built up areas and the country roads; their rate of helmet wearing is below average and similar to urban usage and they more often neglect the wearing of helmets on motorways as well. The motorcyclists having a high engine capacity motorcycle wear a safety helmet more often.

A cluster analysis was carried out, including the attitudes of motorcyclists towards helmets. Three clusters were identified: safety conscious users, always following best safety practice (34%); safety compliant users, who wear helmet, but their attitudes are less responsible (52%), and safety reluctant motorcyclists (14%). The representation of the groups differs significantly by countries, with the highest percentage of safety reluctant users again in Serbia, Greece, and Cyprus (in those countries experience of punishment is the most frequent), and to certain extent also Austria, Italy and the Czech Republic.

Concerning use of other safety equipment, such as technical jacket, back protection, or technical boots, the highest wearing rates we can find in Austria, Sweden, Estonia, Ireland and Netherlands, and the lowest in Italy, Greece, Hungary and Serbia. There is a relation to styles of motorcycling typical for individual countries, but also to weather conditions.

Four ***profiles of motorcyclists*** have been identified through this SARTRE 4 survey: Commuters, Sport Riders, Ramblers and Travellers. They differ tremendously according to their motivations for driving a motorcycle and to their attitude towards risk and risk taking when motorcycling. *Sport Riders* like speed and acceleration when riding, and they have had a significantly highest number of speed tickets (28,7%) than other groups. They are aware of alcohol risk when riding, and like the other groups, they generally do not ride their bike when they have drunk, even if 5% of them have been fined or punished in any other way for driving a motorcycle under the influence of alcohol during the past three years (no meaningful difference with other groups, except for Ramblers). They also generally wear a helmet when they ride (90%) and they are well aware of helmet positive effect for their safety in case of accident (93,5%). Moreover, like Ramblers and Travellers (but against Commuters) they frequently used specific jackets, back protections and motorbike shoes when riding. In terms of risky manoeuvres implemented when motorcycling, they have more risky practices than the others groups and they also seems to be less aware of the dangerousness of *weaving* manoeuvres (in urban area or on motorway) and *overtaking vehicles on the right*.

According to these inter-country specificities, road safety approaches should be also adapted per country by considering dominant profiles of their respective populations of motorcyclists. In several southern countries (like Greece, Israel, Spain, or Italy) but also in Ireland, *Commuters* represents the dominant group (from 50 to 85% of the motorcyclists), and countermeasures in terms of road safety regarding motorcyclists should be consequently primarily focused on this group of riders. From another side, *Ramblers* are the dominant group (from 50 to 76%) in Sweden, Germany, Poland, Finland, and Netherlands and this profile could be the primary “target group” to be considered in this countries. By contrast, *Sport Riders* are the dominant group in 3 central European countries that are Serbia, Hungary and Slovenia, but they also represent between 10 and 20% of the motorcyclists in the other countries. Lastly *Travellers* is a very marginal profile in several countries, like Germany, Greece or Spain, and is only an important group of motorcyclists in 4 countries (i.e. more than 20% of the riders): Slovenia, Cyprus, Serbia, and Estonia (and then 17% in Finland). According to these last set of results, it seems that potential profile-based countermeasures dedicated to motorcyclists’ safety should be also adapted to each country. Countermeasures among motorcyclists liable to be implemented for increasing road safety (in terms of awareness campaign, training, riding licences or traffic laws, for example) should probably take into account these sub-groups characteristics and their respective specificities, in order to be specifically adapted according to each motorcyclist’s profile. Such type of dedicated “target approach” per profile may be a more efficient way for road safety than general countermeasures among all the riders.

The results of the survey revealed considerable differences in ***self-related accidents*** for the total number of accidents as well as the contribution within several subgroups (age, gender, motorcycle type and engine size) in the different countries. Several risk factors are related to accident involvement of motorcyclists in the literature. Besides the lack of experience also younger age (even if corrected for experience), alcohol consumption and speeding behaviour are factors which affect the accident risk of motorcyclists. These findings are reflected by the results of this survey as described below.

In comparison to non accident involved motorcyclists, the group of accident involved motorcyclists (I) is distributed of a higher proportion of young motorcyclists between 18-34 years of age, (II) scores higher on questions about risky behaviour, (III) has more tickets for traffic violations, (IV) indicates to have a riskier attitude towards driving under the influence of alcohol and towards helmet use, (V) scores lower on questions about risk perception and (VI) indicates more often to enjoy acceleration and high speed.

The most important factors in the comparison of accident involved and non accident involved motorcyclists are age, risky riding behaviour, tickets and drink driving. Motorcyclists attitudes, motives to ride a motorcycle and risk perception do not highly affect the accident risk of motorcyclists in this survey. One possible explanation for this fact might be an interaction effect with country and according to this with different cultures and value systems. Because of small numbers of accident involved motorcyclists in each country comparisons of accident involved and non accident involved motorcyclists separated for each country are not reliable. Therefore the participating 19 countries have been divided into a group of northern European countries and a group of southern European countries (plus Israel). Depending on the region there seem to be different risk factors relating to the accident involvement of the motorcyclists. In general the southern European countries have a higher accident rate than the northern European countries. Whereas northern European motorcyclists more often offend speed limits and ride because of extra motives, southern European motorcyclists have a more risky attitude towards helmet use. Both aspects seem to differ between accident involved and non involved motorcyclists in the corresponding region.

Based on the above presented results the following recommendations are derived:

- Development and implementation of risk communication should be based on:
    - Specific knowledge about motorcyclists' expectations, attitudes, motivations and habits concerning drinking and riding, speeding, use of safety equipment and interactions with car drivers.
    - The knowledge about specific motivations for the use of powered two wheelers.
    - Age and gender specific differences.
- Overall regarding the use of motorcycles and riding the behavior and the accident risk of motor cyclists there are many differences between the European countries. Therefore safety measures for motorcyclists should be developed in accordance with the country-specific circumstances.
- In this section, we observed a very clear distinction between northern and southern motorcyclists. They are very different regarding their motivations (and thus profiles), use of safety equipments, drink and drive, and proportion in road deaths. We thus recommend a different approach to road safety communication in northern and southern countries.
- Risk communication approaches should include internet-based dialogue oriented strategies. Especially the implementation of safety topics on social network sites seems to be a promising strategy to reach younger people. An improved risk communication should be implemented in the process of obtaining a motorcycle license.
- Legal BAC: we recommend a BAC limit of 0.2g/l for motorcyclists.
- Considering different enforcement strategies depending on the geographical situation of the target country. Southern countries should be regarded as priority targets as they cumulate a high proportion of motorcycle use within local population and a high frequency of drink-driving.
- Development and implementation of safety equipment adapted to countries with hot weather.

Other road users

Chapter 3.1

Introduction of Other Road Users section

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Richard Freeman (University of London, United Kingdom)

In the first two SARTRE projects, the focus was on car drivers. For SARTRE 3, motorcycle drivers were also considered alongside car drivers. For SARTRE 4, it was decided to include ‘other road users’, namely pedestrians, cyclists and users of public transport.

Respondents were classified as Other Road Users (ORU) if they indicated that either “Driving a car” or “Riding a motorcycle > 50 cc” was not their “most frequent mode of transport during the last 12 months”. There were five options available with varying popularity (Table 1). Walking was most popular, followed by public transport, being a car passenger, cycling and – least popular – using a moped. In this section we are most concerned with the three most popular options: walking, cycling and using public transport. It is interesting to note that 30% of our respondents reported using all three of these modes on a typical day. There are separate chapters dedicated to being a pedestrian and being a cyclist as these are two modes of transport that are being promoted for their environmental and health benefits. However, both of these modes leave the user vulnerable to the consequences of a road traffic accident due to the intrinsic vulnerability of the participant. In contrast, it is possible to add safety devices to cars and motor cycles – such as Anti-lock braking system (ABS) and air bags – but it is not feasible for pedestrians and difficult for cyclists beyond the use of a cycling helmet.

Table 1: On average, how many kilometres per day usually travelled by the following:

Transport mode	None	More than zero
Walking	4%	96%
Cycling	57%	43%
Public transport	33%	67%
Car passenger	41%	59%
Moped (≤ 50 cc)	84%	16%

In 2000, 9,476 pedestrians were killed in road traffic accidents in the EU-19[18], but by 2009 that had reduced to 6,233, accounting for 20% of road traffic fatalities. In The Netherlands, there are just 3.4 pedestrian fatalities per million inhabitants, but in Romania and Poland the rate is about 15 times higher at 49. Similarly, pedestrian fatalities account for just 10% of all road traffic fatalities in the Netherlands, but in Romania, Poland and Latvia that percentage rises to more than 30%. The largest group in pedestrian fatalities is those aged above 64 years of age (with a peak between 75 and 79 years of age) making up more than half of all pedestrian fatalities in France, Germany, Italy and Slovenia. Less than one quarter of all fatalities were female, but more than one third of pedestrian fatalities were female (ERSO, 2009a).

18 - EU19 consists of Belgium, Czech Republic, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Finland, Sweden, United Kingdom.

In 2009, 6.6% of road traffic fatalities were cyclists with 2,109 killed – a decrease of 35% from 2000 when 3,129 were killed. In most EU-19 countries, fatality rates have dropped over the decade 2000-2009, with the exception of Ireland and Romania where rates increased. In 2009, the country with the highest percentage of cycling fatalities was The Netherlands (21%) followed by Denmark and Slovenia (both 11%). In Greece and Spain the percentage is less than 2%. The majority of cyclist fatalities are male (80%), but there are notable inter-country variations: Belgium and The Netherlands having 30% female compared to Portugal and Romania where the figure drops to 8%. Almost half of cyclist fatalities were aged 60 years of age or older (ERSO, 2009b).

These inter-country variations are also seen for the different age groups for those reporting engaging in non-zero distances of walking (Figure 1), cycling (Figure 2) and using public transport (Figure 3). In Cyprus and Sweden, the majority of those walking were in the youngest age group (18 – 24 years of age) whereas in most other countries that age group accounted for less than 20% of those walking. In contrast, for Estonia, Greece, The Netherlands, Serbia and Sweden, less than 10% of those walking were aged 65 years of age or older, but Finland, Germany, Hungary and Italy all had more than 30% of those walking aged over 65 years of age.

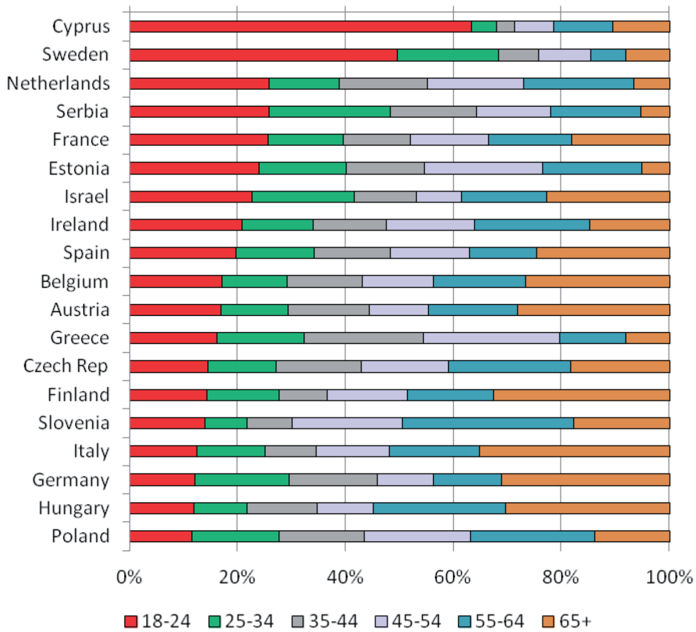

Figure 1: Percentage of age groups by country for those reporting walking on a typical day.

The equivalent figure for cyclists shows a similar pattern (Figure 2), but with some differences. In Cyprus, almost two thirds of cyclists were aged 18-24 years with more than one third in that youngest age group for France, Greece, Israel and Sweden. Inter-country differences are especially marked in the oldest age group with less than 10% in Estonia, France, Greece (actually zero), Ireland, Israel, The Netherlands, Serbia and Sweden. However, more than a quarter were in the oldest age group in Finland, Germany, Hungary, Italy and Spain.

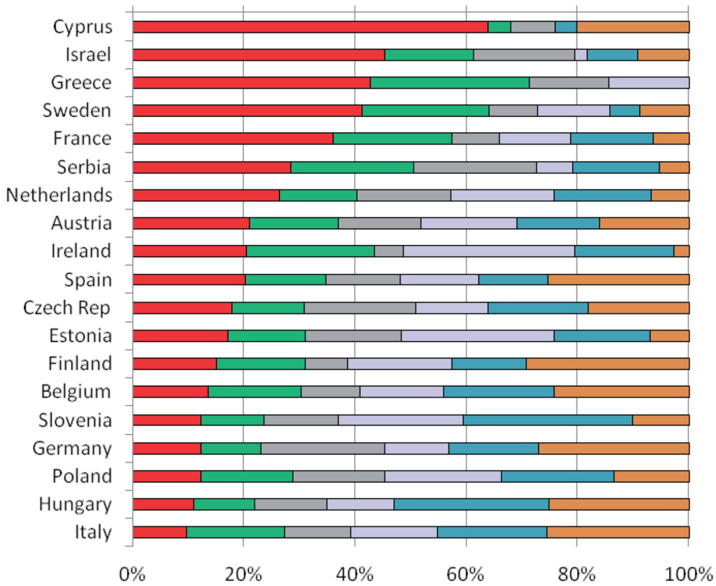

Figure 2: Percentage of age groups by country for those reporting cycling on a typical day.

For public transport use, the differences are less marked, apart from Cyprus and Sweden where the majority of users are in the youngest age group (Figure 3).

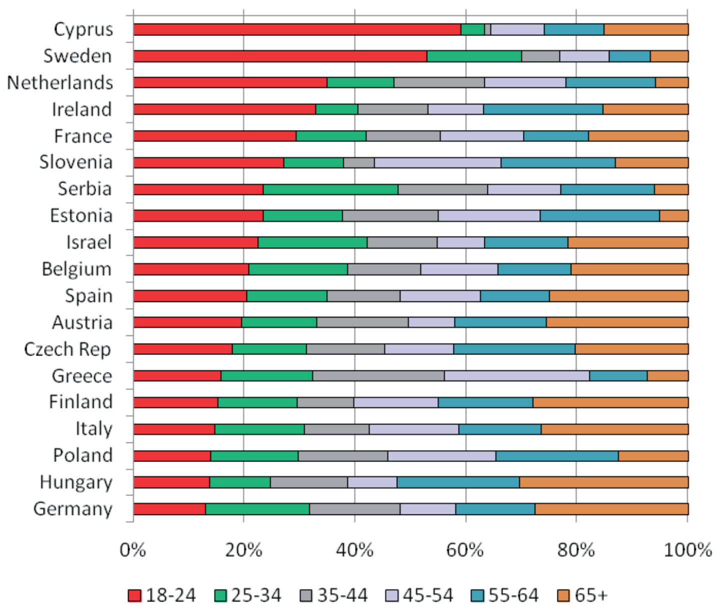

Figure 3: Percentage of age groups by country for those reporting using public transport on a typical day.

Inter-country differences for gender of those walking show that although the majority are female, the Czech Republic and Italy are below the EU average of 55% female (i.e. more males than females compared to population expectations) with Austria and Serbia closer to the expected percentages (Table 2). For cyclists, the pattern is rather different with higher percentages of males than would be expected in Austria, Cyprus, Czech Republic, France, Ireland, Israel, Italy, Poland and Serbia but with Estonia and Slovenia having less than 20% male. Finally, we have the users of public transport who are again predominantly female. In Estonia, Greece and Slovenia males account for less than 20% of users whereas in Czech Republic, Italy and Serbia males account for more than 45% of users.

Table 2: Percentage of respondents who are female who indicated non-zero amounts of usage of each transport mode in a typical day.

Country	Walking	Cycling	Public transport
Austria	57%	47%	59%
Belgium	64%	62%	63%
Cyprus	64%	40%	66%
Czech Rep	53%	49%	52%
Estonia	87%	82%	86%
Finland	78%	75%	78%
France	60%	40%	58%
Germany	72%	64%	73%
Greece	87%	71%	86%
Hungary	72%	62%	72%
Ireland	65%	38%	71%
Israel	63%	48%	62%
Italy	49%	37%	50%
Netherlands	61%	60%	57%
Poland	60%	53%	62%
Serbia	53%	47%	53%
Slovenia	79%	81%	83%
Spain	68%	68%	68%
Sweden	70%	68%	72%

In the next chapter, the motivations of Other Road Users are considered. In particular, the overlap of different modes by individuals is recognised. Indeed, it is not uncommon for road users to make use of a variety of different modes in the same day. Although, it is convenient to talk about car drivers and pedestrians as separate groups, the reality is that many users are both, but at different times. Therefore, cluster analysis is used to identify different types of road users based on a variety of variables. In the dedicated chapters that follow, pedestrians were identified as those respondents who reported non-zero daily walking distance travelled whereas cyclists were identified as those respondents who reported cycling, on average, one or more kilometres per day. In these two chapters, travelling style and satisfaction with the road environment and other users are considered for pedestrians and safety compliance and satisfaction with other road users are considered for cyclists. In addition, cluster analysis was used to identify different kinds of pedestrians.

Chapter 3.2

Other Road Users motivations and travelling style

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Introduction

Reducing our reliance on cars has many environmental and health benefits – traffic congestion should decrease, air quality should improve and people should be fitter and healthier. Also positive effects on road safety are to be expected (e.g. through a modal shift from passenger cars to public means of transport with lower accident risk); on the other hand switching from car to bicycle could in some countries increase the number of head traumas due to the lack of helmet use. Large-scale introduction of electric vehicles and electric bicycles brings new risks and challenges to the field of road safety (SWOV, 2011).

Research results are available in the field of travel behaviour and stimulation for modal shifts of motorized road users to other means of transport. For example, Steg (2003) explored the barriers which deter car drivers from switching to public means of transport; Anable (2005) categorised a population of day-trip travellers into potential 'mode switchers' based on the psychological theory of planned behaviour. Möser and Bamberg (2008) examined the role of cars in the perception of the drivers finding a stronger function as status symbols with the role as a functional means of transport becoming secondary. Cairns et al. (2004) and Jacobsson et al. (2004) analysed the impact of 'soft' transport policy measures and travel demand management on car usage reduction.

Following up these recent developments in research, SARTRE 4 has introduced a new section to the project that was not included in the former three SARTRE surveys, which focused exclusively on car drivers. The new section adds Other Road Users (ORU), i.e. cyclists, pedestrians and users of public transport. In this chapter, we examine the motivations and travelling styles of people who mainly use these other means of transport rather than cars or motorcycles.

To know and to understand the motivations for travelling using these other methods of transportation is crucial for policy makers if they are to draft effective traffic policies that encourage a shift from car use to greater use of other means of transportation.

Method

As a first step, we took a closer look at the statistics for fatalities of 'other road users' in the countries participating in SARTRE 4 in order to get a sense of the distribution of fatal accidents for this specific road user group.

In the next step descriptive analysis of the motivations of 'other road users' was performed, giving an overview on the distribution of reasons walking/cycling/using public transport in the participating countries, followed by a country comparison per motivation variable.

Further sections of descriptive analysis deal with the reasons for walking, cycling and using public transport based on socio-demographic variables and motivations of 'other road users' in context of their living area and their experience of road accidents.

To obtain meaningful, differing groups of 'other road users' a cluster analysis based on their travel behaviour was performed. The variables from 'Use of transport means' (ORU02) and 'Travel behaviour' (CO01) were used for the analysis.

Results

Fatalities for 'other road users'

Examining the statistics for fatalities of 'other road users' (pedestrians, cyclists, car passengers, moped drivers) in the participating countries reveals a very diverse picture. In some countries the fatalities of the other road user group count for more than half of total road fatalities (Poland, Estonia, Hungary and the Netherlands). On the other hand there are countries in which this category of road user accounts for less than one third of all road fatalities (Cyprus, Sweden, Ireland and Serbia). "Passengers" is the largest group within other road users' fatalities for ten countries, but in five countries there were no data available for this category. Pedestrians are the other group with a high number of fatalities, accounting for the highest proportion in Israel with 33% of total road fatalities followed by Poland with 32%. The share of fatalities among cyclists is highest in the Netherlands, where cycling is very popular. All these results have to be interpreted with caution as they depend very much on the degree of use of the various means of transport and the diverse mobility habits in the participating countries (see Figure 1). However, comparable exposure data regarding 'other road users' are not available in most participating countries.

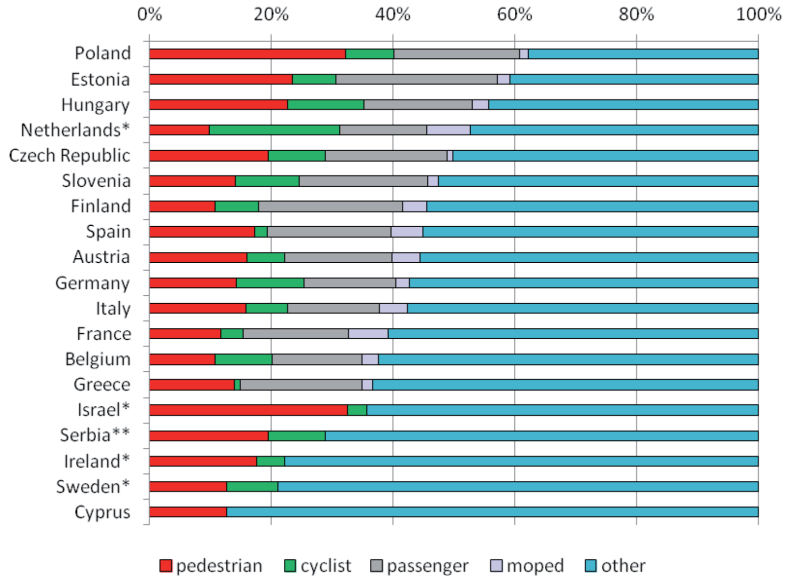

Figure 1: Pedestrians, cyclists, passengers and moped drivers killed in road traffic 2009 compared to total road fatalities (CARE query, December 2011).

Note: * Data from 2008, ** Annual Serbian Traffic Police Directorate data (2009).

Motivations for being an 'other road user'

In order to find associations between attitudes towards various societal issues (CO02) and the reasons for walking/cycling/using public transport (ORU02), a correlation analysis was conducted. This is useful for determining the strength and direction of the association between variables. Generally, there was a low degree of association between these variables: correlation values are always less than .12 in magnitude except for the association of pollution and environment (.211).

Of the seven motivations examined, 'Fear of driving' seems to be the main motivator for walking/cycling/using public transport that is associated at least moderately with concerns about various issues: this is especially the case with the concerns about the 'rate of crime' (.102), 'road accidents' (.111) and 'standard of health care' (.110). The only other relevant association found among these variables was between the motivators 'physical exercise' (.108) with the concern about 'pollution'.

Seven possible motivations for being an "other road user" were offered to respondents. 'No necessity/just other means of transport' (which means there is no necessity to use motorized vehicles to fulfil the individual mobility needs) was the motivation most often selected, with respondents agreeing 'very or 'fairly' (58%) with it as a reason for walking/cycling/using public transport among the respondents. Next were 'Need of more physical exercise' (56%) and 'financial reasons' (53%) followed by 'health reasons' (51%), 'environmental reasons' (43%) and 'fear of driving' (32%). 'Driving licence withdrawal/ban' was agreed 'very much' and 'fairly' by only 18% of the respondents (see Figure 2).

Most of the respondents agreed to the category 'fairly' instead of 'very' except for 'financial reasons' and 'driving license withdrawal' in which the proportions of these two categories were about the same. 'Driving license withdrawal/ban' and 'fear of driving' were the least agreed reasons with most answers falling into the category 'agreed not at all' (74% vs. 45%).

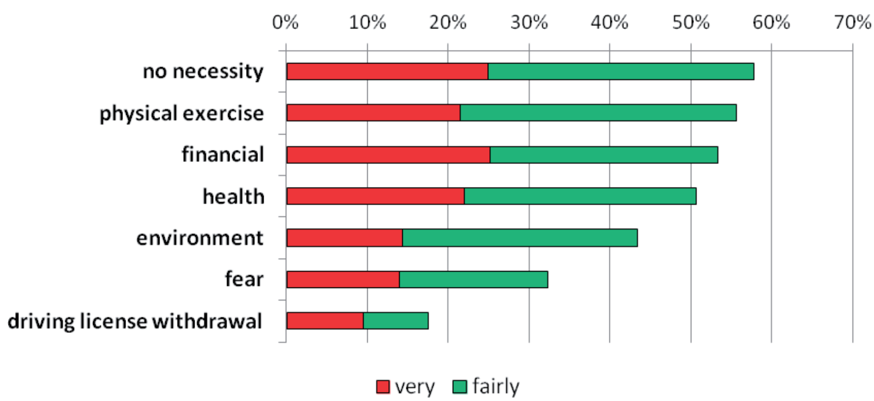

Figure 2: Reasons for walking/cycling/using public transport (all countries).

Financial reasons were a main reason for walking/cycling/using public transport in Israel (72% agree 'very much' or 'fairly') and to a relative high extent in the Czech Republic, Greece, Netherlands, Sweden and Serbia (more than 60% of respondents agree 'very' or 'fairly'). France and Belgium were the countries with the least frequent responses in the categories 'very' and 'fairly' agree (below 40%). The remaining countries were around the average of all participating countries (53%) within a range from 40%-60% agreement ('very' or 'fairly') (see Figure 3).

In Estonia 'health reasons' were a very strong motivator for using alternative means of transport (85% agreed 'very' or 'fairly') followed by the Netherlands (71%) and Sweden (69%). On the other hand these play only a minor role in Austria, Serbia, France and Ireland (below 40% agreement for 'very' or 'fairly').

Country comparison regarding the motivator 'environment reasons' shows similar results as for the motivator 'health': Respondents in Estonia and Sweden named environment reasons as a strong motivator for using alternative means of transport in these countries (72% vs. 71% agree 'very' or 'fairly'). Again, at the other end of the list are Serbia and Ireland ('very' + 'fairly' agree below 25%)- together with Poland – for whom 'environment' is not an important factor.

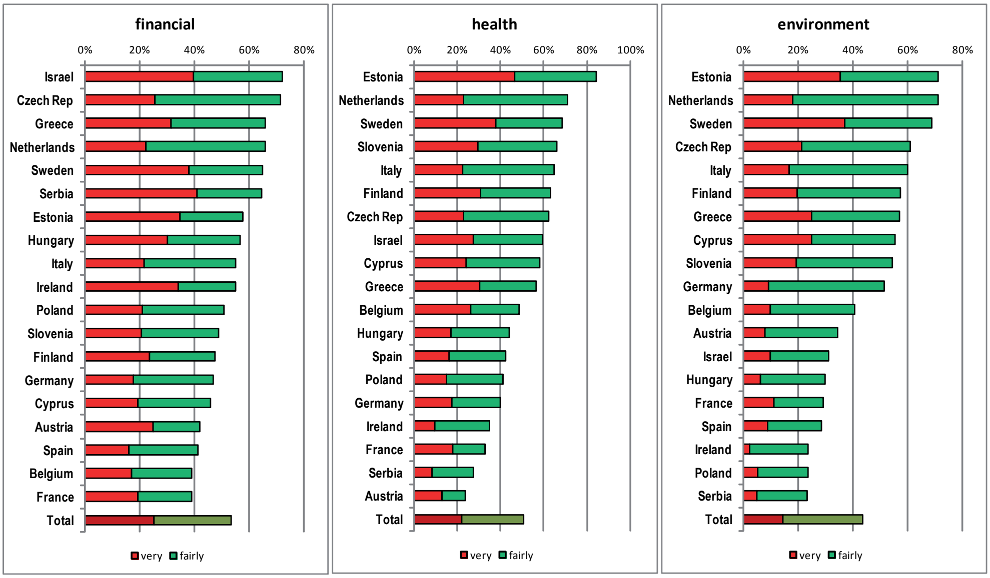

Figure 3: Reasons for walking/cycling/using public transport per country: Financial, health, environment.

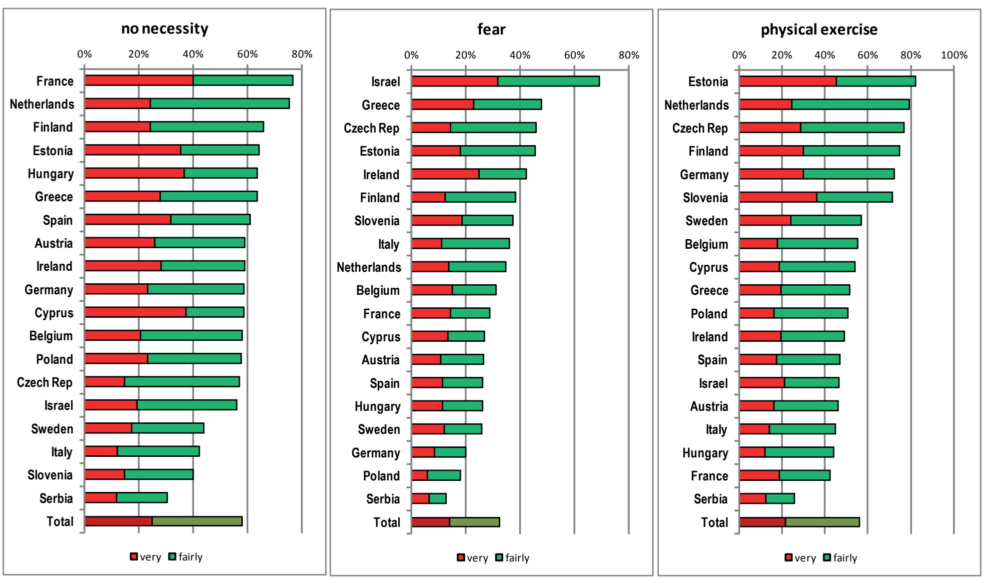

Figure 4: Reasons for walking/cycling/using public transport per country: No necessity, fear and physical exercise.

'No necessity' was named as a reason for being mainly an 'other road user' by more than 70% of respondents in France and in the Netherlands (77% vs. 76% agreeing 'very' or 'fairly'). This reason was of minor importance in Slovenia and Serbia (both below 40% in the categories agree 'very' or 'fairly') (see Figure 4).

On average one third of respondents agreed ('very' or 'fairly') that 'fear of driving' is a reason for using mainly other means of transport than cars and motorcycles. In Israel more than 60% of respondents agreed 'very' or 'fairly'; in Serbia, Poland and Germany only 20% and less agreed 'very' or 'fairly' to fear being a reason for their choice.

The need of more physical exercise is a very strong motivator in Estonia (more than 80% agree 'very' or 'fairly') and to a slightly lesser extent in the Netherlands, Czech Republic, Finland, Germany and Slovenia (all above 70% agree 'very' or 'fairly'). In all other countries this reason is of minor importance – with Serbia being at the end of the list (26% agree 'very' or 'fairly').

'Other road user' types

In order to obtain meaningful, differing groups of 'other road users' a cluster analysis based on their travel behaviour was performed.

The variables from 'Use of transport means' (ORU02) and 'Travel behaviour' (CO01) were used for the analysis. Various transformations of these variables were performed and resulted in the dependent variables for the cluster analysis. These variables are:

1. Total daily travel distance (sum of all ORU02 means of transport; missing cases were treated as zero)
2. Percentages of distance in km (per means of transport; ORU02a-ORU02d; ORU02e 'moped' was not used in the analysis because of very small case numbers)
3. Travel behaviour (CO01b)

The analysis was performed using TWOSTEP CLUSTER, which groups observations into clusters based on a nearness criterion (Log-Likelihood in this case). The procedure uses a hierarchical agglomerative clustering procedure in which individual cases are successively combined to form clusters whose centres are far apart. This algorithm is designed to cluster large numbers of cases. It passes the data once to find the cluster centres and again to assign cluster memberships.

Analysis was performed on the European level and not separately for the individual countries as it makes sense to produce a manageable number of types in order to compare the different countries and not to have optimized typologies for each country, which would not be comparable among each other. The overall approach for the analysis was to obtain 'other road user' types that can be found in each country.

The analysis resulted in five types of 'other road users' (see Table 1):

<u>Type 1:</u> the 'public transport user': is characterized by an above average daily travel distance (mean: 25.4km) and a strong usage of public means of transport (72% nearly daily usage; mean: 15.5km); on the other hand there is a low cycling frequency (72% fall into the category less than 1 time a month), average cycling distance (mean: 1 km) and a low percentage of cycling kilometres (4%); percentage of daily walking kilometres is below average (20%), also below average percentage of passenger kilometres (16%). This category accounts for 32.6% of 'other road users'.

<u>Type 2</u>: the 'pedestrian': covers a very low daily travel distance (mean: 11.7km), uses the car as a passenger for 33% of the daily distance (car passenger km, mean: 5.9km); a high percentage of the daily distance is done by walking (53%). Cycling frequency is very low (less than 1 time a month:

100%) as well as the distance covered by bike. Moreover, very low frequency in usage of public means of transport (less than 1 time a month: 60%; percentage of daily kilometres only 10%). This category accounts for 23.3% of ‘other road users’.

Type 3: the ‘cyclist’: below average daily total travel distance (mean: 17.8km); shows a high rate of cycling frequency (58% nearly daily) and high percentage of daily kilometres covered by bike (41%); very low frequency of usage for public means of transport (less than once a month: 45%) combined with a low percentage of daily kilometres covered by public means of transport (12%). This category accounts for 22.2% of ‘other road users’.

Type 4: the ‘pedestrian + public transport user’: about average daily travel distance (mean: 18.3km); very low usage of bicycle (68% never); about average user of public means of transport (frequency nearly daily: 24%; 32% of daily kilometres; mean distance: 7.2km); slightly above average percentage of daily walking kilometres (36%), average daily walking distance (3.6km). This category accounts for 15.5% of the population.

Type 5: the ‘active traveller (ORU)’: very high total daily travel distance covered by other means of transport than car and motorcycle (mean: 104.5km); high frequency of using public means of transport (49% nearly daily) combined with above average daily distance covered by public means of transport (mean: 44.5km); high percentage of daily kilometres as car passenger (35%), high mean for car passenger distance (42.2km); percentage of daily kilometres for walking low (9%) but above average kilometres as pedestrian (mean 6.5km); above average cycling distance (9,8km); this category accounts for only 6.4%.

Table 1: Summary of cluster analysis for other road user types.

	Public transport user	Pedestrian	Cyclist	Pedestrian + public transport user	Active Traveller (ORU)
Cluster size (percentage of total)	32.6%	23.3%	22.2%	15.5%	6.4%
percentage of cycling kilometres	4%	1%	41%	3%	14%
percentage of travel: public transport	59%	10%	12%	32%	41%
percentage of travel: walking	20%	53%	26%	36%	9%
percentage of travel: car passenger	16%	33%	19%	28%	35%
cycling distance (km)	1.02	0.18	6.42	0.44	9.77
car passenger distance (km)	4.92	5.91	4.48	6.50	42.16
walking distance (km)	3.60	3.41	3.48	3.60	6.54
public transport distance (km)	15.47	1.76	2.92	7.24	44.47
total daily travel distance (km)	25.35	11.72	17.77	18.26	104.45
cycling frequency less than once a month	72%	100%	58%	68%	32%
public transport frequency nearly daily	72%	60%	45%	24%	49%
walking freq. nearly daily	79%	73%	79%	81%	80%

ORU types: motivations

The five types resulting from the cluster analysis were compared regarding motivations for walking/cycling/using public means of transport. A higher level of agreement is indicated by a lower mean score (see Table 2).

Table 2: Cluster comparison regarding motivations variable/ORU01; means of clusters compared to total.

	finan-cial	health	environ-ment	no necessity	fear	physical exercise	driving license with-drawal
Public transportation user	2.34	2.74	2.68	2.35	3.11	2.60	3.60
Pedestrian	2.68	2.47	2.81	2.46	2.87	2.52	3.51
Cyclist	2.46	2.37	2.48	2.30	3.15	2.16	3.56
Pedestrian + public trans-port user	2.42	2.49	2.86	2.41	2.61	2.56	2.97
Active Traveller (ORU)	2.22	2.56	2.54	2.34	3.10	2.27	3.32
Total	2.45	2.54	2.68	2.37	2.98	2.45	3.46
F-Value	16.585	17.095	18.550	2.969	30.757	27.875	50.054
P (sig)	0.000	0.000	0.000	0.018	0.000	0.000	.000

Importance of motivation factor above mean:

So, the main motivations for each cluster are as follows:

- Type 1 ('Public transportation user'): 'Financial', 'No necessity'
- Type 2 ('Pedestrian'): 'Health', 'Fear'
- Type 3 ('Cyclist'): 'Health', 'Environment´, 'No necessity', 'Physical exercise'
- Type 4 ('Pedestrian + public transport user'): 'Financial', 'Health', 'Fear', 'Driving licence withdrawal'
- Type 5 ('Active Traveller ORU'): 'Financial', 'Environment', 'No necessity', ´Physical exercise´, 'Driving license withdrawal'

ORU Types: Country comparison

Type 1 ('Public transportation user') is the most common cluster over all countries: 32.6% fall into this category. In Austria it has the highest proportion (56.5%), followed by Italy (46.5%), Serbia, Greece and France (all 40% and above). It is most underrepresented in Israel (9.9%), Cyprus (14.6%) and Ireland (17.3%).

Type 2 ('Pedestrian') - 23.3% overall. It is high in Greece (53.7%), Cyprus (45.1%), Slovenia (37.2%) and Spain (35%); it is underrepresented in Israel (1.3%), the Netherlands (4.8%) and Belgium (7%).

Type 3 ('Cyclist') – is of similar proportion as type 2 (22.2%). It is most strongly represented in the Netherlands (55.6%), followed by Germany, Finland, Hungary and Sweden (all above 30%). Very low representation of type 2 is found in Greece (2.3%), Israel (3.6%) and Serbia (7.2%).

Type 4 ('Pedestrian and public transport user') proportions differ most strongly among the countries: It is remarkably common in Israel (75.3%), followed by Belgium and Ireland with proportions around 40%. In more than half of the countries the proportion of type 4 is 10% and lower.

Type 5 ('Active Traveller ORU') is the smallest cluster and covers 6.4% of the 'other road users' sample. This type is most common in Estonia (13.3%), Serbia (13.1%) and the Netherlands (10.1%). In Greece, Poland and Italy type 5 is significantly underrepresented (all 3% and below; see Figure 5).

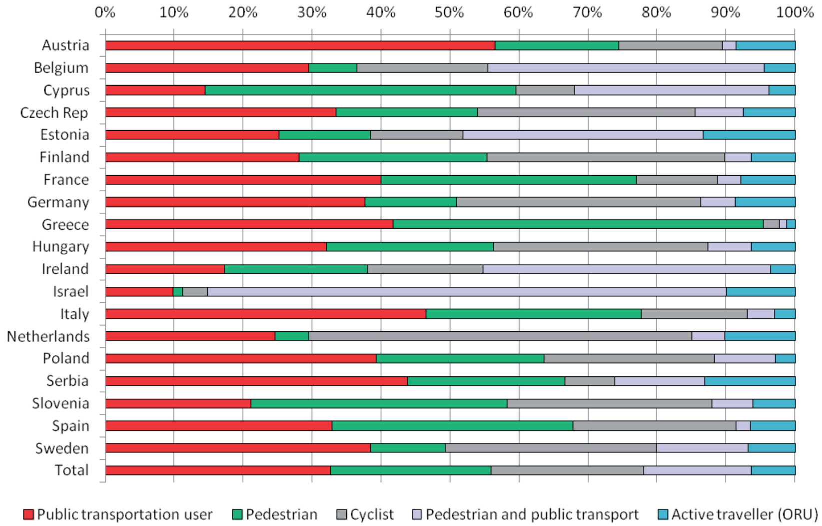

Figure 5: Proportion of ORU types per country.

Motivations and demographic characteristics

In the following section the reasons for walking, cycling and using public transport were analysed based on the variables AGE CATEGORY and GENDER. The influence of other background variables (CHILDREN (YES/NO), NUMBER OF CHILDREN, EDUCATION, OCCUPATION and MARITAL SITUATION) were also analysed, but those results are only included if the results reveal something interesting and statistically significant. It should be noted that some of the variables are confounded with other variables. For example, ‘single’ people are likely to be younger than ‘widowed’ respondents, and ‘married’ people might have a higher household income than do ‘separated’ respondents.

The influence of age on motivations

The younger the respondent, the more often they agreed ‘very much’ or ‘fairly much’ with financial reasons for walking, cycling or using public transport. Nearly one third of the respondents in the age category ‘18-24 years’ agreed ‘very much’ with this option, compared with less than one sixth in the age category ‘65+’. On the country level, statistically significant differences ($p < 0.05$) between the age groups were found in most of the countries. In Belgium, France and Italy the youngest respondents were not as motivated by financial reasons as respondents belonging to adult and middle-aged categories. In Cyprus, the option ‘very much’ was not chosen in the age group ‘25-34’. In contrast, in Germany and Hungary the youngest respondents were highly motivated by financial reasons: more than half of the respondents in these countries belonging to age categories ‘18-24’ (Germany) and ‘25-34’ (Hungary) agreed ‘very much’ with financial reasons for motivation. In Ireland and Finland financial motivations were considered very important in all of the age groups: the proportion of ‘very much’ was over 48% in Ireland and over 32% in Finland regardless of the age of the respondent.

Regarding health motivations, in general older respondents were more likely to agree with the alternative ‘very much’. In the oldest age category (‘65+’), 30% of the respondents answered accordingly whereas in the age group ‘25-34’ only 17% agreed ‘very much’ about having health reasons as a motivation. In Estonia, all age groups were very concerned about health as a motivation – this result was found to be statistically significant compared with other countries. An interesting point was that in Germany and Hungary none of the youngest respondents had answered ‘very much’ for the question of health reasons as motivation for walking, cycling or public transport as modes of transport.

The young respondents seemed to be more concerned about environmental questions and having environmental reasons as a motivation. The proportion of youngest people answering 'very much' was 18%, which was twice as much as the proportion in the oldest age group. However, in some countries the older age groups were also greatly concerned about environmental motivations. For example in Finland, the age category '45-45' scored higher than the younger age groups in environmental motivations for using public transport, walking or cycling. In Austria, respondents belonging to age group '35-44' did not answer 'very much' at all. In Sweden, concern about environment was very high in all groups regardless of age.

When analysing 'fear of driving' as a motivation for walking, cycling and using public transport, the older age groups replied more often that they agreed 'very much'. The proportion was highest in the age group 55-64 years – maybe because this group is still active in working life and would probably be more willing to drive if fear of driving did not prevent them. In two countries – Ireland and Sweden - the age group 45-54 replied most often 'very much' for 'fear of driving' being a reason for using these modes of transport.

Finally, for 'need more physical exercise' as a motivation, the respondents belonging to older age categories replied more often that they agreed 'very much'. For the age group '25-34', the proportion of 'very much' response was a bit higher than for '35-44'. Probably these results could also be connected with health motivations (especially for the older age groups) or could be explained by marital status, number of children or preferences with personal or household time-use: the respondents in the younger groups (especially single ones) generally have more time of their own that they can spend on physical exercise than married couples or families with small children.

The influence of gender on motivations

Financial reasons were slightly more important for men than for women as a motivation for walking, cycling or using public transport. In three countries (Ireland, Poland and Spain) the differences between the genders were statistically significant differences ($p < 0.05$). In Poland and Spain women were more concerned about financial reasons than men as a motivation. In Ireland the differences between the genders were the greatest: 51% of men but only 25% of women agreed 'very much' about financial reasons being a motivation for not driving.

For health reasons there were no significant differences between the genders. About half of both men and women replied either 'very much' or 'fairly' to this question.

There was a statistically significant difference between men and women in relation to environmental reasons for walking, cycling and use of public transport. Women answered 'very much' slightly more often than men for this question. On country level, there were statistically significant differences between gender groups in the Czech Republic, (25% of women vs. 18% of men answered 'very much') and in the Netherlands (no difference in 'very much' but clearly more female respondents in 'fairly').

The female respondents were also more likely to answer 'very much' for 'fear of driving' or 'need more exercise' for motivation as choosing walking, cycling or public transport as transport modes. For fear of driving, the proportion of women answering 'very much' was more than twice as much as for men (18% vs. 7%). In most of the countries the differences between the genders were statistically significant. In Italy and Slovenia the differences between genders were statistically significant in 'more exercise' as a motivation – in both of these countries men were more willing to choose the option 'very much' than women, although in general female respondents replied 'very much' slightly more often than men.

Other variables

Respondents whose marital status was either 'single' or 'separated' agreed 'very much' more often than other groups for financial reasons as motivation and 'married' or 'widowed' agreed with this alternative less often than others. There might be differences between these groups in income level, and this might explain part of these differences as well. Also the number of children had some influence on the respondents' willingness to choose 'very much' for financial motivation – those respondents who had children were more concerned about financial questions. This variable might also be connected with the marital status of the respondents.

'Widowed' respondents were more concerned about health than other groups, probably because this variable is connected with age, and also people with children were more concerned about health as a motivation than people without children.

'Single' respondents and those living 'as married' were more concerned about environmental reasons than respondents belonging to other marital status groups. People belonging to these groups might be younger than those who are married or widowed, which might also explain their motivations.

Only occupation as a background variable was found to be statistically significant in explaining the 'no necessity / just other means of transport' reasons for walking, cycling and using public transport. Over 60% of 'housewives / not otherwise employed' and 'professional lawyers / accountants / etc.' answered 'very much' or 'fairly' for 'no necessity' as a motivation factor. Respondents belonging to 'executive / top management / director' category as well as those who reported to be 'business owner / craftsman / proprietor' were the most likely to answer 'not at all' for 'no necessity' as a motivation for not driving. None of the variables were statistically significant in explaining the differences between the respondents in 'driving license withdrawal/ban', although there were some differences between countries.

Motivations in context of the living area

Influence of town size

With data on the size of the municipality from which the respondent comes it was possible to evaluate how individual responses vary depending on the size of the village, town or city. The municipalities were divided into four groups: first are villages and very small towns with populations under 10 000 inhabitants, second are small towns with population between 10 000 and 100 000 inhabitants, third are medium-sized cities with 100 000 – 500 000 inhabitants and fourth are big cities with population over 500 000 inhabitants. Limits for each category were selected with regard to different conditions in different regions of Europe.

Significant differences in responses have been identified in only some cases:

- Financial factor was mentioned by the biggest share of people in big cities and was of minor importance in small villages.
- The Health factor was the least frequently mentioned in big cities, with the difference to all other categories in responses 'very' and 'fairly' being about 10%.
- Environmental issues were considered more important in larger cities, but the differences between categories were not statistically significant.
- No significant differences were observed in results for "no necessity" and for more physical exercise.
- Fear of driving and driving license withdrawal was mentioned much less in big cities; in the other categories the results were almost identical.

The main statistically significant differences were observed for the financial motivation factor in the following countries: in small towns financial motivation was much stronger in Estonia, Israel and Slovenia, in medium-sized cities in Greece and in big cities in Israel and Sweden. In contrast, this factor was less important in small cities of Germany and medium-sized cities of Spain. Health motivation is more important in Estonia, in small towns in Sweden and Spain and in big cities in Sweden and Greece, but less important in Spanish big cities. Environmental motivation has the biggest influence in medium-sized and big cities of Estonia, Sweden, Finland, Greece and Slovenia. The only country where this factor was significantly more important in small towns than in bigger ones is the Czech Republic. The "no necessity" factor was significantly more important in Hungarian big cities and less important in Italian big cities. Fear of driving as a motivation was significantly more important in Israeli and Greek villages. The wish for more physical exercise was significantly more important in Estonia, Slovenia and Finnish big cities and less important in Hungarian small towns and big cities and Austrian medium-sized cities. Driving license loss as a motivation is much more important in Estonia and Israel.

Differences between urban and rural areas

In the question CO14 respondents reported how they describe the area where they live. Possible answers were: 'rural area/village', 'small town', 'suburban area/city outskirts' and 'urban area/city/large town'. Using these data responses were analysed regarding motivation for walking, cycling and using public transport in terms of socio-geographical characteristics of the region:

- The Financial factor has the least effect on the motivation of respondents in rural areas, and has relatively small impact in small towns.
- The Environmental factor has similar distribution to the financial factor, apart from small towns having 'fairly' as the most frequent response.
- The Health factor has the greatest importance in small towns and suburban areas, as well as fear of driving and more physical exercise.
- The 'No necessity' factor shows no differences in the various living areas.
- 'Driving license withdrawal' has the greatest importance in small towns and urban areas.

However, generally we can say that although there are some differences in the motivation of respondents in rural, suburban and urban areas, these differences are not very large. Significant differences between countries are: financial motivation has the greatest importance in Israel, Serbia, Estonia and Greek and Irish urban areas and the least importance in Spanish and French rural areas and German suburbs. The health factor is significantly more important in Estonia, in Greek suburbs, Slovenian small towns, Finnish rural areas and Swedish urban areas, but significantly less important in French rural areas and Austrian, Serbian and Irish urban areas. Environmental motivation is more important in Swedish, Estonian, Cypriot, Czech, Slovenian and Finnish cities and small towns and less important in Ireland, Poland, Serbia and Hungary. The "no necessity" factor and fear of driving do not differ between urban and rural areas. The physical exercise factor is significantly more important in Estonian, Finnish and German urban areas, Slovenian and Czech small towns and suburbs and German rural areas, but the least important in Serbian non-urban areas and French and Hungarian rural areas. The driving license withdrawal factor is the most important in Estonia and Israel, the least important in Hungary, France and Sweden, but there are not significant differences between urban and rural areas.

Influence of experience with road accident

Question ORU11 asked whether the respondent has been involved in an accident during the last three years. If the respondent gave an answer greater than zero to a) to e) the category 'yes' was recorded for people who have had experience with a recent accident. Otherwise, the category 'no' was recorded. This resulted in an average of 11.8% of other road users reporting an accident (ranging from 1.5% in Hungary to 27.3% in Cyprus).

For many factors the results were identical, regardless of whether respondents had been involved in an accident or not. Somewhat surprisingly, this situation occurred even for “fear of driving”. On the other hand, it confirmed the assumption that the loss of driving license was a significantly stronger motivation for walking for people who were involved in an accident. Significant differences between the categories were found for the health and environmental factor; these factors were more important for people who had been involved in an accident.

Conclusions

Fatalities of ‘other road users’

- Passengers and pedestrians are the ‘other road user’ groups with a relative high proportion of fatalities compared to the total number of road fatalities.

Motivations for being an ‘other road user’

- There was only a low degree of association between attitudes towards various societal issues (CO02) and the reasons for walking/cycling/using public transport (ORU02): Correlation values were consistently below 0.12 except for the association of pollution and environment (.211).

- ‘No necessity/just other means of transport’(which means there is no necessity to use motorized vehicles to fulfil the individual mobility needs) was the motivation most often selected, with more than a half of the respondents agreeing ‘very or ‘fairly’ (58%) with it as a reason for walking/cycling/using public transport among the respondents. ‘Need of more physical exercise’ (56%) and ‘financial reasons’ (53%) followed.

- ‘Driving license withdrawal/ban’ and ‘fear of driving’ were the least agreed reasons (74% and 45% respectively agreed ‘not at all’).

‘Other road user’ types

- Cluster analysis resulted in the identification of five types of ‘other road users’ with the ‘public transportation user’ being the most common cluster over all countries: 32.6% fall into this category. It is mainly characterized by an above average daily travel distance and a strong usage of public means of transport. In Austria it has the highest proportion (56.5%), followed by Italy (46.5%), Serbia, Greece and France (all 40% and above). It is most underrepresented in Israel (9.9%), Cyprus (14.6%) and Ireland (17.3%).

- Next frequent were two clusters of about the same proportions: The first, labelled as ‘pedestrians’ (23.3%) - mainly characterized by a very low daily travel distance, car usage as a passenger for 33% of the daily distance and a high percentage of the daily distance is done by walking (53%). This group is significantly high in Greece (53.7%), Cyprus (45.1%), Slovenia (37.2%) and Spain (35%); it is significantly underrepresented in Israel (1.3%), the Netherlands (4.8%) and Belgium (7%).

- A similar proportion of respondents were classified as ‘cyclists’ – below average daily total travel distance, a high rate of cycling frequency and high percentage of daily kilometres covered by bike (22.2%). This group is most strongly represented in the Netherlands (55.6%), followed by Germany, Finland, Hungary and Sweden (all above 30%). There is very low representation of ‘cyclists’ in Greece (2.3%), Israel (3.6%) and Serbia (7.2%).

- The two remaining clusters ‘Pedestrian + public transport user’ and ‘Active Traveller ORU’ cover together about 20% of the ORU population.

Motivations and demographic characteristics

- The younger the respondents, the more often they agreed 'very much' or 'fairly much' with financial reasons for walking, cycling or public transport as modes of transport. Nearly one third of the respondents in the age category '18-24 years' agreed 'very much' with this option, compared with less than one sixth in the age category '65+'.

- Considering health motivations, in general older respondents were more eager to agree with the alternative 'very much'. In the oldest age category ('65+'), 30% of the respondents answered accordingly whereas in the age group '25-34' only 17% agreed 'very much' about having health reasons as a motivation.

- The young respondents seemed to be more concerned about environmental issues and having environmental reasons as a motivation. The proportion of youngest people answering 'very much' was 18% which was twice as much as the proportion in the age group of the oldest respondents. However, in some countries the older age groups were also highly concerned about the environmental motivations (e.g. Finland).

- Regarding the motivators 'fear of driving' and 'need more physical exercise' respondents from the older age categories replied more often that they agreed 'very much'.

- Financial reasons were slightly more important for men than for women as a motivation for walking, cycling or using public transport. Women answered 'very much' slightly more often than men for environmental reasons as a motivation. Female respondents also answered 'very much' for 'fear of driving' or 'need more exercise' for motivation; for fear of driving, the proportion of women answering 'very much' was more than twice as much as for men answering similarly (18% vs. 7%).

- Respondents whose marital status was either 'single' or 'separated' responded 'very much' more often than other groups for financial reasons as a motivation and 'married' or 'widowed' agreed with this alternative less often than others. There may be differences between these groups in their income level, and this might explain part of these differences.

- Also the number of children had some influence on the respondents' willingness to respond 'very much' for financial motivation – those respondents who had children were more concerned about financial questions. This variable might also be connected with the marital status of the respondents.

Motivations in context of the Living area

- The financial factor as motivation was mentioned mainly by people in big cities and was least important in small villages. On the contrary, the health factor was least frequently mentioned in big cities, the difference to all other categories in responses 'very' and 'fairly' is about 10%.

- Environmental issues were considered more important in larger cities, but the differences between categories were not statistically significant.

- "No necessity" factor has not larger differences in the above categories; driving license withdrawal has the greatest influence in small towns and urban areas.

- The financial factor had the least effect on motivation in rural areas; it had also a relatively small impact in small towns; the health factor had the greatest influence in small towns and suburban areas, as well as fear factor and physical exercise factor. Driving license withdrawal as a factor has the greatest influence in small towns and urban areas.

Influence of experience with a road accident

- For many factors, the results were merely identical among respondents, regardless of whether they were involved in an accident or not. This occurred even for the fear of driving question. On the other hand, the loss of driving license was a significantly stronger motivation for walking for people who had been involved in an accident. Significant differences were also found for the health and the environmental factor; these factors were more important for people with experience of a road accident.

Chapter 3.3

Pedestrians

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Introduction

Pedestrians are the most vulnerable users of transport networks due to various reasons such as lack of protection and also due to particular characteristics and behaviour affecting the nature of their interaction with motorized traffic (OECD, 2001&2011; ERSO, 2008; Yannis et al., 2007a). As a consequence, the knowledge of pedestrian attitudes, perceptions and behaviour may thus assist policy makers in the better understanding of pedestrian behaviour issues and safety needs and eventually in the planning and implementation of measures to improve pedestrian safety (Yannis et al., 2007b).

Several existing researches provide useful and insightful results on pedestrian attitudes, perceptions and behaviour. For example, Yagil (2000) examined the self-reported road-crossing behaviour of young student pedestrians. Another study (Granié, 2009) explored the effects of sex-stereotype conformity, perception of danger and risky behaviour of adolescent pedestrians, whereas Bernhoft and Carstensen (2008), analyzed preferences and behaviour of older pedestrians and cyclists. Zhou et al. (2009) attempted to measure pedestrians' social conformity and to test the theory of planned behaviour. Diaz (2002) examined pedestrians' attitudes towards traffic violations and self-ratings of violations, errors and lapses, whereas Sisiopiku and Akin (2003) analyzed behaviours at and perceptions towards various pedestrian facilities such as crosswalks, physical barriers and pedestrian warning signs.

However, these studies mostly focus on particular aspects and on particular populations, the samples examined are small, whereas no results comparing different countries are available. In the SARTRE 4 survey, the attitudes and behaviour of a large sample of pedestrians are examined at European level for the first time.

The present report concerns the analysis of selected pedestrians' responses to the SARTRE 4 survey. The selection of pedestrians was carried out according to the following criterion: pedestrians were selected as those respondents who reported that their most frequent transport mode in the last 12 months was neither passenger car nor motorcycle (question SQ3) and who reported non-zero daily walking distance travelled (question ORU2a).

More specifically, the analysis concerns the pedestrians' responses of the dedicated "Pedestrians" part of the SARTRE 4 survey (ORU), as well as the responses of selected questions of the common part of the questionnaire (CO).

The analysis consists of 2 parts:

1. Descriptive analysis: frequencies, percentages and country comparisons on pedestrians' road safety attitudes and behaviour, analyses per age, gender, town size and area type.

2. In-depth analysis: statistical analysis and modeling of pedestrians' travel habits, road safety attitudes and behaviour by means of factor and cluster analysis.

Descriptive analysis

Summary of questionnaire responses

CO01. During the last 12 months on average how often did you travel by...

The great majority (71%) of the pedestrians travelled less than once a month **by car as a driver** last year. Moreover, the majority of pedestrians travel by car **as passengers** one to four times a week or one to three times a month. The great majority of the pedestrians travelled less once a month **by motorcycle as a driver or passenger** last year (more than 80%). The percentage of pedestrians that travelled by moped less than once a month last year is higher than 80% in most countries.

Pedestrians travelled daily or mostly 4 times a week **by walking** last year (92%). In most countries, pedestrians travelled less than once a month **by cycling** last year (52%) apart from Netherlands where the majority of pedestrians travelled nearly daily or one to four times a week (79%). Moreover, in most countries the percentage of people that used **public transport** from once a week to daily is higher than 50%.

CO02. How concerned are you about each of the following issues?

Most pedestrians are very or fairly concerned about **crime, pollution, health care, unemployment and road accidents** (more than 70%). There is a great variation of pedestrians' concern about **congestion**. While some countries (Cyprus, Greece, Serbia, and Poland) worry very or fairly about congestion (more than 65%) some other countries (Czech Rep, Germany, Sweden, Hungary and Austria) have a correspondent percentage of less than 40%. It is likely that the responses are affected by the levels of congestion in each country (OECD, 1999).

CO03. Thinking specifically about the risk of accident, how safe do you think the roads are in our country to travel on?

The percentage of pedestrians who consider the roads to be **very or fairly safe** ranges from 24% (Greece) to 92% (Finland). Pedestrians in Northern and Western European countries are more satisfied with road compared to Central and Southern European countries. Greece, Cyprus and Poland show by far the highest percentages of pedestrians that do not find roads safe at all (see Figure 1).

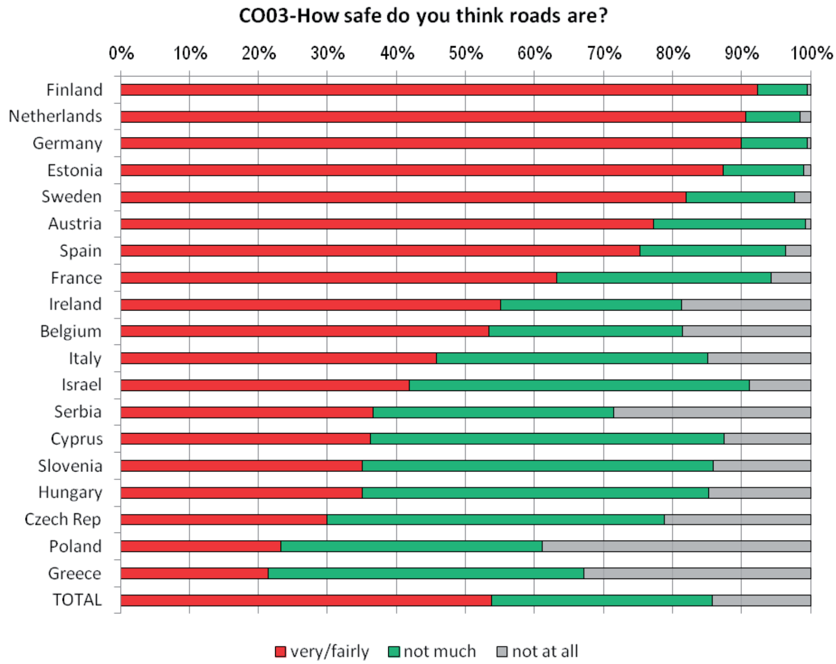

Figure 1: CO03. How safe do you think the roads are in our country to travel on?

CO04. How concerned or not do you think the Government is about road safety?

The percentage of pedestrians who believe that the government does care (very much or fairly) about road safety, ranges from only 15% (Greece) to nearly 81% (Finland). 46% of pedestrians in Greece believe that the government does not care at all about road safety. Even in Northern and Western European countries, the percentage of pedestrians who think that the government is very concerned about road safety does not exceed 25%.

CO05. How much would you agree or disagree that our roads have become safer over the past 10 years?

The percentage of pedestrians who believe that **the roads have become very or fairly safer** over the past 10 years ranges from 22% (Greece) to 79% (Finland).

CO06. How much would you be in favour of using...?

The majority of respondents are very or fairly in favour of using **speed limit devices in cars** (percentage higher than 70% apart from Netherlands and Sweden, see Figure 2), **black boxes** (percentage about 80%), **fatigue detection devices** (around 85%), and **alcolocks** in cars (percentage higher than 60%). The acceptance of alcolocks for **recidivist car drivers** in even greater compared to all car drivers (see Figure 3).

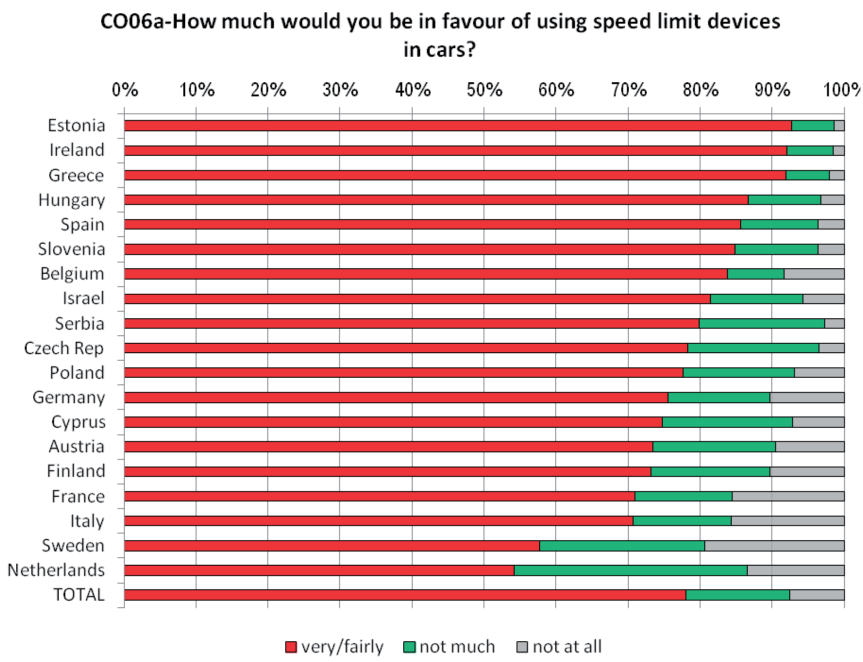

Figure 2: CO06a. How much would you be in favour of using speed limit devices in cars?

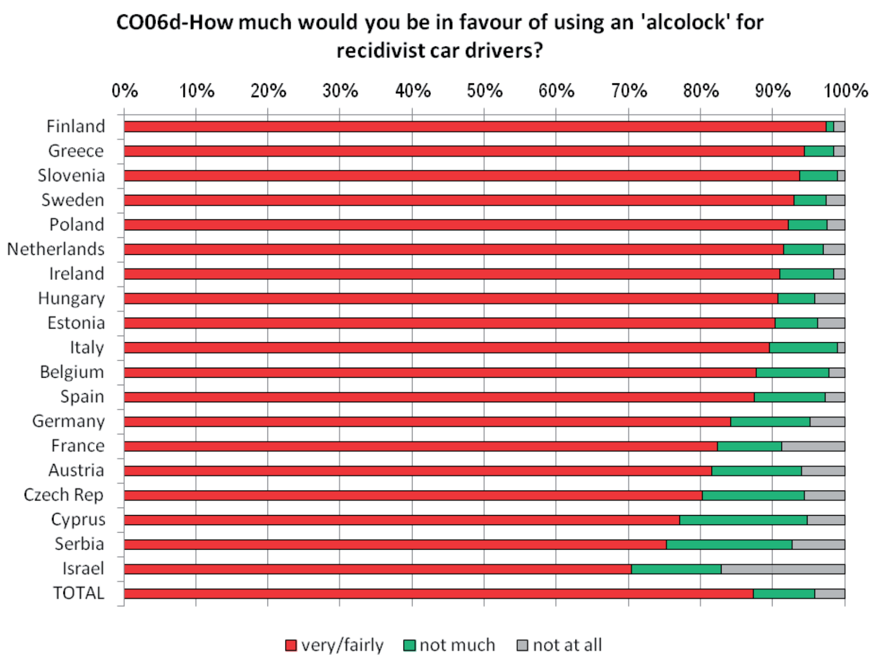

Figure 3: CO06d. How much would you be in favour of using an 'alcolock' for recidivist car drivers?

CO07. How much would you be in favour of the following measures?

The vast majority of pedestrians are very much or fairly in favour of using **cameras for red light surveillance** (more than 80%), **surveillance of speeding** at a single point (more than 80%), or between two distant points (more than 70%).

The percentage of pedestrians who strongly support **more '30 km/h' zones** very much is lower compared to the other measures, although this is a measure explicitly aiming to improve pedestrian safety.

On the other hand, the majority of pedestrians are very or fairly in favour of more **car and motorcycle free zones**. The average percentage is more than about 70%.

CO08. Do you agree or disagree with the following statements?

While most of pedestrians strongly agree or just agree with more severe **penalties for speeding** offences, there is some variation. For instance, Hungary supports this measure with a percentage of about 91% while the correspondent percentage for Sweden is about 42%. Most pedestrians agree or strongly agree with more severe **penalties for drink-driving** offences with an average percentage about 90%.

There is some variation in the pedestrians' responses about more severe penalties for not using restraint systems. While some countries agree or strongly agree with a percentage about 80% (Spain, Cyprus, Ireland, Hungary and Greece) some others have a lower percentage of about 50% (Sweden, Slovenia and Italy).

Most pedestrians agree or strongly agree with more severe penalties for not wearing helmets on motorcycles and the percentage is about 80%. The lowest percentage can be found in Sweden (58%) and the higher in Greece (90%). Most pedestrians also agree or strongly agree with more severe penalties for using handheld phones while driving and the percentage is about 76%. The lowest percentages can be found in Sweden (65%), Austria (66%) and Slovenia (67%) and the highest in Ireland (89%), Greece (88%) and Hungary (86%).

The results are possibly affected by the degree to which the above risk-taking or distracted driver behaviour is spread in each country.

CO09. How dangerous do you consider each of the following transportation modes to be regarding accidents?

Most pedestrians do not consider walking to be dangerous regarding accidents. The average percentage is about 60%. Sweden has the highest percentage (75%) while Ireland has the lowest one (33%). On the other hand, pedestrians considered cycling to be fairly or very dangerous (65% on average). The respective percentages for car driving and motorcycling are higher than 70% and 90% respectively.

ORU03. As a pedestrian, how often do you...?

The minimum percentage of pedestrians that never or rarely cross the road when it is red light for pedestrians can be found in Sweden (45%) and Cyprus (49%). The maximum related percentages can be found in Poland (88%), Slovenia (87%), Hungary (85%) and Czech Rep (77%). The European average percentage of pedestrians who never or rarely cross the road when it is red light for pedestrians is 71%.

As regards crossing outside designated locations, the minimum percentage of pedestrians that never cross at places other than pedestrian crossings the can be found in Sweden (7%), and the maximum in Israel (31%) (European average is 17%), see Figure 4.

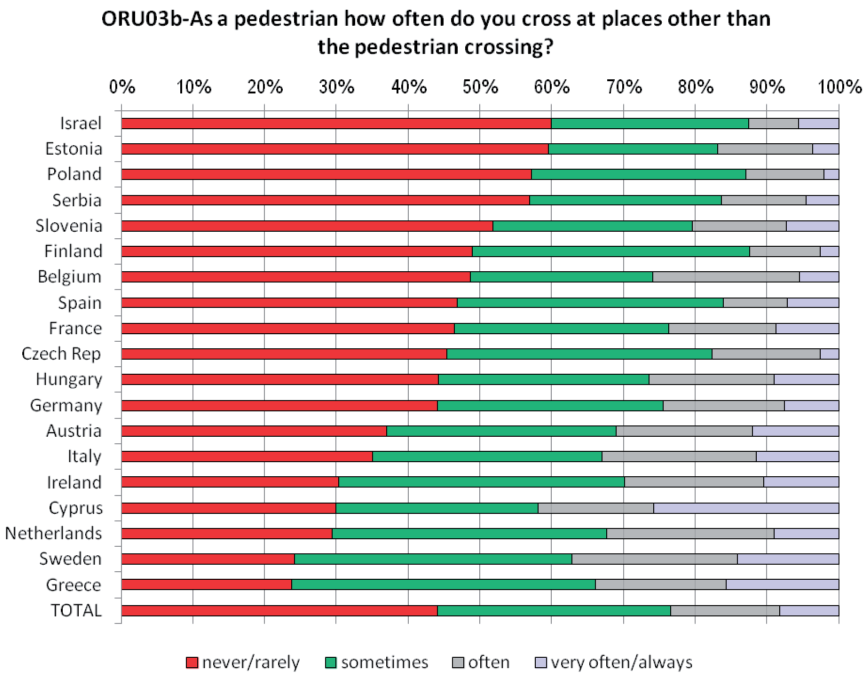

Figure 4: ORU03b. As a pedestrian, how often do you cross at places other than the pedestrian crossing?

Seven percent of pedestrians in Cyprus say that they always cross at places other than pedestrian crossings (a percentage that is lower than 4% in all other countries). Due to the small sample size, this result is to be considered with some caution. Cyprus also has the second highest percentage of pedestrians who cross often and very often at places other than pedestrian crossings (35%). Sweden has the highest percentage (36%).

The minimum percentage of pedestrians that never **avoid too dangerous streets or intersections** can be found in Greece (5%), Cyprus and Estonia (7%). The maximum percentage of pedestrians that never avoid too dangerous streets or intersections can be found in Finland (45%).

In most countries, the vast majority of pedestrians never or rarely **wear reflective clothing** (more than 80%). In Northern countries (Sweden, Estonia, Finland, Ireland) pedestrians wear reflective clothing more often. Only in Estonia and Finland pedestrians wear reflective clothing more than often (65%), possibly due to a combination of weather conditions and related culture.

The maximum percentage of pedestrians that always or very often have to **walk on the street because of obstacles** can be found in Cyprus (59%), followed by Greece (44%), Italy (31%), Estonia (21%) and Serbia (15%) (the average value is 14%). The maximum percentage of pedestrians that never or rarely have to walk on the street because of obstacles can be found in Finland (64%) and Germany (54%) (the average value is 37%).

As regards distractions while walking, the minimum percentage of pedestrians that never or rarely make or answer a call with a **handheld phone** can be found in Sweden (18%). There is a great variation in the pedestrians who never make or answer a call with a handheld phone. It ranges from 3% (Estonia) to above 45% (Hungary and Slovenia). Most of pedestrians never use **MP3/iPod/music devices**.

ORU04. As a pedestrian, thinking about the area in which you walk on, how satisfied are you with the following?

Almost half of all pedestrians are very of fairly satisfied with **pavements**. There is a great variation in the countries whose pedestrians that are very satisfied with the pavements. This percentage ranges from very small such as 2-4% (Estonia, Hungary, Czech Rep. and Greece) to high such as 30-42% (Austria, Finland, Israel, France and Sweden).

In general, almost half of pedestrians are very or fairly satisfied with the **separation of pedestrians and cyclists**.

The maximum percentage of pedestrians that are very or fairly satisfied with **safety** can be found in Finland (85%). Most of the countries have a percentage higher than 50%. The maximum percentages of pedestrians that are not much or not at all satisfied with safety are observed in Greece (83%) and Cyprus (80%), see Figure 5.

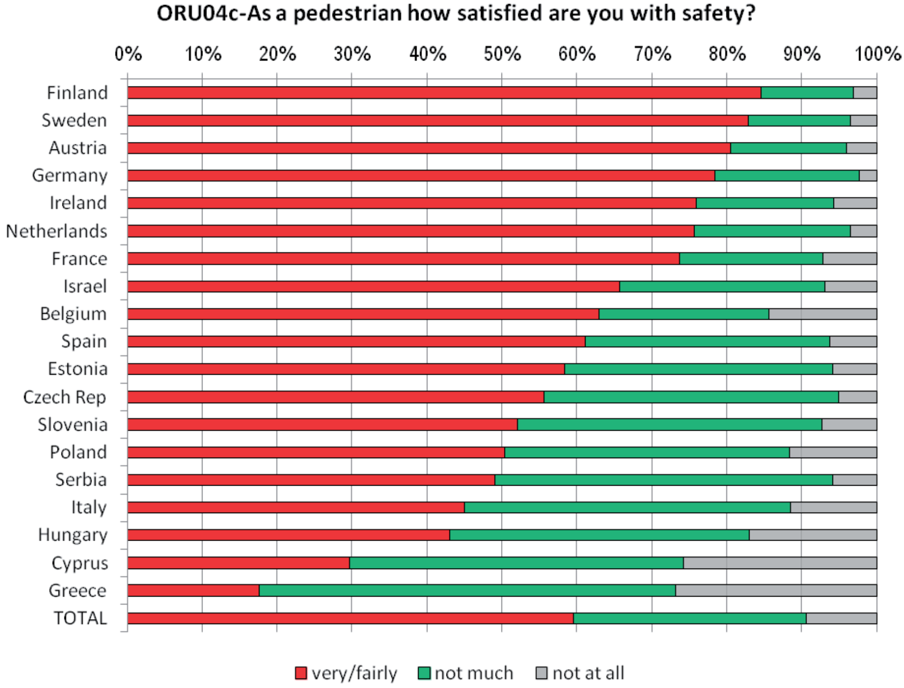

Figure 5: ORU04c. As a pedestrian how satisfied are you with safety?

Most pedestrians are not much or not all satisfied with **speed of traffic**. The maximum percentage of pedestrians that are very or fairly satisfied with speed of traffic can be found in Finland (75%). The lowest percentages of pedestrians that are very satisfied with speed of traffic can be found in Netherlands, Hungary and Germany (2%) and the highest in Finland (19%), Israel (17%) and Sweden (16%). Moreover, it seems that the majority of pedestrians is not much or not at all satisfied with the **volume of traffic**. The maximum percentage of pedestrians that are not much or not at all satisfied with the volume of traffic can be found in Czech Republic (74%), Greece (72%), Slovenia (71%) and Poland (72%).

The highest percentages of pedestrians that are very of fairly satisfied with the **number of street lights** can be found in Austria (78%) and Estonia (77%). The correspondent average percentage is 63%. The maximum percentage of pedestrians that are not satisfied with the number of street lights can be found in Greece (79%) and Cyprus (55%). The correspondent average percentage is 37%. More than half of EU pedestrians are very of fairly satisfied with the number of crossing points.

The maximum percentage of pedestrians that are very of fairly satisfied with the **number of crossing points** can be found in France (76%), Finland (76%) and Netherlands (74%). The maximum percentage of pedestrians that are not much or not at all satisfied with the number of number of crossing points can be found in Greece (79%) and Cyprus (78%), while the correspondent average percentage is 43%.

ORU08.When travelling in general, as a pedestrian, how often do you...

The majority of European pedestrians get **annoyed with car drivers** (more than 60%) more than sometimes, while almost 1 out of 4 pedestrians often annoyed with car drivers, and more than 1 out of 10 get very often annoyed with car drivers, see Figure 6.

Almost 1 out of 4 pedestrians get often **annoyed with motorcyclists**. The maximum percentage of pedestrians that get never or rarely annoyed with motorcyclists can be found in Sweden (74%). Greece, Czech Rep., Estonia, Austria, Germany, Poland, Italy, Slovenia and Serbia have a percentage greater than 25% of pedestrians that gets often or very often annoyed with motorcyclists.

Most of pedestrians are never or rarely **annoyed with bicyclists** (more than 55%) apart from Netherlands, Austria, Estonia and Germany (almost 30%).

ORU11. In the past 3 years have you been involved in a road accident as a pedestrian?

Nearly all pedestrian respondents were not involved in a road accident as a pedestrian in the last 3 years. Sweden, Austria, Czech Rep, Spain and Ireland have the largest percentage of pedestrians that have been involved in an accident (more than 5%).

Analysis per area type and town size

ORU03 town size factor

Regarding town size factor, answers of participants vary significantly. Inhabitants of **big and middle size towns** cross the road when it is red light for pedestrians more frequently, they use music devices during their walk more often, they use more their mobile phones while walking and they cross streets at places other than the pedestrian crossing more often. On the contrary, big cities residents wear less reflective clothing and are less afraid of dangerous streets and intersections.

ORU03 area description factor

Differences between urban, suburban and rural areas are mostly visible in red light crossing, mobile phone use and listening to music while walking, which are much less common in rural areas and small towns. Furthermore, wrong place crossing and overcoming parked cars blocking the way is less frequent in rural areas. On the other hand, wearing reflective clothing and avoiding some streets or intersections is less frequent in urban areas.

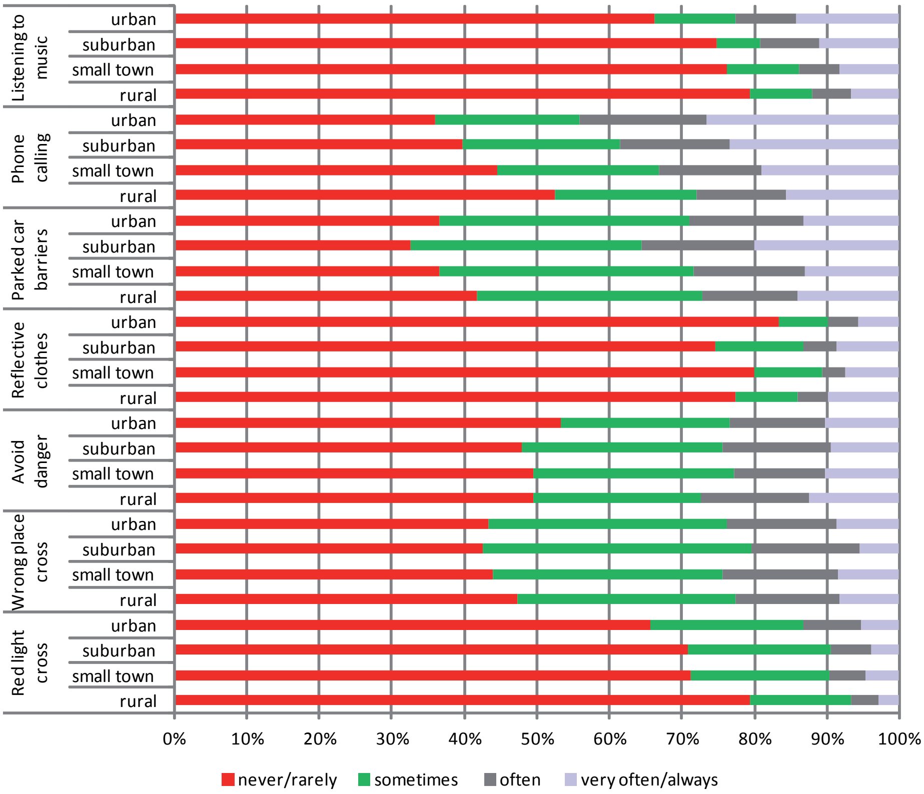

Figure 6: ORU03. As a pedestrian, how often do you...?

ORU04 town size factor

Differences in the size of cities in relation to the satisfaction of their inhabitants by qualitative parameters of pedestrian infrastructure are significant in the sum of categories "very" and "fairly satisfied". In most cases, **satisfaction is higher in big cities** and gradually decreases with the decrease in town size. This course can be seen on issues such as the number of places to cross the street, number of street lights, safety, separation of pedestrians and cyclists and pavements. No significant differences are observed in responses regarding traffic speed and traffic volume, satisfaction is slightly smaller in small villages and in big cities.

ORU04 area description factor

Regarding area description factor, results are quite similar to town size factor. With the exception of traffic volume, all answers in urban areas showed **higher satisfaction with pedestrian infrastructure** in these areas, less in suburban areas and small towns and the least in rural areas, although these differences were not always striking (e.g. in traffic speed). Inhabitants of small towns are as satisfied as those of large cities, as regards the number of crossing places and the number of street lights, see Figure 7.

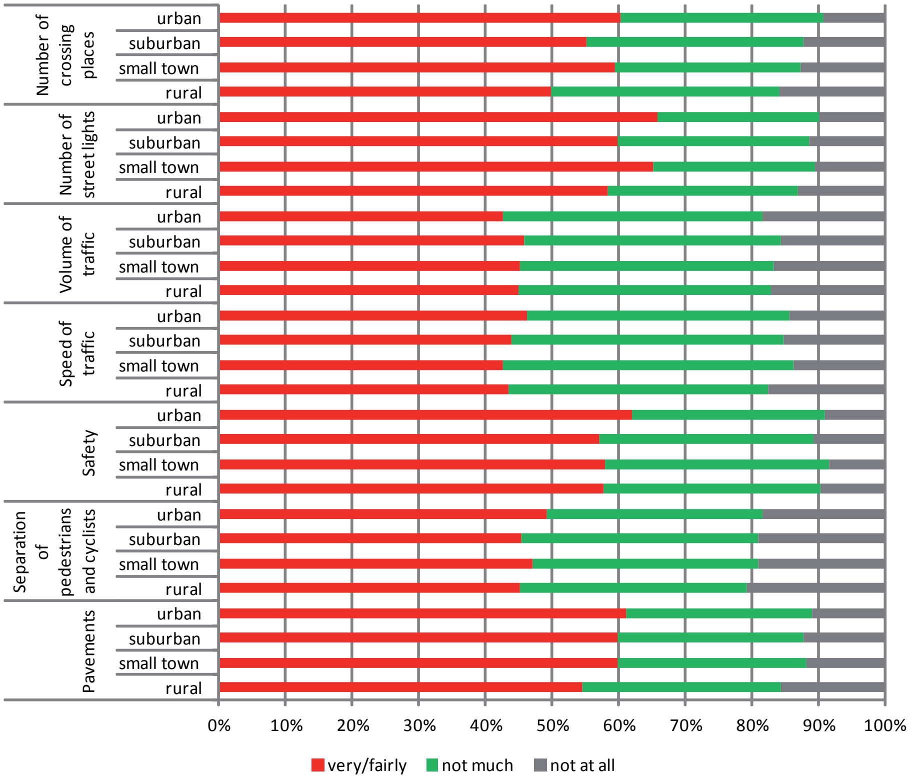

Figure 7: ORU04. As a pedestrian, thinking about the area in which you walk on, how satisfied are you with the following?

ORU08 town size factor

Pedestrians' annoyance by motorcyclists increases with town size, while their annoyance with bicyclists decreases with town size. Annoyance by car drivers does not appear to vary per town size, see Figure 8.

ORU08 area description factor

A quite different distribution of results is obtained as regards the area description factor. The highest annoyance by car drivers' behaviour is in observed suburban areas and the highest annoyance by motorcyclists' behaviour is observed in small towns.

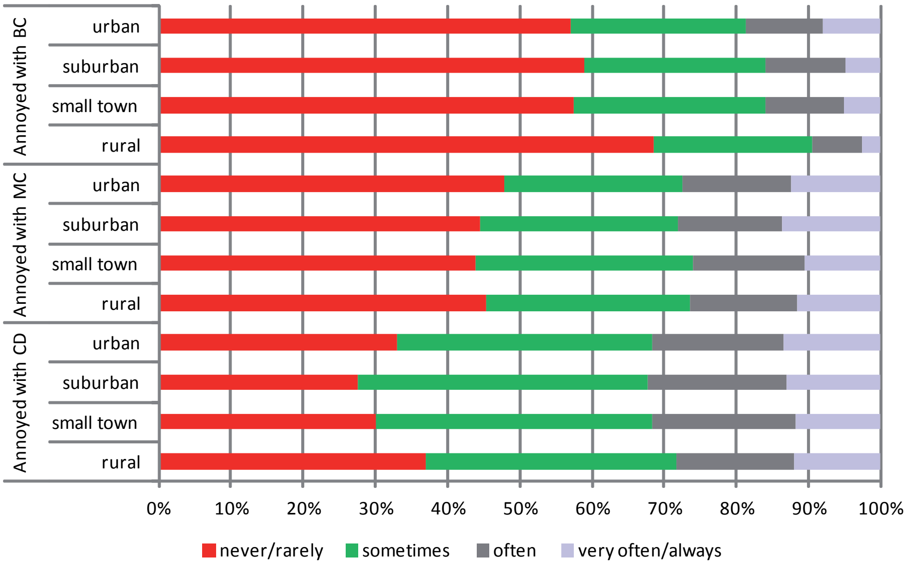

Figure 8: ORU08.When travelling in general, as a pedestrian, how often do you...

ORU10a,c town size factor

The perception that one can drink alcohol and walk if one does it carefully is increases significantly when the size of the municipality increases. Similarly, the perception that walking drunk increases the risk of an accident with another road user is slightly reduced when town size increases.

Analysis per age and gender

ORU03 by gender

Making/answering a phone call was done most often both by female and male respondents (12% vs 11% answered 'always', 10% answered 'very often'). Using a music device and wearing reflective clothing were the things that over 50% never did. The majority of the respondents answered that they never crossed the street on red light for pedestrians. In general, the differences between male and female respondents were statistically significant in all other issues except 'parked cars' and 'music devices'. **Men cross streets on red light or wrong places more often than women, and women avoid dangerous streets or intersections more often than men.**

On country level, statistically significant differences between the genders were found in these countries:

- crossing on red light: Cyprus, Ireland, Italy, Netherlands, Poland, Slovenia
- crossing on wrong place: Estonia, France, Ireland, Italy, Netherlands, Poland, Sweden
- avoiding dangerous streets or intersections: Estonia, Greece, Italy, Poland
- wearing reflective clothing: Finland, Hungary, Sweden
- walking on streets because of parked cars or other barriers: Austria, France
- phone calls with hand held phone: Estonia, Serbia
- using music device: Estonia, Germany, Greece, Netherlands for music device

ORU03 by age category

In all questions, statistically significant differences were observed between the age categories. In general, the older age groups answered more often ‘never’ or ‘rarely’ for these questions. This was the situation especially in questions about using mobile phone or music device while walking. The **older respondents avoided dangerous streets or intersections more often** than other age groups.

In all of the countries, there were statistically **significant differences between the age groups in using music devices**, and in most of the countries also in ‘crossing the street on red light’ (Austria, Belgium, Cyprus, Czech Rep, France, Germany, Hungary, Ireland, Italy, Netherlands, Poland, Serbia, Slovenia, Sweden), in ‘crossing street on wrong place’ (Austria, Belgium, Cyprus, Finland, Germany, Italy, Netherlands, Poland, Serbia, Slovenia, Spain, Sweden) and in ‘using hand-held mobile phone’ (all except Serbia and Spain). In some countries, there were statistically significant differences in avoiding streets (Belgium, France, and Poland), wearing reflective clothing (Belgium, Finland, and Sweden) and walking on streets because of barriers (Cyprus, France).

ORU04 by gender

In general, male respondents were more satisfied than the female ones. The difference between male and female respondents was clearest in being satisfied with pavements (20 % of male ‘very satisfied’ vs. 13 % of females). However, the share of people responding ‘not very much’ satisfied was over 25 % in all of the questions, and between 9 % and 20 % for ‘not at all’ satisfied. The differences between the genders were statistically significant, except for ‘volume of traffic’ and ‘number of places to cross the street’.

On country level, statistically significant differences between the genders were observed in these countries:

- pavements: France, Israel, Serbia
- separation of pedestrians and cyclists: Austria, Estonia, Serbia
- safety: Cyprus, Israel, Sweden
- speed of the traffic: Belgium, Germany, Israel, Netherlands, Slovenia
- number of street lights: Slovenia
- number of places to cross the street: Slovenia

ORU04 area by age group

In general, the youngest and the oldest age groups responded more often that they are very satisfied with the things mentioned in the question (especially for pavements, separation of pedestrians and cyclists and safety). The older age groups were less satisfied with the speed and volume of the traffic than other groups. Statistically significant differences between the age groups were observed in ‘pavements’, ‘speed of the traffic’ and ‘volume of the traffic’ , and also some differences between age groups were found on country level:

- pavements: Estonia, Israel, Serbia and Slovenia for pavements,
- separation of pedestrians and cyclists, Sweden
- safety: Serbia, Israel
- speed: Cyprus, Netherlands, Serbia, Sweden
- volume: Serbia, Italy, Cyprus, Czech Republic
- street lights: Sweden, Serbia
- crossing places: Ireland, Israel

ORU08 by gender

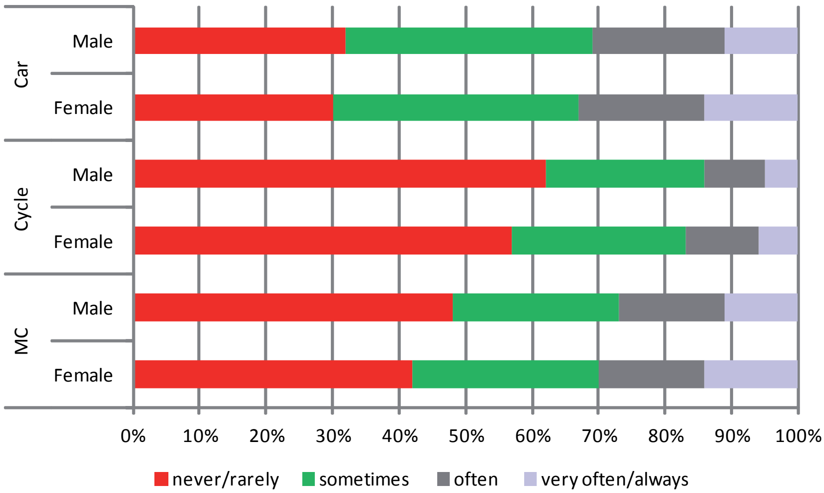

Figure 9: ORU08 by gender. When travelling in general, as a pedestrian, how often do you get annoyed by...

Female pedestrians seem to get annoyed about other road users more often than male pedestrians (See Figure 9). However, the shares of respondents getting annoyed ‘always’ or ‘very often’ are quite small; less than 12% for ‘very often’ and less than 4 % for ‘always’. The differences between the gender groups were statistically significant except for getting annoyed about cyclists. On country level, some statistically significant differences were found:

- Only in Cyprus and Serbia the differences were statistically significant for ‘annoyed about car drivers’

- Belgium, Finland, Netherlands in ‘annoyed about cyclists’

- Cyprus for annoyed about motorcycle drivers

ORU08 by age

Older respondents reported to be less annoyed about car drivers than other age groups (see Figure 10). For getting annoyed with cyclists, the differences between the age groups were very small. For getting annoyed with motorcycles, the situation was quite the opposite: young groups reported more often than older groups that they were annoyed with motorcyclists. Statistically significant differences between age categories were found for ‘annoyed with car drivers’ and ‘annoyed with motorcyclists’ but not for ‘cyclists’. On country level, only a few statistically significant differences were found:

- Cyprus, Ireland , Serbia: statistically significant differences in ‘annoyed with motorcycles’
- Finland, Poland, Sweden – in ‘annoyed with car drivers’

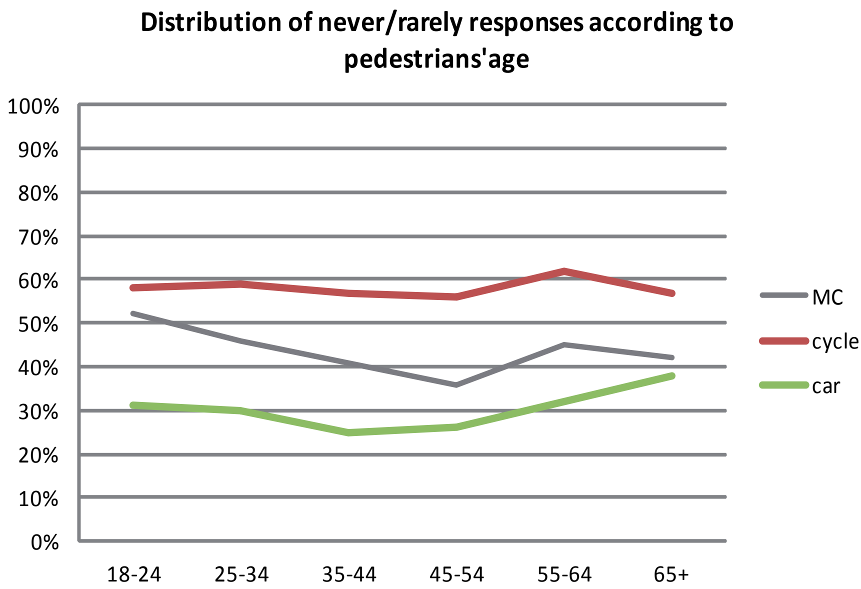

Figure 10: ORU08 by age. When travelling in general, as a pedestrian, how often do you...(never/rarely).

ORU10a,c by age and gender

Respondents were asked how much they agreed with the statements ‘you can drink and walk if you do it carefully’ and ‘drinking and walking increase the risk of an accident with another road user’. Male respondents responded more often that they agreed ‘very much’ with the first statement and female respondents agreed more often with the second statement. However, 33% of female respondents (vs. 24% of male) answered that drinking and walking does not increase at all the risk of an accident with another road user. Statistically significant differences were also identified on country level, in Italy and in Poland (for both statements) and in Cyprus (for the first statement).

ORU10a,c by age category

Younger age groups agreed more often than older groups that ‘you can drink and walk if you do it carefully’. Twenty-three percent of the youngest respondents agreed ‘very much’ with this statement compared with 12% of the oldest group. When asked about the risk of accident, the older groups agreed more often than the younger ones (47% vs. 34% for ‘very much’). On country level, statistically significant differences between age groups were found in Finland, France, Germany, Greece, Ireland, Netherlands, Slovenia for ‘drinking and walking’ and in Germany, Ireland, Slovenia for ‘risk of accident’.

In-depth analysis

Grouping pedestrians on the basis of their travel habits

In order to obtain meaningful groups of pedestrians based on their travel behaviour a cluster analysis was performed.

The variables “Use of transport means” (ORU02) and “Walking frequency” (C01e) were used for the setup of the analysis. Various transformations of these variables were performed and resulted in the dependent variables for the cluster analysis. These variables are:

Total Travel Distance (sum of all ORU02 means of transport; missing cases were treated as “0”)

Percentages of distance in km per means of transport (ORU02a-ORU02d; ORU02e ”moped” was not used in the analysis because of very small case numbers)

The analysis was performed through TWOSTEP CLUSTER, which groups observations into clusters based on a nearness criterion (Log-Likelihood in this analysis).

Analysis was performed on the European level and not separately for the individual countries as it makes sense to produce a manageable number of pedestrian types in order to compare the different countries; and not to have optimized typologies for each country which would not be comparable among each other.

The analysis resulted in four types of pedestrians (see Figures 11 and 12):

- <u>Type 1:</u> Medium daily travel distance (mean on all means of transport: 22,03km), daily walking but below average distance (mean: 2,83km), high percentage of usage of public means of transport or high percentage travelling as car passenger; very low percentage of travelling by bicycle; 44.5% of pedestrians fall into this category. Thus, it can be labelled ‘**Average distance traveller, short distance pedestrian and user of public transport**’.

- <u>Type 2</u>: Very similar to type 1 but it is characterized by a much higher daily travel distance (mean: 79,93km >> highest travel distance of all four types) and a much higher walking distance (mean: 8,63km); this is the smallest group: 9.9% of all pedestrians fall into this category. Thus, it can be labelled ‘**Long distance traveller and pedestrian**’.

- <u>Type 3:</u> the “typical” pedestrian: two thirds (67%) of the daily travel distance is done by walking, another fourth (24%) is done by cycling; low daily total distance (mean 9,5km) as usage of public means of transport and travel as car passenger is very low; 24,1% of cases fall into this category. Alternatively, it can be labelled ‘**Short distance traveller - mostly walking and cycling**’.

- <u>Type 4:</u> Similar to type 1, but with the following differences: higher percentage of daily travel distance by walking (23%) and cycling (14%), minor use of public means of transport (31%) or travelling as car passenger (28%); 21,5% of pedestrians fall into this category. So, a suitable label would be ‘**Average distance traveller, short distance pedestrian and frequent cycling**’.

	Average distance traveller, short distance pedestrian and use of public transport	Long distance traveller and pedestrian	Short distance traveller mostly walking and cycling	Average distance traveller, short distance pedestrian and frequent cycling
Cluster size	44,5%	9,9%	24,1%	21,5%
percentage of walking kilometers	17%	19%	67%	23%
total daily travel distance	22,03	79,93	9,05	21,18
walking frequency nearly daily	100%	93%	100%	64%
walking distance	2,83	8,63	4,45	2,48
percentage of public transport kilometers	44%	46%	4%	31%
percentage of car passenger kilometres	31%	27%	5%	28%
Percentage of cycling kilometres	6%	6%	24%	14%

Figure 11: Summary of cluster analysis for pedestrian types with respect to travel habits.

The four types resulting from the cluster analysis are present in various proportions in the participating countries.

Type 1 (Average distance traveller, short distance pedestrian and user of public transport) covers 44.5% of the pedestrian population. In Belgium type 1 is represented significantly higher, in Israel and in Hungary by trend higher than on average. In the Netherlands, Ireland and Sweden this type is by trend lower than the mean of all countries.

9.9% fall into the category “Type 2” (Long distance traveller and pedestrian), thus this group is the smallest. In Germany,Austria and Estonia type 2 is represented significantly higher than in the other countries. In Serbia, Sweden, and Israel the proportion is by trend higher. In Italy type 2 is significantly underrepresented.

The proportion of Type 3 (Short distance traveller - mostly walking and cycling) differs most strongly among the countries. It lies significantly above the mean (24.1%) in Cyprus Poland and Ireland. It is significantly lower represented in Austria, Israel, Belgium, France and Serbia.

Type 4 (Average distance traveller, short distance pedestrian and frequent cycling) is of similar proportion as type 3 (21.5%). It is significantly high in Italy and Austria. In Germany, Sweden, Spain and Greece it tends to be lower than on average.

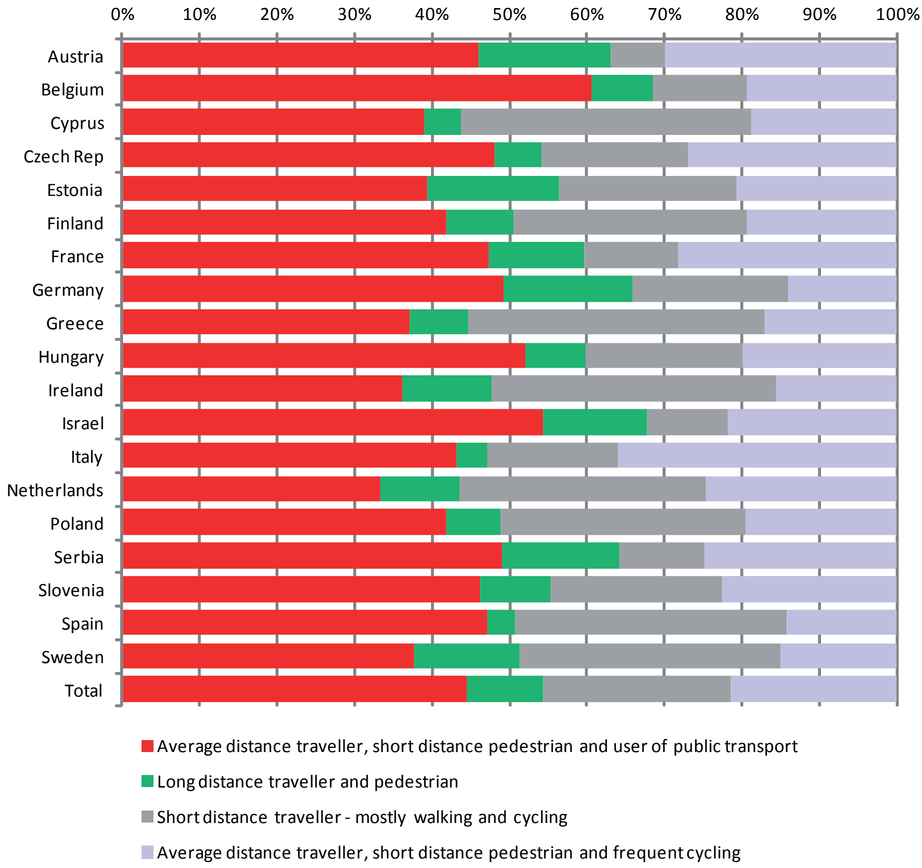

Figure 12: Proportion of pedestrian types per country, in %.

Identifying components of attitudes and behaviour

The next step of the analysis is to try to identify groups of variables reflecting pedestrians' attitudes, behaviours and perceptions. For that reason, an exploratory factor analysis (and more specifically a principal component analysis) took place. This technique has two main objectives: the first is to understand the structure of a large set of variables and the second is to reduce the dataset to a more manageable size and at the same time retain as much of the original information as possible.

Components Extraction

In order to obtain meaningful groups of variables (components) reflecting pedestrians' responses, a principal component analysis was performed on 33 selected variables of the questionnaire[19].

All the necessary statistical checks (i.e. sample size, communalities, shared variance) were carried out in order to assess the validity of the results. Then the optimal number of components was defined and the uncorrelated component scores were calculated.

19 - The variables from questions CO06, CO07, CO08 and ORU03, ORU04 and ORU08 (pedestrians' acceptance of measures, penalties etc.) were selected as more relevant to the scope of the analysis. Furthermore, on the basis of the results of the descriptive analysis, questions ORU01 and ORU10 were not considered interesting for further analysis, while questions ORU11 (accident involvement) and ORU3d (reflective clothing) were eliminated because in most countries only a minor proportion of pedestrians reported positively.

Results

The components obtained are summarized in Table 1, and a detailed description is provided below:
Factor 1 Satisfaction with the pedestrian environment

Table 1: Summary of components.

Factor 2	Attitude towards penalties
Factor 3	Attitude towards electronic in-vehicle devices
Factor 4	Attitude towards speed limitations and surveillance
Factor 5	Pedestrian behaviour and distraction
Factor 6	Attitude towards pedestrian safety measures
Factor 7	Annoyance with other road users
Factor 8	Changing behaviour

Component 1: The first component (Table 2) is correlated with the variables which concern satisfaction with the road and traffic conditions, the pedestrian facilities etc. It can be thus labelled as "***satisfaction with the pedestrian environment***".

Table 2: Component 1 loadings: "satisfaction with the pedestrian environment".

ORU4c	Satisfied with safety	,761
ORU4a	Satisfied with pavements	,723
ORU4d	Satisfied with speed of the traffic	,713
ORU4g	Satisfied with number of crossing places	,705
ORU4e	Satisfied with volume of traffic	,673
ORU4f	Satisfied with number of street lights	,648
ORU4b	Satisfied with separation of pedestrians and cyclists	,643

Component 2: The second component (Table 3) is correlated with the variables which concern the acceptance of various penalties such for inappropriate driver behaviour. It can be labelled as "***Attitude towards penalties***". The variables involved indicate low agreement with penalties regarding speeding, drink-driving, restraint, helmet and handheld phone use.

Table 3: Component 2 loadings: "Attitude towards penalties".

CO08d	Agreement or disagreement with no wearing helmets penalty	,807
CO08c	Agreement or disagreement with severe penalties for not using restraint systems	,785
CO08e	Agreement or disagreement with more severe penalties for handheld phone use	,719
CO08b	Agreement or disagreement with more severe penalties for drink driving	,703
CO08a	Agreement or disagreement with more severe speeding penalty	,693

Component 3: The third component (Table 4) is correlated with the variables which concern the implementation of various in-vehicle devices aiming to improve driver behaviour or prevent inappropriate driver behaviour. It can be labelled as "***Attitude towards electronic in-vehicle devices***".

Table 4: Component 3 loadings: "Attitude towards electronic in-vehicle devices".

CO06c	In favour of alcolock	,823
CO06d	In favour of alcolock for recidivist drivers	,809
CO06e	In favour of fatigue detection devices	,690
CO06b	In favour of black box	,653
CO06a	In favour of speed limiting devices	,551

Component 4: The fourth component (Table 5) can be labeled "***Attitude towards speed limitations and surveillance***". This component is correlated with low acceptance of such measures.

Table 5: Component 4 loadings: "Attitude towards speed limitations and surveillance".

CO07b	In favour of speed cameras at a single point	,811
CO07c	In favour of speed zone cameras between two points	,795
CO07a	In favour of red light cameras	,731
CO07d	In favour of 30km/h zones	,465

Component 5: The fifth component (Table 6) is correlated with the variables which concern pedestrians self-reported behaviour. This component can be labelled "***Pedestrian behaviour and distraction***".

Table 6: Component 5 loadings: "Pedestrian behaviour and distraction".

ORU3a	Frequency of red light crossings	,718
ORU3f	Frequency of handheld phone use	,704
ORU3b	Frequency of crossings in places other than pedestrian crossings	,703
ORU3g	Frequency of music devices use	,686

Component 6: The sixth component (Table 7) is correlated with the variables which concern dedicated pedestrian safety measures, such as 30km/h zones, bicycle lanes, sidewalks, car- and motorcycle-free zones). This component can be labelled "***Attitude towards pedestrian safety measures***".

Table 7: Component 6 loadings: "Attitude towards pedestrian safety measures".

CO07e	In favour of bicycle lanes	,790
CO07f	In favour of sidewalks	,788
CO07g	In favour of car and motorcycle free zones	,676
CO07d	In favour of 30km/h zones	,446

Component 7: The seventh component (Table 8) is correlated with the variables which concern "***Annoyance with other road users***".

Table 8: Component 7 loadings: "Annoyance with other road users".

ORU08b	Annoyed with motorcyclists	,812
ORU08a	Annoyed with car drivers	,772
ORU08c	Annoyed with cyclists	,722

Component 8: The eighth component (Table 9) is correlated with the variables which concern pedestrians who avoid dangerous streets or intersection and who have to walk on the streets because of parked cars or other barriers. It can be thus labelled "***Changing behaviour***".

Table 9: Component 8 loadings: "Changing behaviour".

ORU03c	Frequency of avoiding too dangerous streets/intersections	,842
ORU03e	Frequency of walking on the street because of parked cars/barriers	,568

Overall, the components identified are largely in accordance to the structure of the survey questionnaire, as was expected. In some cases, however, the estimated components provide further insight into aspects of pedestrian attitudes and behaviour. For example, Components 1, 2, 3 and 7 are highly associated with questions ORU04, CO08, CO06 and ORU08 respectively. Component 4 and 6 are highly associated with almost half of the questions of CO07 each, while Component 5 with most of questions of ORU03 of the questionnaire. Finally, Component 8 is highly associated with 2 out of 7 questions of ORU03 of the questionnaire.

Grouping pedestrians on the basis of attitudes and behaviour

As a next step, a cluster analysis was carried out. Cluster analysis is a similar technique to principal component analysis whose aim is to group cases (i.e. individuals). In this analysis it was aimed to group pedestrians in meaningful groups or clusters. The variables that were selected were the 8 components and the clustering was based upon the Component Scores that were calculated from the Principal Component Analysis.

The method of analysis that was chosen was the Two Step Cluster Analysis. This method of clustering is most appropriate for very large data files and it can produce solutions based on both continuous and categorical variables. All the appropriate steps were taken in order to perform the two-step cluster analysis (standardized continuous variables, log likelihood test, BIC criterion).

Pedestrian Clusters

The cluster analysis resulted in 3 clusters of pedestrians. 44,4% of pedestrians are in the 1st cluster, 30,7% are in the 2nd cluster and 24,9% are in the 3rd cluster

Table 10 illustrates the Centroids, which are the mean standardized component scores that each cluster center has. These values indicate the distance from the component 'centre' that each cluster centre has. Given that the component scores are standardized, it is underlined that the mean component score has a value equal to 0.

Table 10: Clusters' centroids (Final clusters' centres).

Facors	Label	Cluster 1	Cluster 2	Cluster 3
1	Satisfaction with the pedestrian environment	-0,08923	0,12876	0,00049
2	Attitude towards penalties	-0,30251	0,64728	-0,25797
3	Attitude towards electronic in-vehicle devices	-0,41307	0,64893	-0,06287
4	Attitude towards speed limitations and surveillance	-0,35964	0,54795	-0,03374
5	Pedestrian behaviour and distraction	0,03574	0,24045	-0,35996
6	Attitude towards pedestrian safety measures	-0,50943	-0,07808	1,00458
7	Annoyance with other road users	0,07156	0,01860	-0,15052
8	Changing behaviour	0,12444	0,22458	-0,49856

Overall, the 3 clusters can be summarized as follows: Cluster 1 includes pedestrians with positive attitudes and positive behaviour, while Cluster 2 includes pedestrians with negative attitudes and negative behaviour. Cluster 3 includes pedestrians with positive behaviour, but mixed attitudes, as they agree with some types of measures but disagree with others. More specifically:

- **CLUSTER 1: "Positive attitudes, positive behaviour"**

Satisfied with road environment

Agree with and penalties

Agree with devices

Agree with speed limitations and surveillance

Average risk-taking and distraction

Accept pedestrian measures

- **CLUSTER 2: "Negative attitudes, negative behaviour"**

Not satisfied with road environment

Disagree with measures and penalties

Disagree with devices

Disagree with speed limitations and surveillance

High risk-taking and distraction

High changing behaviour

- **CLUSTER 3: "Mixed attitudes, positive behaviour".**

Average satisfaction with road environment

Agree with penalties

Average agree with devices

Average agree with speed limitations and surveillance

Low risk-taking and distraction

Disagree with pedestrian measures

Not annoyed by other road users

Not changing behaviour

Thirty-seven percent of male pedestrians are in Cluster 1, which suggests that they have positive attitudes and positive behaviour, while 38% has negative attitudes and negative behaviour. Only 25% has mixed attitudes. Almost half of females (48%) have positive attitudes and positive behaviour while 25% and 27% are assigned to the other two clusters.

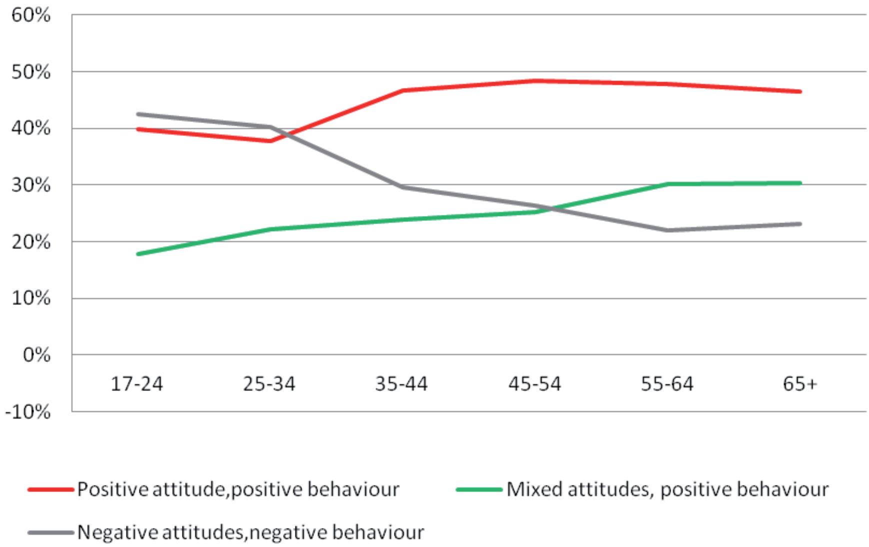

Figure 13: Proportion of pedestrian types per age group in %.

Although overall most pedestrians belong to Cluster 1 (positive attitudes and positive behaviour) and the lowest percentage belongs to Cluster 2 (negative attitudes and negative behaviour), this trend is reversed for **pedestrians younger than 34 years old, who have negative attitudes and behaviour** (see Figure 13). Those age groups (17-24 and 25-34) have the lower percentage of mixed attitudes (Cluster 3).

The Figure 14 shows that the percentage "positive attitudes and positive behaviour" is higher than 40% in almost all the countries, apart from Austria, Netherlands, Spain and Germany. In those 4 countries pedestrians are equally distributed across the 3 clusters. The highest percentages of "negative attitudes and negative behaviour" can be found in Italy (48,2%), Cyprus (46,5%), Sweden (39,3%) and Greece (38,9%). The most dispersed cluster is "mixed attitudes, positive behaviour", which has some notably low percentages such as 5,6% (Greece), 6,9% (Cyprus) 8,1% (Estonia), while at the same time has some high percentages such as Hungary (40,5%), Finland (39,2%) and Spain (38,7%).

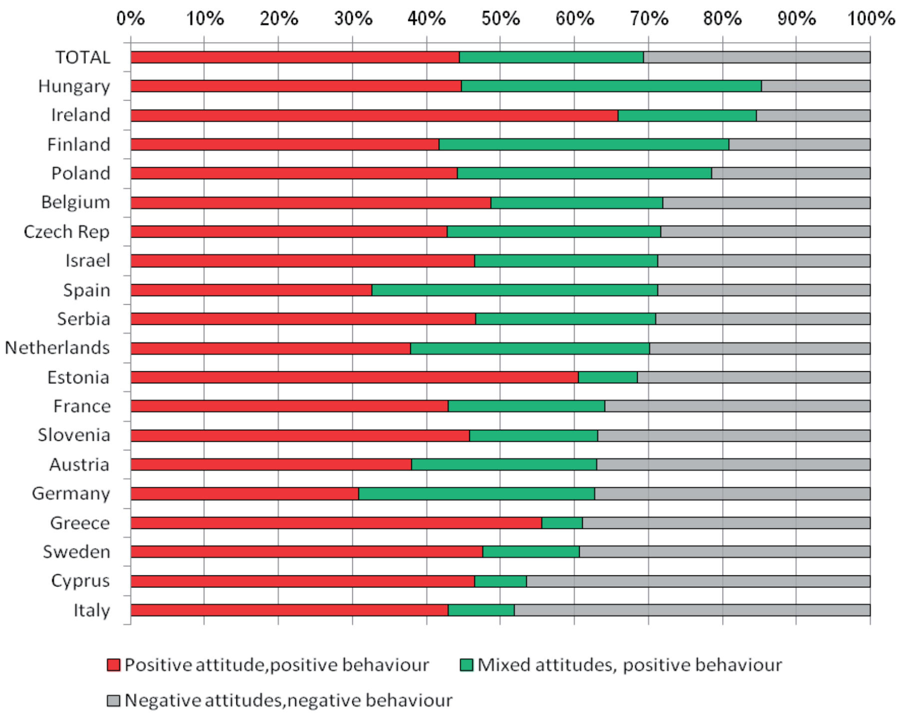

Figure 14: Proportion of pedestrian types per country, in %.

Conclusion

From the **descriptive and in-depth analyses** of the pedestrian's responses, a number of interesting remarks can be made:

- Aside from walking, pedestrians travel frequently as car passengers and as public transport passengers, and less as motorcycle passengers.
- Pedestrians seem to be very concerned about several socioeconomic issues, including pollution, unemployment and health care. Only in a few countries pedestrians are worried about congestion. The responses are clearly affected by the degree to which these issues are present in the different countries.
- Pedestrians seem to be more satisfied with the roads, find that they have become safer and perceive important concern of the governments for road safety in northern and western European countries, while the opposite is the case for southern and central European countries.
- Pedestrians are **very much in favour of all safety measures** for speeding, drink-driving and fatigue, especially for recidivist drivers. It is interesting though, that they seem to support somewhat less the establishment of more '30km/h' zones, even though it is a dedicated pedestrian safety measure.
- Moreover, pedestrians generally **agree with more enforcement and severe penalties**, especially as regards drinking and driving as well as not wearing helmets won motorcycles.
- Overall, it observed that pedestrians **do not support so much the measures that aim to decrease traffic speed** and this seems counterintuitive, but may be attributed to

the fact that they are not willing to accept more time spent in cars or public transport as passengers. It appears that pedestrians are less aware of the risk associated with the speed of traffic, although they are quite aware of the risk associated with alcohol.

- Pedestrians **perceive an increased risk associated with motorcycling** by far, followed by car driving, while public transport is perceived to be the safest transport mode.
- **Cycling is considered to be more dangerous than walking.**
- Although in most countries pedestrians never or rarely cross roads in red light, a proportion ranging from 10 to 30% often do that. **Crossing at non designated locations appears to be a quite widespread behaviour**. On the other hand, they often avoid roads or intersections that appear to be dangerous.
- **Unsafe or distractive behaviours are more frequent in urban areas**, especially in increased town size, than in rural areas. On the other hand, the use of reflective clothing and the avoidance of certain streets or intersections are more widespread in rural areas.
- Men cross streets on red light or wrong places more often, and women and the elderly avoid dangerous streets or intersections more often.
- Pedestrians appear to use mobile phone quite often while walking, but MP3/ipod devices are used rarely. This may be partly due to a lower penetration of these devices in the general population that mobile phones, and not necessarily to a lower perceived risk.
- The lowest satisfaction with the road environment (sidewalks, lighting, pavements) are consistently observed in specific countries, namely Greece, Cyprus, Hungary, and also Italy, Poland and Estonia. As regards traffic conditions, it is somewhat surprising that **pedestrians are not satisfied with the speed of traffic**, given that they are also not strongly in favour of speed reducing measures.
- The satisfaction of pedestrians with the road infrastructure increases with town size, possibly due to better pedestrian facilities in bigger cities.
- The youngest and oldest age groups are more often satisfied with the road infrastructure. On the contrary, older people were found to be less satisfied with the speed and volume of traffic.
- Pedestrians, especially females, are quite annoyed with car drivers, less annoyed with motorcyclists and even less annoyed with bicyclists. The results of these questions appear to be affected by the level of mobility of each mode in each country (e.g. increased pedestrians' annoyance with motorcyclists in Greece, bicyclists in the Netherlands). It is interesting to note that only **annoyance with motorcyclists appears to increase with town size**, possibly due to increased mobility of motorcycles in big cities.
- A **cluster analysis on pedestrians travel habits** was carried out, revealing 4 types of pedestrians:

Type 1: Average distance traveller, short distance pedestrian and user of public transport (44.5% of pedestrians, over-represented in Belgium, Israel and Hungary)

Type 2: Long distance traveller and pedestrian (9.9% of pedestrians, over-represented in Germany, Austrian and Estonia).

Type 3: Short distance traveller - mostly walking and cycling (24.1% of pedestrians, over-represented in Cyprus, Poland and Ireland).

Type 4: Average distance traveller, short distance pedestrian and frequent cycling (21.5% of pedestrians, over-represented in Italy and Austria).

- It is interesting to note that the majority of pedestrians are not ‘typical’ ones, i.e. a large proportion of their daily travel is carried out by other means of transport.
- The results revealed that the 33 variables of the study can be optimally clustered together in **8 Components**. In addition, those Components can be broadly classified into two sub-groups, one group associated with attitudes and one with behaviour. More specifically, Components 1 (Satisfaction with the pedestrian environment), 2 (Attitude towards penalties), 3 (Attitude towards electronic in-vehicle devices), 4 (Attitude towards speed limitations and surveillance), 6 (Attitude towards pedestrian safety measures) and 7 (Annoyance with other road users) are associated with stated-**preferences and attitudes**, while Components 5 (Pedestrian behaviour and distraction) and 8 (Changing behaviour) are associated with stated-**behaviour**.
- The Cluster analysis revealed 3 groups of pedestrians on the basis of the 8 Components of attitude and behaviour:

Type 1: positive attitudes and positive behaviour

Type 2: negative attitudes and negative behaviour

Type 3: mixed attitudes and positive behaviour.

- Almost 70% of pedestrians have neutral to positive behaviour and attitudes while a non negligible 30% are expressing negative attitudes towards measures and interventions as well as towards existing pedestrian environment and safety
- As expected, male pedestrians show negative attitudes and behaviour to a larger extent compared to female pedestrians.
- Young individuals are also over-represented in the cluster of pedestrians with negative attitudes and behaviour. The distribution of pedestrians in the three clusters in the nineteen countries reveals some interesting findings.
- In very few countries is one of the three types of pedestrians dominant; in most countries, a non-negligible proportion of ‘negative’ pedestrians is observed.

Chapter 3.4

Cycling other road users

Silverans Peter (BIVV, Belgium)

Zavrides Neophytos (ETEK, Cyprus)

Introduction

In Europe, 2440 cyclists died in road accidents in 2008, making up 6.5% of the total number of road accident fatalities in 2008 (Dacota, 2010). However, differences between countries are large. In countries like the Netherlands and Denmark, where the bicycle is an important daily means of transport, the proportion of cyclist fatalities is much higher (18% and 13% respectively), whereas in Greece and Spain, the proportion of cyclist fatalities is only 1 or 2% (SafetyNet, 2009). Moreover, cyclist crashes are heavily and disproportionally underreported in the police crash statistics compared to what hospital record and other studies show (SafetyNet, 2009). According to the same source, in the Netherlands, for instance, only 31% of all hospitalized cyclists are included in the official accident statistics, whereas this is 92% for hospitalized car occupants

Significant research has gone into the development of safety mitigation methods for vehicles, but comparatively little has been done for bicycles and pedestrians. Non-motorized travel and interest in promoting it are both on the rise, however. According to the policy orientations for road safety 2011-2020 of the European Commission (2010), national governments are “increasingly involved in promoting walking and cycling”. At the same time the commission argues that this requires more attention to road safety in these areas. Since the commission states that “for many potential cyclists, real or perceived road safety risks remain a decisive obstacle”, risk perception will be discussed in detail in this chapter. The number of non-motorized trips and the number of all trips that are currently made by cycling or walking has increased significantly. Moreover, improved awareness of the health benefits and the advantages for urban mobility of active transportation mean that all European countries are focusing more resources on improving bicycle and pedestrian facilities and overall safety. The analyses discussed in this chapter aim to give an insight in the cyclists’ attitudes towards road safety.

Method

The selection of the cycling other road users followed the common methodological guidelines for the SARTRE 4 survey. The results in this chapter are based on the subset of other road users that answered the specific subsets of questions that were only asked to cycling other road users (ORU05, ORU06 and ORU09). These questions were only asked to the other road users that reported to cycle one or more kilometres per day on average[20].

20 - Other road users that answered zero or that did not answer how many kilometres they cycle per day on average where excluded from the analysis. According to the common methodological guidelines other road users that did not answer this questions were also to be asked the specific cycling questions, but in practice this has only rarely been done.

Results

Description of the cyclist sample

In Figure 1 both the percentage of cycling other road users and the average number of kilometres driven per day per cycling other road user in each country are depicted for each of the participating countries. The horizontal axis gives the percentage of cyclists in the other road users group. On average, only about 34 percent of all European other road users cycle. The vertical axis gives the average number of kilometres driven *per cyclist* for each of the countries. On average, a European cycling other road user cycles about seven kilometres per day. As expected countries with a tradition in cycling like the Netherlands, Germany and Finland have the highest percentage of cyclists in the other road users group. Greece, Cyprus and Spain have the lowest percentages. The percentage of cycling other road users is unrelated to the average number of kilometres driven per cyclist per day (r= 0.00).

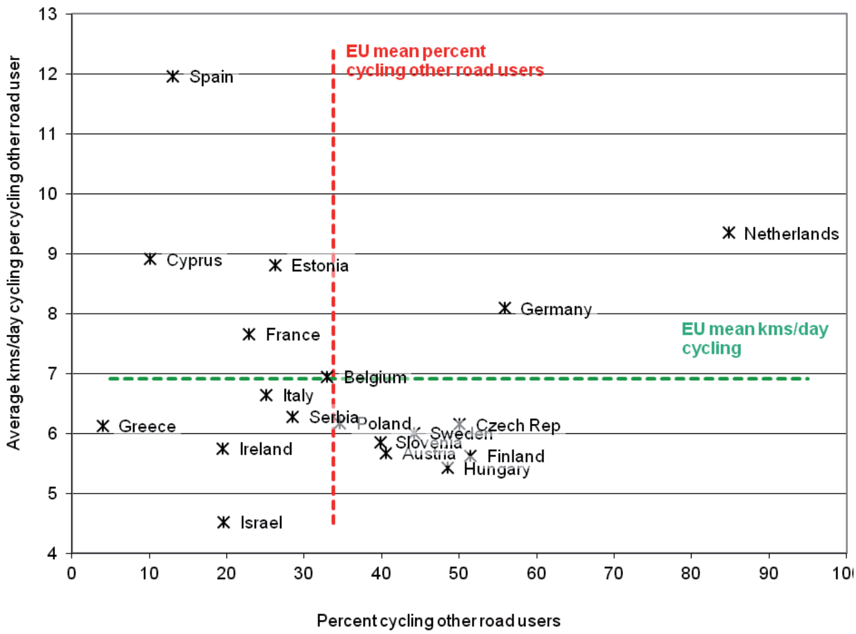

Figure 1: Percentage of cycling other road users and average number of kilometres cycled per cycling other road user per day per country.

Given that the total SARTRE-sample is not representative for the total population (due to arbitrary sample sizes for motorcyclists and other road users), it is not possible to get a clear estimate on the intensity of cycling for each of the countries. The best possible indicator is the number of kilometres driven per day per other road user, which is simply the product of both indicators included in Figure 1. This product is depicted in Figure 2. The countries in the upper right corner of Figure 1. have the largest cycling traffic volumes, whereas countries in the lower left corner of Figure 1 have the smallest cycling traffic volumes. In the EU, other road users cycle on average 2.4 kilometres per day.

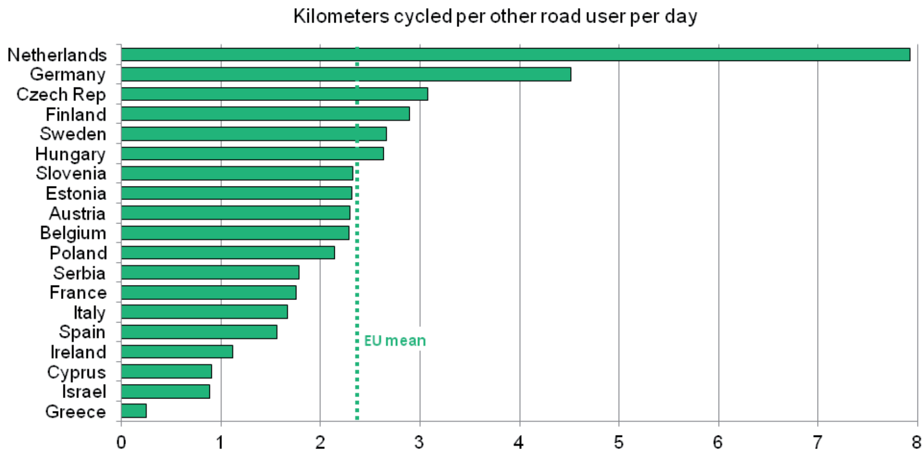

Figure 2: Kilometres driven per other road user per day per country.

A comparison of Figure 1 with Figure 2 shows that the cycling intensity in each country depends more on the percentage of other road users that effectively cycle from time to time than on the kilometres driven by those that do cycle. Cyclists in Spain, for instance, drive the most kilometres per day, but due to the fact that they are relatively rare (only 12% of the Spanish other road users cycle) they do not represent a high volume of traffic. Cyclists in Finland, on the other hand, cycle on average only half as much as their Spanish counterparts, but due to the fact that about half the other road users cycle from time to time in Finland, they represent a relatively high traffic volume.

The characteristics of the cyclists

In the figures below, the distribution of the cycling other road users over age groups and gender are depicted per country. In Cyprus, Greece, Israel, Sweden and Serbia the cyclists are mainly younger people whereas in Hungary, Italy, Finland and Czech Republic the cyclists are mainly older people. As shown in Figure 4 in Cyprus, Spain, Italy and Ireland more than 60% of the cyclists are males whereas in Estonia, Slovenia, Greece and Finland more than 70% of the cyclists are women.

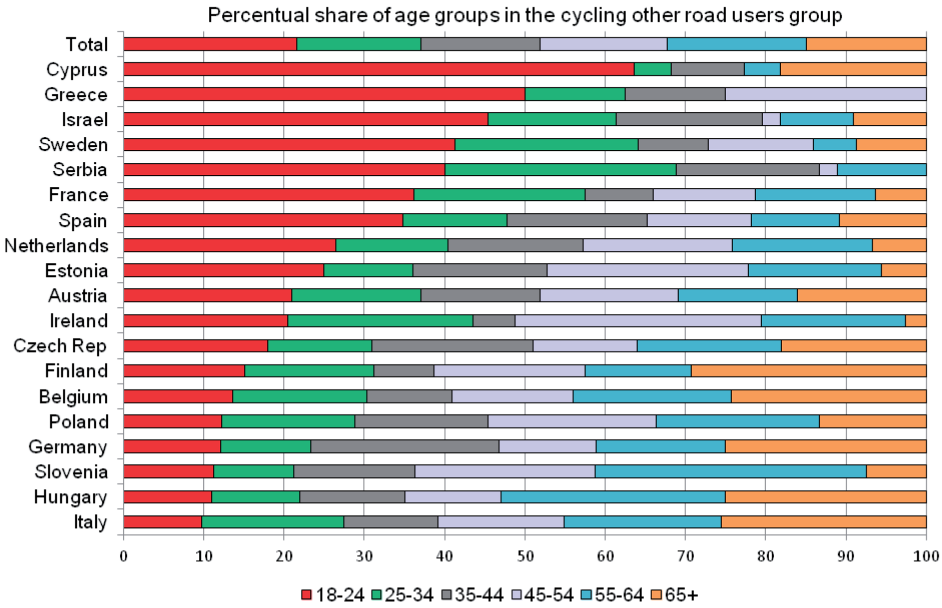

Figure 3: Cycling other road users by age group.

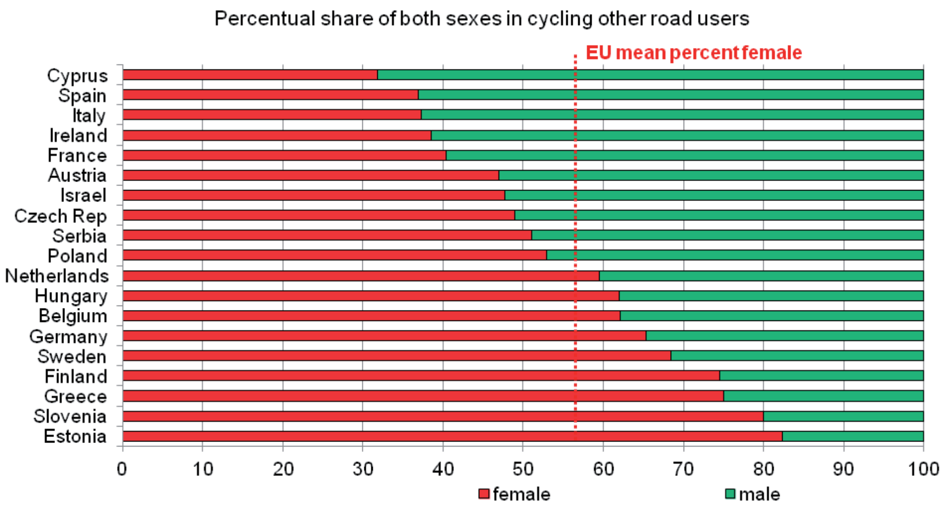

Figure 4: Cycling other road users by gender.

Cyclists' risk perception

In order to evaluate the cycling other road users perception of the risk of cycling they were asked how dangerous they considered cycling to be regarding accidents. The question had to be answered with "very", "fairly", "not much" or "not at all". In order to evaluate the risk perception per country, the percentage of "very" and "fairly" answers were added for each country. The result of this calculation is shown in Figure 5. The perceived risk of cycling is the highest in Ireland, Greece and Finland. The lowest risk perception was found in Spain, Israel and Austria. All together the top and bottom three countries are neither countries with high cyclist traffic volumes, nor countries with low cycling traffic volumes.

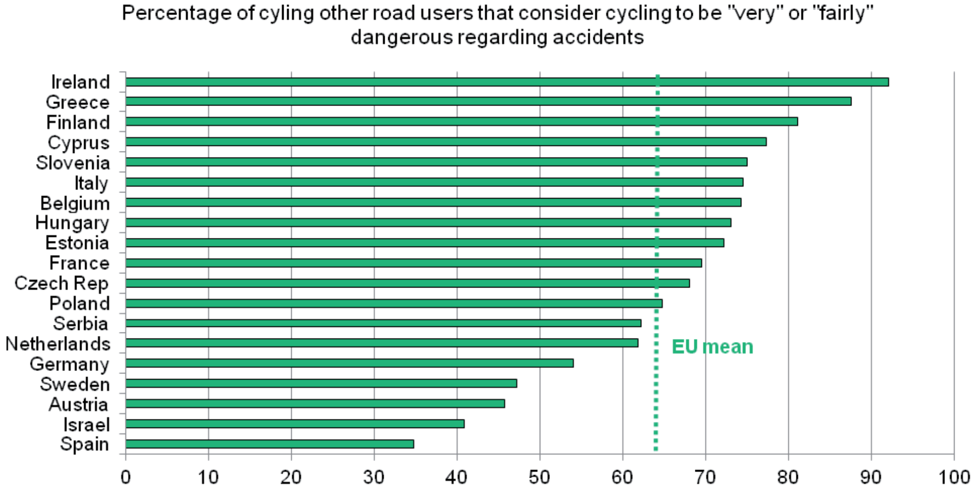

Figure 5: Perceived danger of cycling per country.

To illustrate the relative independence of cycling traffic volumes and cyclists" risk perception, in Figure 6 both the cycling traffic volume per country and the perceived danger of cycling are depicted.

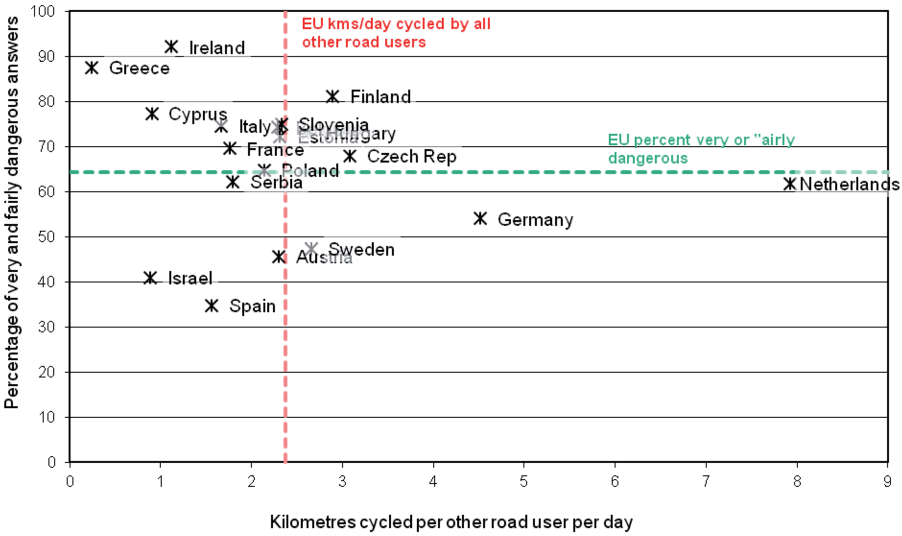

Figure 6: Perceived risk of cycling and cycling traffic volumes per country.

The interpretation of the present results is complicated by the fact that the danger of cycling regarding accidents can be interpreted in two ways. Either as the risk of a cyclist *causing* accidents or as the risk of the cyclist *getting hurt in an accident*.

Self-reported behavioural habits

In order to evaluate international differences in dangerous cycling behaviour (crossing when the light is red, not using headlamp when cycling in the dark,...) and the use of protective equipment and devices (reflective clothing, helmets,...) the cycling other road users were asked how often (never, rarely, sometimes, often, very often or always) they performed these behaviours or used the equipment. Depending on the question either extreme of the answer scale can be considered as more or less relevant, so the questions were analyzed depending on the question at hand. Since there is no room to be exhaustive in the present report, we only discuss the results of crossing the road when the light is red, the use of reflective clothing and the use of bicycle helmets.

Figure 7 shows the percentage of cycling other road users that sometimes, often, very often or always cross the road when the light is red.

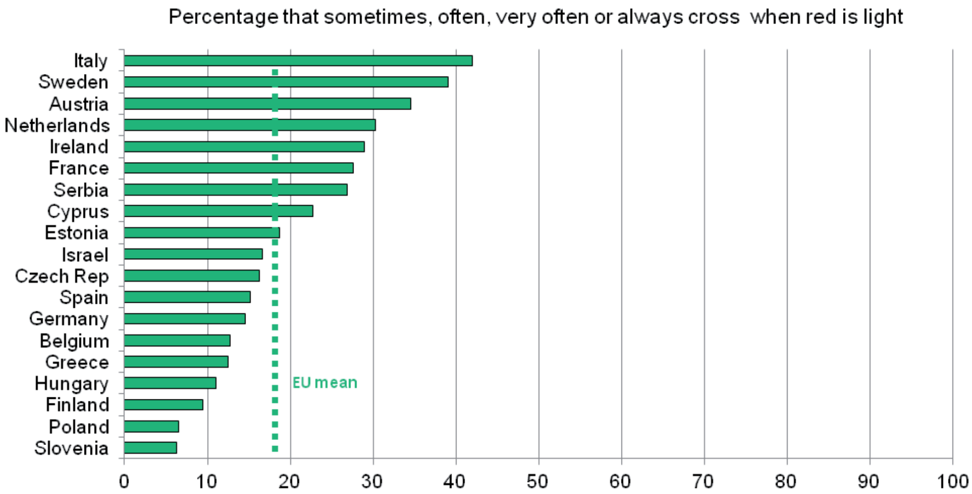

Figure 7: Percentage of cyclists that sometimes, often, very often or always cross when the light is red.

In Slovenia, Poland and Finland, cyclists are most respectful of red lights, whereas in countries like Italy, Sweden and Austria, more than 30 percent of the cyclists sometimes cross the road when the light is red. There does not seem to be a relationship between the popularity of cycling in any particular country and this type of behaviour.

In Figure 8 the percentage of cyclists that often, very often or always wear reflective clothing are shown for each of the participating countries.

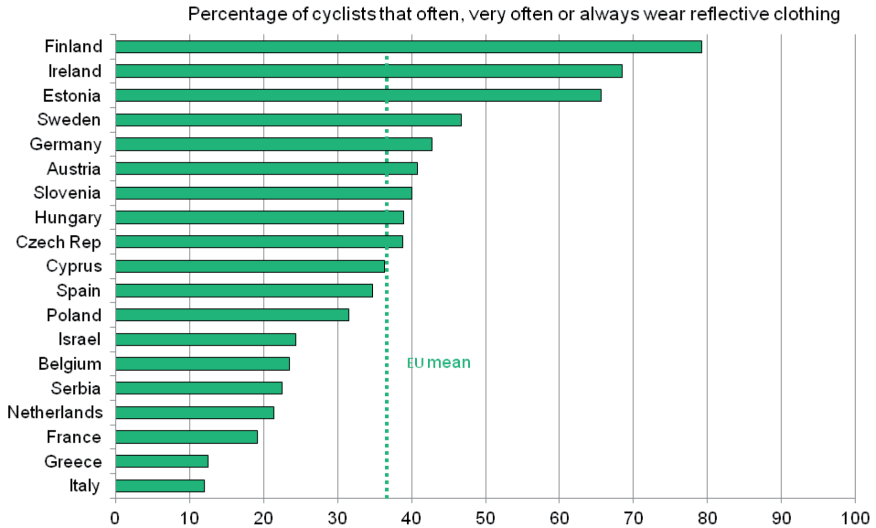

Figure 8: Percentage of cyclists that often, very often or always wear reflective clothing.

Reflective clothing is most worn in Finland, Ireland and Estonia and least in France, Greece and Italy.

Figure 9 shows the percentage of cyclists in each country that often, very often or always wear a bicycle helmet.

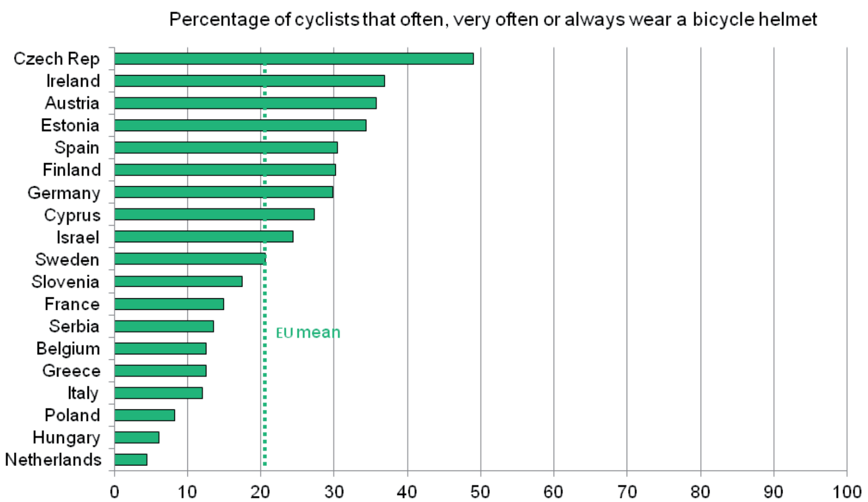

Figure 9: Percentage of cyclists that often, very often or always wear a bicycle helmet.

Overall, the percentage of cyclists that regularly wear a bicycle helmet is quite low, with only 20 percent of the cyclist, on average, wearing often or more a bicycle helmet. Helmets are most often worn in the Czech Republic, Ireland and Austria. In Poland, Hungary and the Netherlands, less than 10 percent of the cyclists regularly wear a bicycle helmet.

Satisfaction with bicycle safety and bicycle infrastructure

- Satisfaction with bicycle safety and risk perception as a function of cycling traffic volumes

The cycling other road users were asked to evaluate how satisfied they are *as a cyclist and concerning the route they usually take,* with the speed and volume of traffic, with the road infrastructure (cycle paths, street lightning) and with safety in general. They could choose between very, fairly, not much and not at all satisfied. We therefore analysed the international differences in the percentage of (very or fairly) satisfied cyclists.

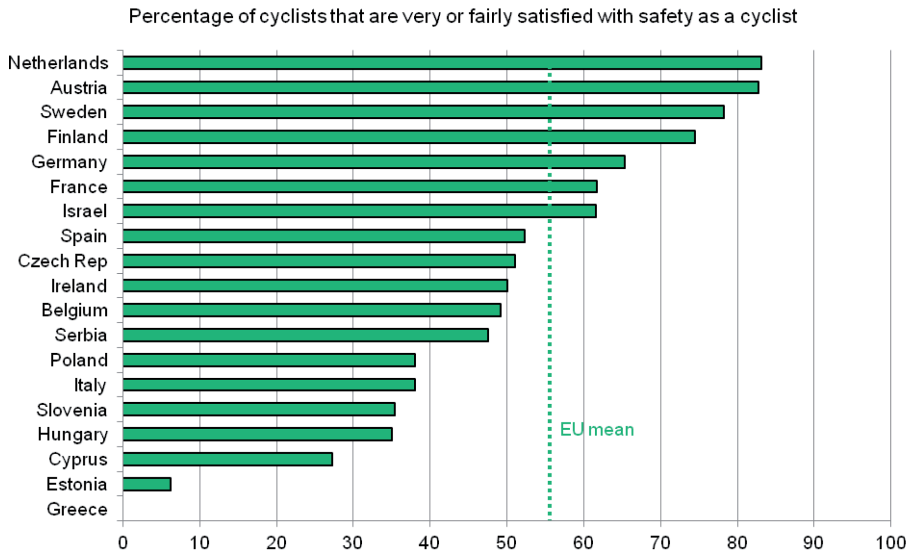

Figure 10: Percentage of cyclists that are very or fairly satisfied with safety as a cyclist.

From Figure 10 it appears that the satisfaction with safety tends to be higher in countries with high cycling traffic volumes (like the Netherlands, Sweden, Finland and Germany) and lower in countries with low cycling traffic volumes like Cyprus, Estonia and Greece. In Greece not a single cyclists is satisfied with safety. In order to analyse the relation between both variables we calculated the correlation between the degree of satisfaction with safety and the average kilometres cycled per other road user per day (see Figure 11).

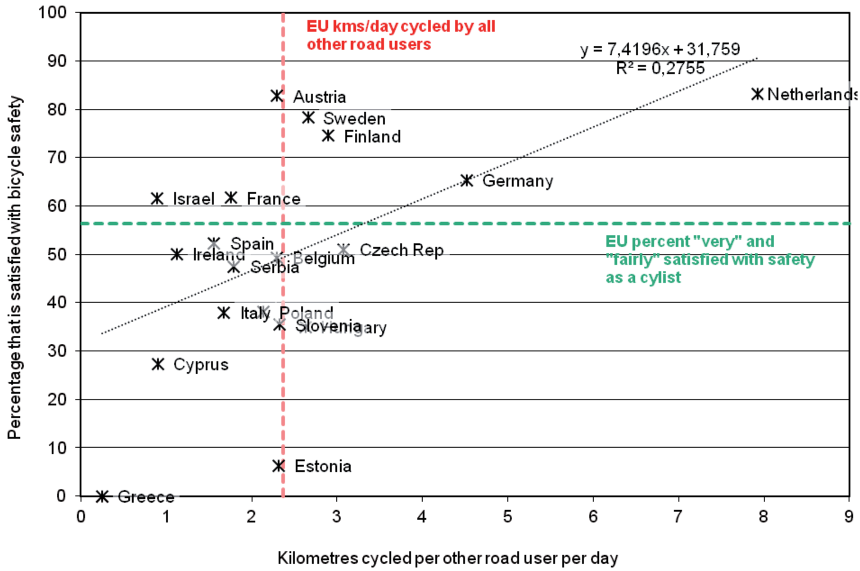

Figure 11: Percentage of cyclists that are very or fairly satisfied with safety as a cyclist as a function of cycling traffic volumes.

Across all countries, the correlation between satisfaction with safety and traffic volume is fairly high (r=.52), but as can be seen in Figure 11 there are several exceptions to this general trend. Despite the fact that Estonia has an average EU cycling volume, less than one out of ten of the cyclists are satisfied with their safety. On the other hand in three countries (Austria, Sweden and Finland) the cyclists are more than averagely satisfied with their safety, despite the fact that they only have around average cycling traffic volumes.

The results in Figure 6 showed that the perceived danger of cycling did not correlate at all with the cycling traffic volumes per country. Figure 11 on the other hand illustrates a clear correlation between the cycling traffic volumes per country and the cyclists' satisfaction with safety. This obviously raises the question whether the cyclists' satisfaction with safety is related to their risk perception or not. Figure 12 below clearly illustrates that there is a clear correlation (r= -.52) between risk perception and satisfaction with safety per country: the higher the average risk perception in a country, the lower the percentage of cyclists satisfied with their safety.

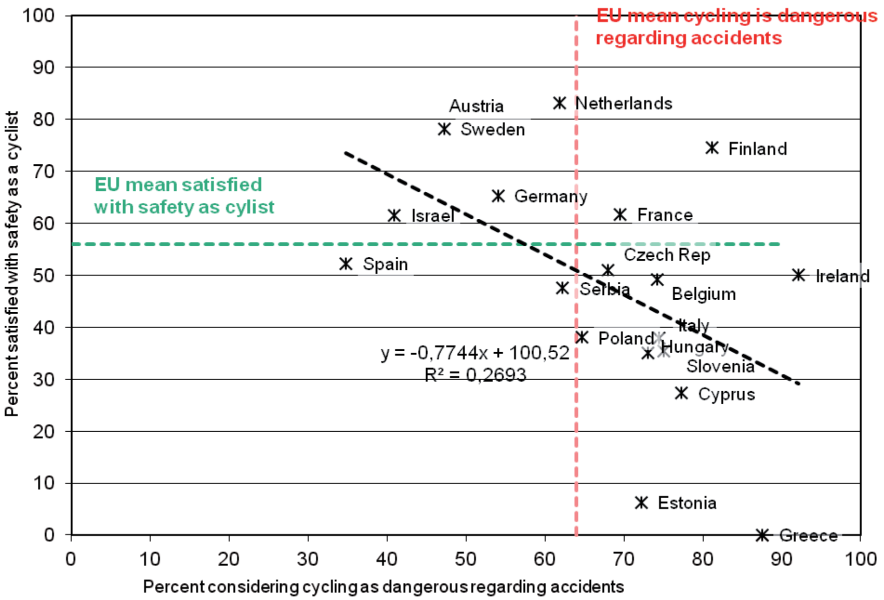

Figure 12: Percentage of cyclists satisfied with safety as function of risk perception.

Further analysis of this relationship at an individual level, however, shows that this relationship is much weaker when analysed at the individual level then at the aggregate level. The overall binary correlation between satisfaction with safety and perceived risk was only -.11 (p<.001). This provides a clear cut warning against quick inferences based on analyses at group level (the famous ecological fallacy, cf. Duncan et al., 1998 for a review).

- Satisfaction with bicycle safety in relation to satisfaction with bicycle paths

Figure 13 below gives the percentage of cyclists that are satisfied with the cycle paths on the route they usually take.

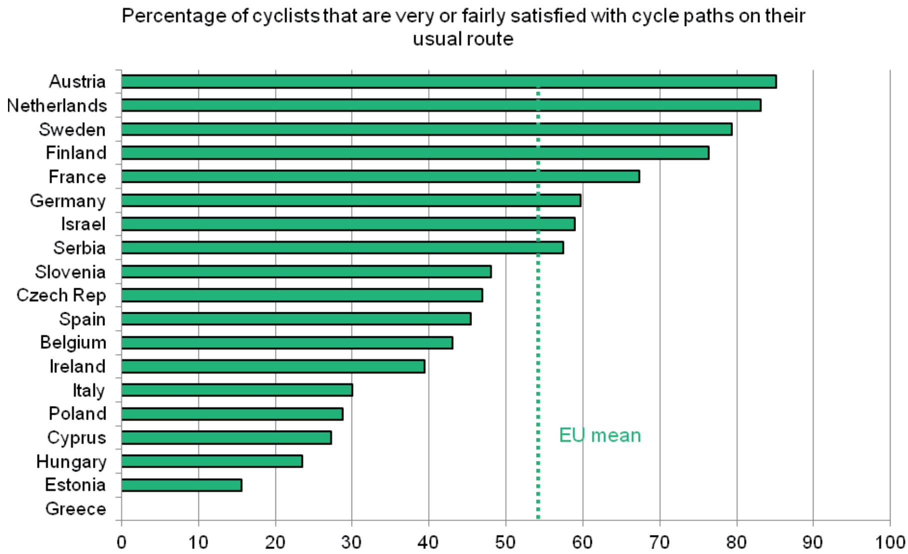

Figure 13: Percentage of cyclists that are very or fairly satisfied with cycle paths (Greece= 0%).

As expected, cyclists in countries with high cyclist traffic volumes tend to be more satisfied with the cycle paths on the route they usually take. But once again there are notable exceptions to this trend. Despite the high cycling traffic volumes in Hungary, Hungarian cyclists are the second least satisfied with cycle paths. Whereas Israeli cyclists' satisfaction is slightly above the EU average, while being the second to last country in terms of cycling traffic volumes. Figure 14 below gives the correlation between both variables:

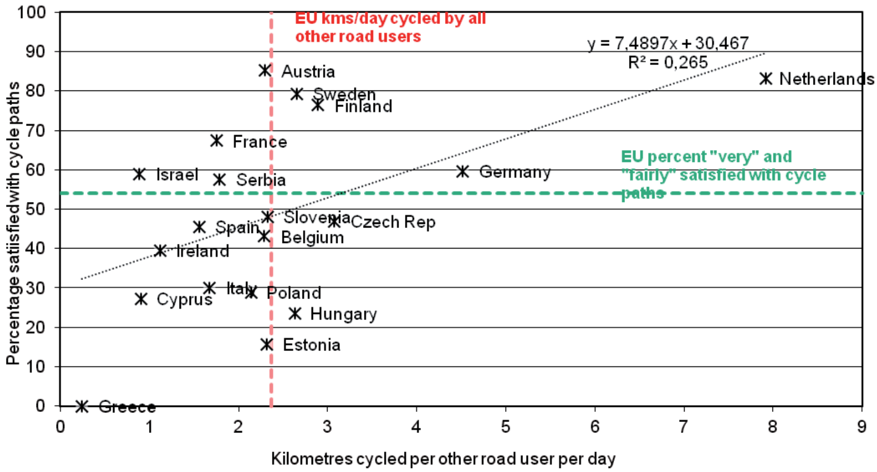

Figure 14: Satisfaction with cycle paths as a function of cycling traffic volumes.

The fact that this Figure is almost identical to Figure 15 suggests a very high correlation between satisfaction with cycle paths and satisfaction with cycle safety over countries. We therefore calculated the correlation between both variables across all countries.

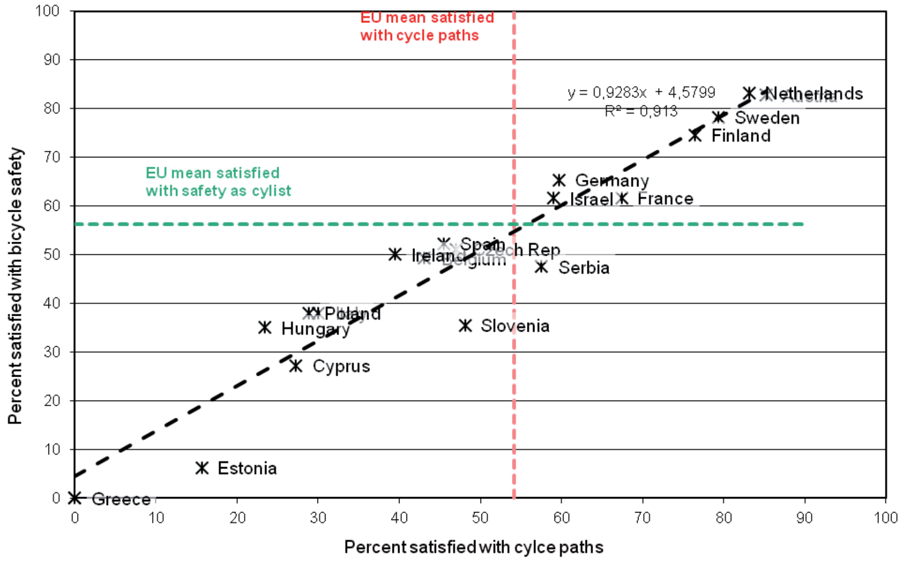

Figure 15: Satisfaction with safety as a function of satisfaction with cycle paths.

The correlation between satisfaction with safety as a cyclist and satisfaction with cycle paths approached 1 (r= .95). In order to verify whether this between-group correlation does not reflect an ecological fallacy, we also calculated the correlation between both variables at an individual level. At an individual level, the correlation between both variables (after binary coding) was still .62 and very significant.

- Satisfaction with speed and volume of traffic and with number of street lights

For the remaining question we simply calculated the percentage of satisfied cyclists for each of the themes. Figure 16 below gives the percentage of cyclists that are satisfied with the speed of traffic.

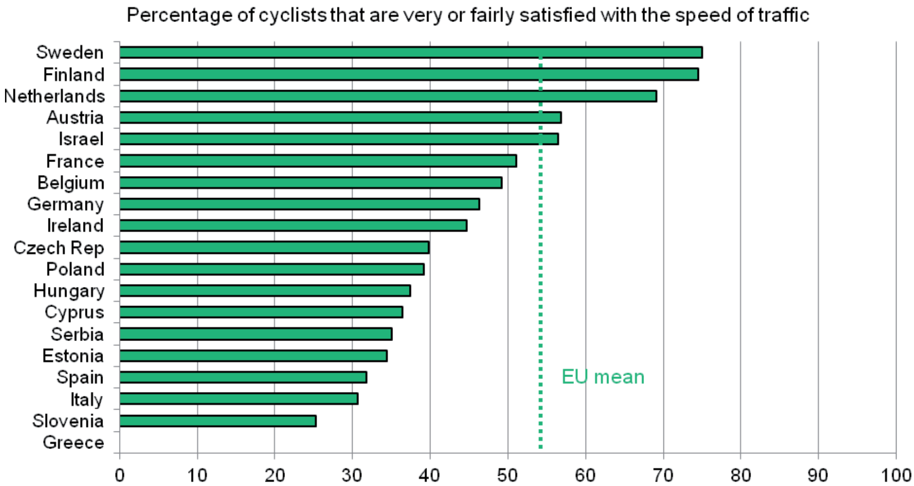

Figure 16: Percentage of cyclists that are very or fairly satisfied with the speed of traffic.

Once again, the satisfaction scores for speed correspond largely with the cycling traffic volumes in each of the countries. The top three countries (Sweden, Finland and the Netherlands) have above-average cycling traffic volumes, whereas the bottom three countries (Italy, Slovenia and Greece) are countries with below average cycling traffic volumes. But, once again, there are notable exceptions to this general trend. The Czech Republic and Germany for instance, are below average satisfied with the speed of traffic while having above average cycling traffic volumes. Israel on the other hand, has a (slightly) above average satisfaction with the speed of traffic while having (much) under average cycling traffic volumes.

The satisfaction scores for the volume of traffic reflect the same ordinal order of the countries as for the speed of traffic. This is obvious from a direct comparison of Figure 16 and Figure 17.

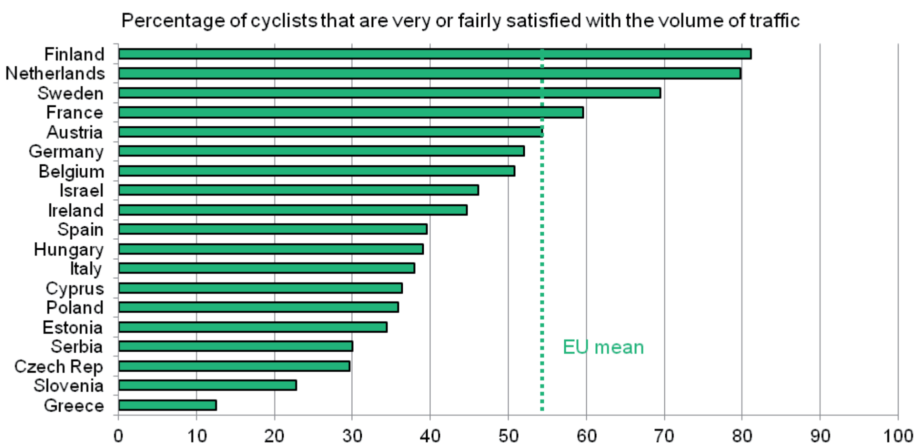

Figure 17: Percentage of cyclists that are very or fairly satisfied with the volume of traffic.

Finally, the satisfaction scores for the number of street lights show less international variation then the satisfaction scores for the speed and volume of traffic. As shown in Figure 18 there is hardly any international variation in these scores, although on the low satisfaction end of the continuum Greece, Serbia and Cyprus stand out with only 0 to 40 percent satisfied cyclists, whereas on the other side of the scale the Netherlands stand out with more than 80 percent satisfied cyclists.

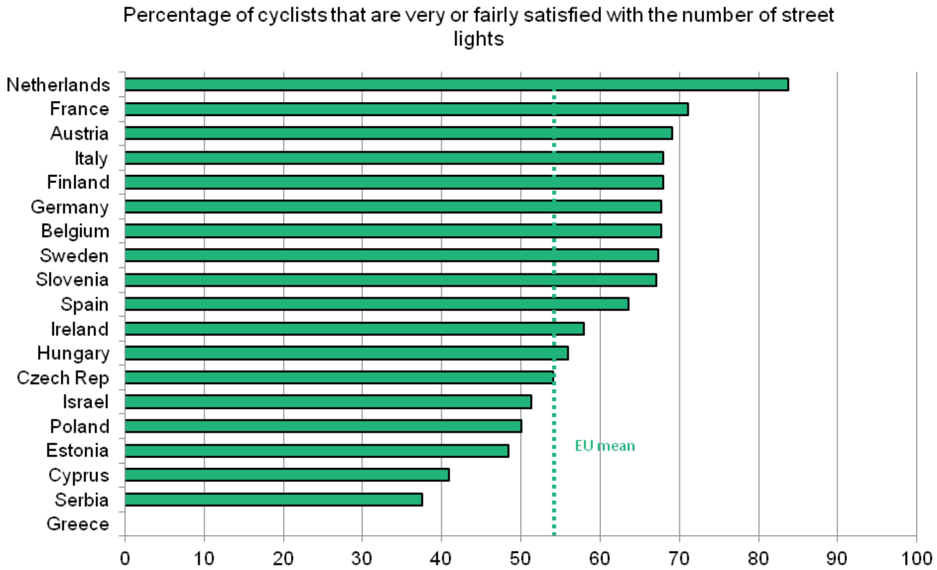

Figure 18: Percentage of cyclists that are very or fairly satisfied with the number of street lights.

Cyclists' interactions with other road users

Cyclists' interactions with other road users were questioned by means of question ORU09, which was "When travelling in general, as a cyclists, how often do you (a) get very annoyed with car drivers, (b) get very annoyed with motorcyclists, and (c) get very annoyed with bicyclists. Figure 19 below depicts the percentage of cyclists that are often, very often or always annoyed by all three types of road users.

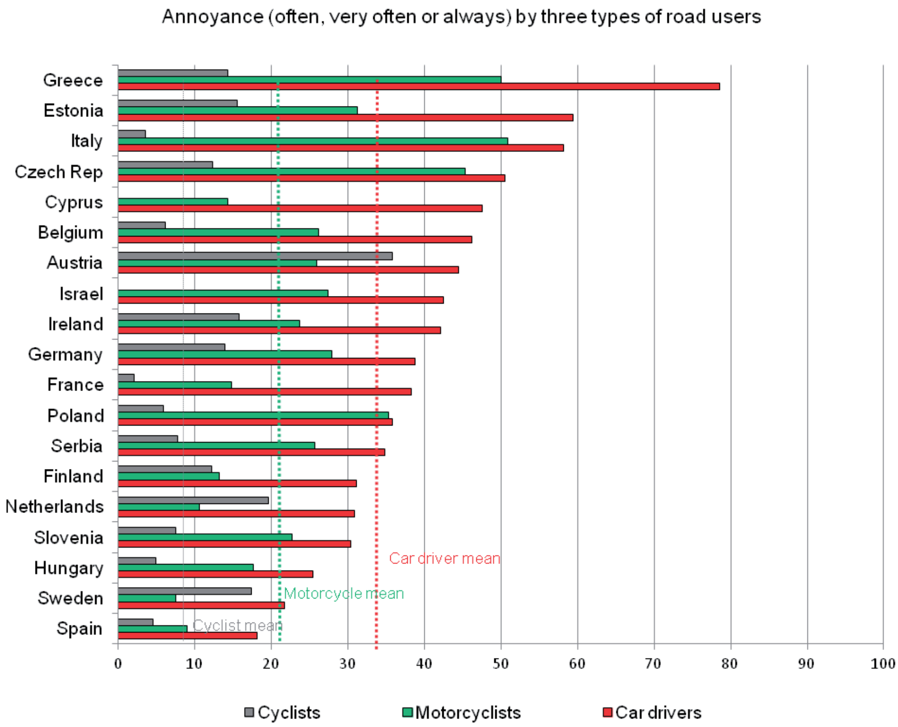

Figure 19: Percentage of cyclists that are often, very often or always annoyed by other road users.

Apart from the ranking of the countries regarding annoyance with car drivers these results are hard to interpret. Annoyance with a certain type of road user depends on at least two factors: the traffic volumes for a particular road user group and the annoying behaviour of that road user group. Hence it is impossible to tell from this graph alone whether a high degree of annoyance with - for instance - motorcyclists - is due to the behaviour of the motorcyclists in a country or simply to the fact that motorcycling is a popular means of transport in that particular country. The highest annoyance scores for motorcyclists, for instance, are noted in Greece, the Czech Republic and Italy, which seem countries with a substantial traffic share for motorcyclists.

Overall, it is clear that cycling other road users are most annoyed by car drivers, followed by motorcyclists and the least by cyclists. This order is only disrespected in three countries, and always in the same sense; in Austria, the Netherlands and Sweden, cyclists are more annoyed by other cyclists then by motorcyclists. For the Netherlands and Sweden this might be due to relatively high cyclist traffic volumes and low motorcyclist traffic volumes. Austria has only an average cycling traffic volume, but relatively low motorcylist traffic volumes might in part explain this difference.

Opinions on drinking and cycling

Question ORU10 was set to report the opinion of cyclists on drinking and walking and cycling. More specifically the cyclists were asked whether they agree with the proposition that you can drink and cycle if you do it carefully (OPU10b) and with the proposition that drinking and cycling substantially increases the risk of an accident with another road user (ORU10d). Figure 20 below depicts the percentage of cyclists that agree one can drink cycle if one does it carefully.

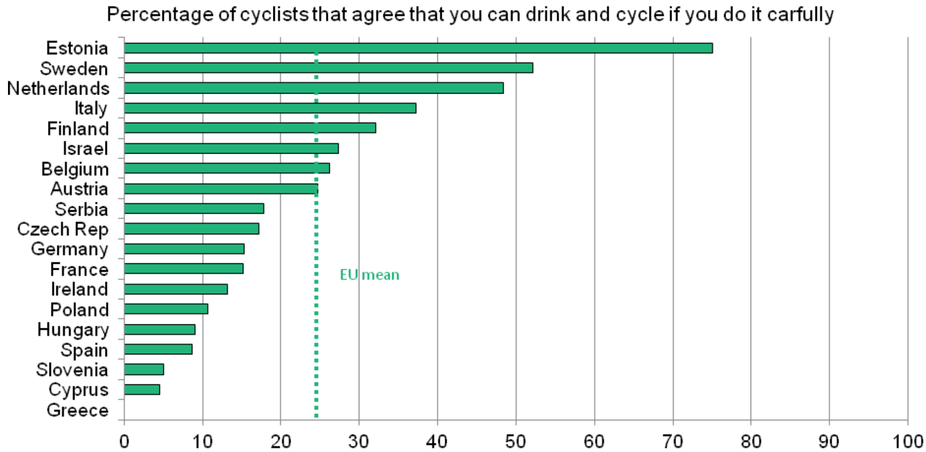

Figure 20: Percentage of cyclists that agree you can drink and cycle if you do it carefully.

On average, one out of four cyclists agrees with this proposition, but Figure 20 reveals huge international variations in this number. In the Netherlands, Sweden and Estonia, for instance about one out of two cyclists or more agree with this proposition, whereas in six countries less than one out of ten cyclist agree with this proposition (Greece, Cyprus, Slovenia, Spain and Hungary). Apart from Hungary the latter are all countries with relatively low cyclist traffic volumes. Possibly the zero alcohol limit in countries like Hungary and Slovenia might be related to these low percentages.

Figure 21 depicts the percentage of cyclists who agree that drinking and cycling substantially increases the risk of an accident.

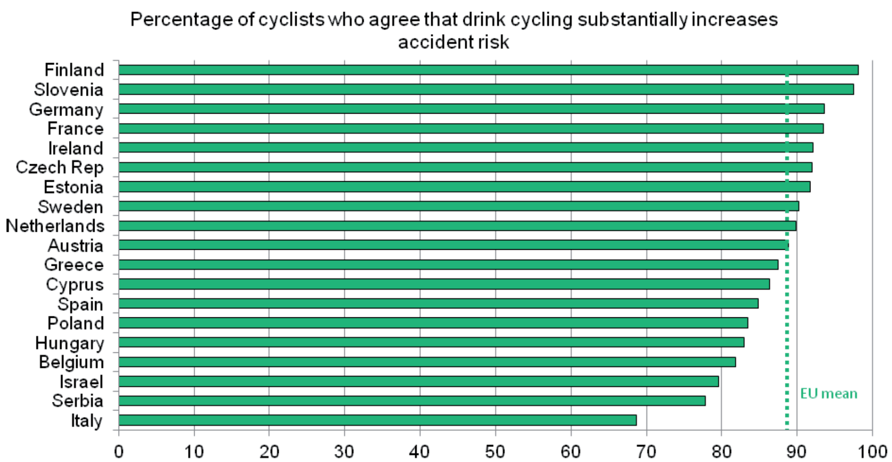

Figure 21: Percentage of cyclists that agree that drink cycling substantially increases accident.

From this figure it is clear that there are fewer differences in opinion. Most importantly, the large majority of all cyclists in all countries agree with the idea that drink cycling is dangerous, resulting in an overall average of 88 percent agreeing cyclists. Only in Italy, Serbia and Israel cyclists seem to be less convinced, with percentages somewhere between around 70 and 80 percent.

Somewhat surprisingly, across all countries, we did not find any correlation between both variables (cf. Figure 22). When we calculated the correlation between both variables at an individual level, we obtained a weak but significant correlation of - .19. All together these results seem to indicate that both attitudes reflect largely independent dimensions.

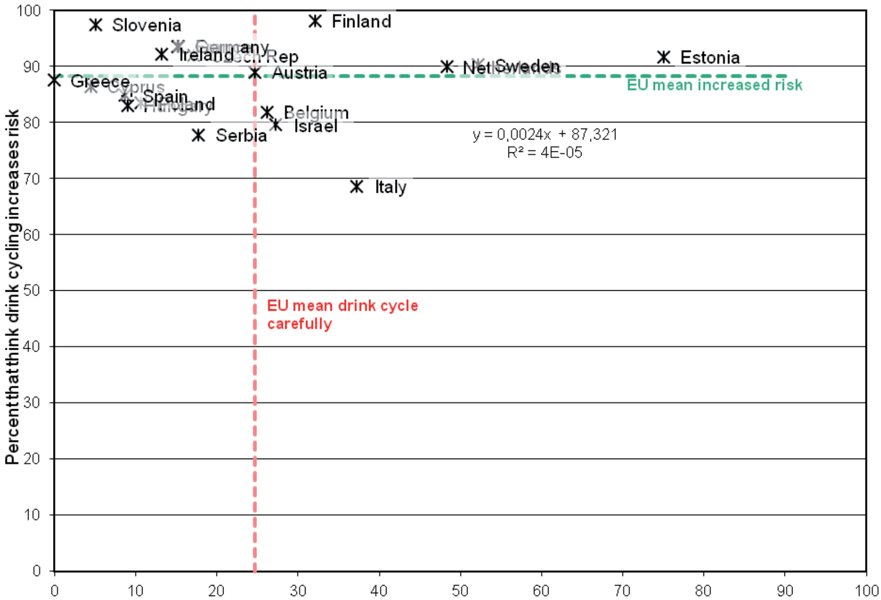

Figure 22: Cyclists that agree that drink cycling substantially increases accident risk as a function of agreement with the idea that you can drink and cycle if you do it carefully.

Accident involvement as a cyclist

In question ORU11 the respondents were asked to indicate whether or not they have been involved in an accident in the last three years as a pedestrian, cyclist, car passenger, motorcycle passenger or moped rider[21]. In the figure below we depict the percentage of cyclists that have been involved in an accident for each country. Since accident involvement is generally hugely dependent on exposure (e.g. Elvik & Vaa, 2009), the percentage of accident involved cyclists is depicted in the figure below as a function of the average kilometres cycled per cyclist. Not cycling other road users were not taken into account in this analysis.

21 - The question did not specify whether injury accidents or accidents in general were intended.

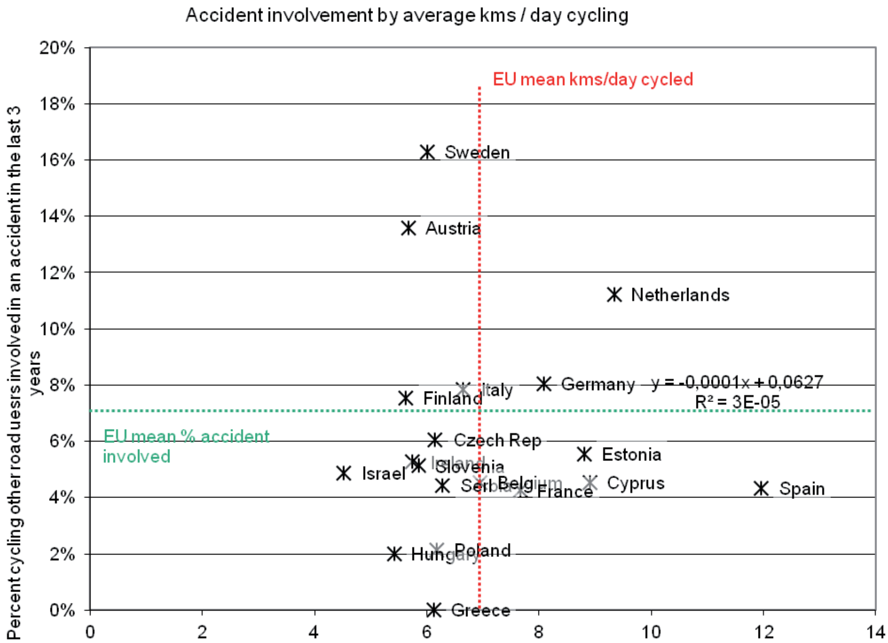

Figure 23: Accident involvement by average kilometres cycled per day.

On average, 7 percent of the cycling other road users were involved in an accident in the last three years. In absolute terms, Sweden, Austria and the Netherlands count the highest percentage of accident involved cyclists. Greece, Hungary and Poland the lowest percentage. Moreover, Figure 23 also shows that across all countries, accident involvement seems largely independent of the average kilometres per day cycled per cycling other road user.

In order to get a clearer picture of the relationship between exposure and accident involvement, we also calculated the cyclist accident risk by dividing the total number of accident involved cyclists in each country by the total number of kilometres cycled in three years in each of the countries (based on the average number of kilometres cycled per day). This gives a reasonable approximation of the accident risk in terms of the number of accidents per 100.000 kilometres cycled. One has to bear in mind, however, that it was not possible to take cyclists with more than one accident into account in this analysis, as this information was not available. The figure below gives the number of accidents per 100.000 kilometres cycled for each of the countries. In order to explore whether this accident risk might be related to the popularity of cycling in each country, this risk is depicted as a function of the average kilometres cycled per other road user in the figure below (cf. Figure 24 below).

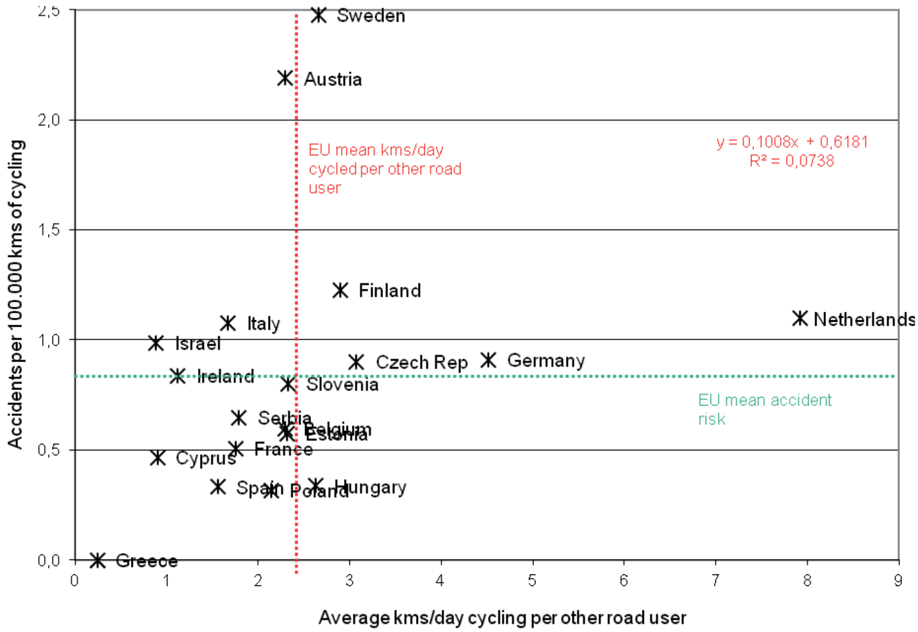

Figure 24: Cyclist accident risk as a function of cycling traffic volumes per country.

The mean overall accident risk was about one accident per 100.000 kilometer[22]. This analysis revealed a light tendency for a higher accident risk for cyclists in countries with large cycling traffic volumes. This was rather unexpected since one would expect better cycling infrastructure and more experienced cyclists in these countries then in countries with smaller cycling traffic volumes (e.g. SafetyNet (2009), Jacobson (2003), Elvik (2009), Reynolds et al (2009)). But with a correlation of only .28 this relationship was not very strong.

As expected from the percentage of accident involved cyclists per country, the accident risk appears to be the highest in Sweden and Austria, and the lowest in Greece, Spain, Poland and Hungary. Due to a lack of objective exposure data for cyclists for each of these countries, it is however impossible to evaluate whether this estimation reflects the real accident risk as a cyclist or a reporting bias in the verbal reporting of accidents.

Conclusion

In this chapter the attitudes of cycling other road users were discussed. First of all, there appeared to be a huge international variation in the use of the bicycle as a mode of transport, both with regard to the percentage of other road users that sometimes do use a bicycle as with regard to the kilometres cycled per cycling other road user. Using the average number of kilometres cycled per day per other road user (cyclists and non-cyclists) the Netherlands, Germany and the Czech Republic appeared to be the countries with the highest cycling traffic volumes, Greece, Israel and Cyprus the countries with the lowest cycling traffic volumes. Across all countries, the perceived danger of cycling appeared to be independent of the cycling traffic volumes. Regarding the use of protective equipment the analyses revealed large international differences, but from the available data it was not possible to attribute these differences to any particular cause.

22 - Data on cycling accident risk are scarce, but to have at least one reference: Elvik (2009) reported an estimate of about 1 injury per million kilometers cycled. This is about 10 times smaller than the European average estimate from this analysis. This might be due that our survey also includes property damage accidents, to the specificities of the situation in Norway or other factors.

The satisfaction of cycling other road users with their safety as a cyclist, on the other hand, appeared to be dependent on the popularity of cycling in each of the countries. Cyclists in countries with high cycling traffic volumes tend to be more satisfied with their safety. Generally, cyclists in these countries are more satisfied with the speed and volume of traffic as well. The most clear cut relationship was observed with the satisfaction with cycle paths, which was significantly higher for countries with high cycling traffic volumes. Moreover, the satisfaction with safety as a cyclists appeared highly correlated with the cyclists' satisfaction with cycle paths, both at an aggregate level (r= .52) as at an individual level (r= .62), which seems to illustrate the importance of cycle paths in the safety culture regarding cycling.

Regarding drinking and cycling we observed an interesting discrepancy between the percentages of cyclists that think one can drink cycle if careful and the percentage of cyclists that think that drink cycling substantially increases the risk of being involved in an accident. Both dimensions appeared to be largely independent.

Based on the percentage of cyclists that reported having been involved in an accident as a cyclist and the average kilometres cycled we analysed the accident risk as a function of the cycling traffic volumes. Contrary to our expectations, the accident risk tended to be higher in countries with higher cycling traffic volumes. Due to a lack of objective cycling exposure data and cycling accident data (cycling accidents tending to be more underreported then accidents with motor vehicles) it was however impossible to tell whether this tendency reflects the real accident risk as a cyclist or a reporting bias in the verbal reporting of accidents.

Chapter 3.5

Summary and recommendation for other Road Users

Gian-Marco Sardi (SIPSiVi, Italy)

Richard Freeman (University of London, United Kingdom)

This section has examined data collected from respondents identified as other road users, which is a group not previously examined in the three previous iterations of SARTRE. It is clear that other road users are an especially important group for policy maker in Europe – and worldwide – due to the need to reduce emissions of carbon dioxide, diesel particulates and other products of the internal combustion engine. In addition, Europe and Western cultures are experiencing increasing levels of obesity, which can be addressed in part by increased travel by foot and by bicycle. However, it is essential to note that the respondents in this study used a variety of transport modes in their daily lives and that it is not uncommon to use a variety of transport modes for a single journey (e.g. taxi to a railway station and then a bus following a train journey with a walk to the final destination). Understanding other road users is especially important as they are a group with a high proportion of fatalities compared to car drivers and motorcyclists.

The section began with a chapter on motivations for being an other road user. Needing more physical exercise and financial reasons were the most popular motivations for being an other road user, in addition to it being seen as just another means of transport. Financial reasons and environmental concerns were particularly important for younger respondents whereas older respondents were more likely to cite health reasons and a fear of driving. Recognising the need to classify different types of other road user, five types were identified: Public transport user; Pedestrians; Cyclists; Pedestrian & public transport user; Active traveller. Inter-country variation was marked with, for example, low numbers of 'pedestrians', but high numbers of 'cyclists' in The Netherlands.

The following chapter focused on pedestrians, who were found to travel frequently as car passengers and users of public transport, but less so as motorcycle passengers. Pedestrians in northern and western Europe believe that road safety is an important concern of their national government and are satisfied with roads; the opposite is found for those from eastern and southern countries (i.e. Cyprus, Estonia, Greece, Hungary, Italy and Poland). As the most vulnerable of road users, it is unsurprising that pedestrians show strong support for a variety of safety measures and dissatisfaction with the speed of traffic, but not the establishment of more 30 km/h zones. While this might seem surprising, it is likely to reflect the multi-modal nature of road users with pedestrians also travelling on such roads as drivers or vehicle passengers. Pedestrians support strong enforcement policies with severe penalties for various infringements, including drink driving. Motorcycling is seen as the most dangerous mode of transport, followed by car driving with public transport being seen as the safest mode. Cycling is seen as more dangerous than walking. Pedestrians do not tend to cross roads when a red light is showing, but do cross at non-designated crossing points while taking care to avoid roads or intersections that they perceive as dangerous. Men and city dwellers are most likely to engage in riskier behaviours, but city dwellers are least likely to use safety measures such as wearing reflective clothing. Considering travel habits, there were four different types of pedestrians: Average distance traveller, user of public transport; Long distance traveller; Short distance traveller – with cycling; Average distance traveller – with frequent cycling. Most pedestrians have neutral to positive behaviour and attitudes to road safety, but males and younger pedestrians have more negative attitudes.

The third chapter focused on cycling. Cycling is a form of transport with great inter-country variation. As might be expected, it is very popular in The Netherlands, but also in the Czech Republic and Germany. In contrast in Cyprus, Greece and Israel there was relatively little cycling. However, the popularity of cycling in a country did not predict the perception of cycling's dangerousness, but did predict the satisfaction with a cyclist's own safety. In particular, satisfaction with cycle paths seemed to be determined by the popularity of cycling in that country (or the causal direction may be reversed). Cyclists are confident that they can drink and cycle if they are careful, but think drinking and cycling increases the risk of accidents in general. A notable minority (20%) of cyclists admit to sometimes or often ignoring a red light and a similar number regularly wear a helmet.

Recommendations:

- Policy makers must recognise that road users use a variety of modes, sometimes even in one journey so policy should support the use of multiple modes.
- If policymakers want to increase the use of more environmental friendly modes of transport then they have to ensure that they are perceived to be safe and comfortable. Solutions must be carefully considered for each location, taking into account issues such as weather and physical environment.
- There are a variety of factors that can increase the number of other road users so policy makers need to take care to identify what determines transport choices, e.g. an increase in poverty in a country is likely to increase those having to walk and cycle, in addition to any health promotions.
- Targeting messages on environmental benefits to younger people and health concerns to older people is most likely to increase each group's walking and cycling
- If governments in southern and eastern Europe wish to increase the amount of walking and cycling, they need to communicate to their populations their focus on improving road safety and the urban environment together with explicit plans setting out effective actions.
- Some pedestrians do not support 30 km/h zones so the focus should be on a combination of measures, i.e. speed limits and better road layouts.
- Pedestrians are active agents in the urban environment whose safe behaviour should be enabled by road layouts designed for them – and not just cars - rather than enforced by penalties.
- Cycle paths are associated with higher levels of cycling and perceived personal safety so their construction – or separation of cyclists from other traffic - should be the first choice for increasing cycling
- Enforcement of drinking and cycling penalties and penalties for ignoring red lights should be strict, with penalties increased if necessary.
- Cyclists seem over-confident in their own ability to cycle safely so safety campaigns need to focus on the risks to "someone like you", without making cycling seem overly dangerous which could discourage people from cycling.

Road users comparison

Chapter 4.1

Comparison section introduction

Julien Cestac (IFSTTAR, France)

Patricia Delhomme (IFSTTAR, France)

Why should we compare road users?

Road users share the same space and time with different needs, feelings and attitudes, which may influence their interactions. The choice of car as transportation mode may be motivated by different goals comparing with the choice of public transports or motorcycle. Moreover, each transport mode has a number of specific attributes such as velocity, weight, loading capacity, comfort level or vulnerability in case of accident (Montella et al., in press).

Comparison is uneasy because categories of road users are not mutually exclusive. Indeed, one can be member of all categories alternatively. In fact, almost all motorcyclists are also car drivers. Most people may be pedestrians, bicyclists or public transport users at least sometimes. Comparisons are thus made under the assumption that one individual may adapt his/her attitudes and behaviour regarding road safety depending on the transport mode he/she is using.

Moreover, this comparison is also challenging considering nineteen countries in Europe and beyond. Indeed, being a motorcyclist in Finland may be different than being a motorcyclist in Italy. If we compare the relative proportion of registered Powered Two-Wheelers (PTW, i.e. motorcycles and mopeds) across countries we can see that how much it depends on the country considered (see 1).Does climate matter? Warmest countries have the highest proportion of registered PTW compared to cars. However, weather may not be the unique factor in explaining the choice of PTW. Indeed, some countries with relatively cold weather such as Finland reach high proportions of PTW whereas some countries with a relatively hot weather such as Cyprus and Serbia reach low proportions of PTW compared to cars.

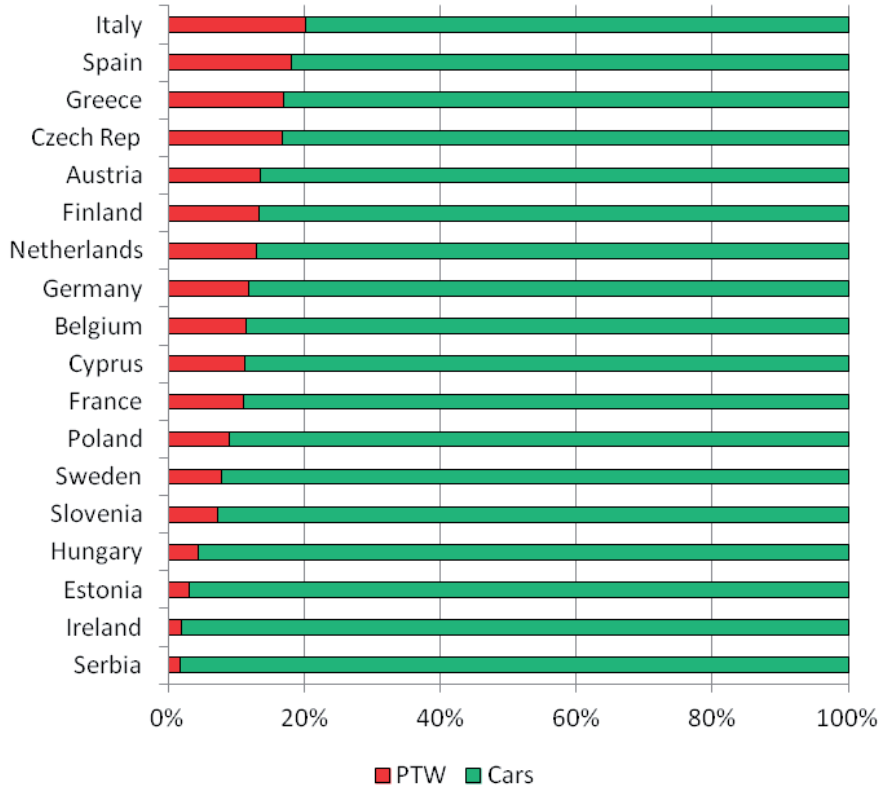

Figure 1: Registered PTW (mopeds and motorcycles) compared to registered cars in 2008, by country.

Note: Sources: ACEM for PTW and Eurostat for cars. Except for Serbia (source: Annual Serbian Traffic Police Directorate data, 2009) and Israel (data unavailable).

The comparison of road users' attitudes and behaviours regarding road safety is needed in order to understand their involvement in road accidents. The distribution of each road user category in the victims of road accidents is very different depending on the country considered (see Figure 2). For example in Cyprus, 29% of killed road users in 2008 were PTW whereas in Estonia they represent 1% of killed road users. In the Netherlands, 26% of killed road users in 2008 were bicyclists whereas they represent 2% of killed road users in Greece and Spain and 3% in Israel. Finally, in Estonia 50% of killed road users in 2008 were pedestrians whereas they represent 10% of killed road users in the Netherlands and 13% in Belgium and Sweden.

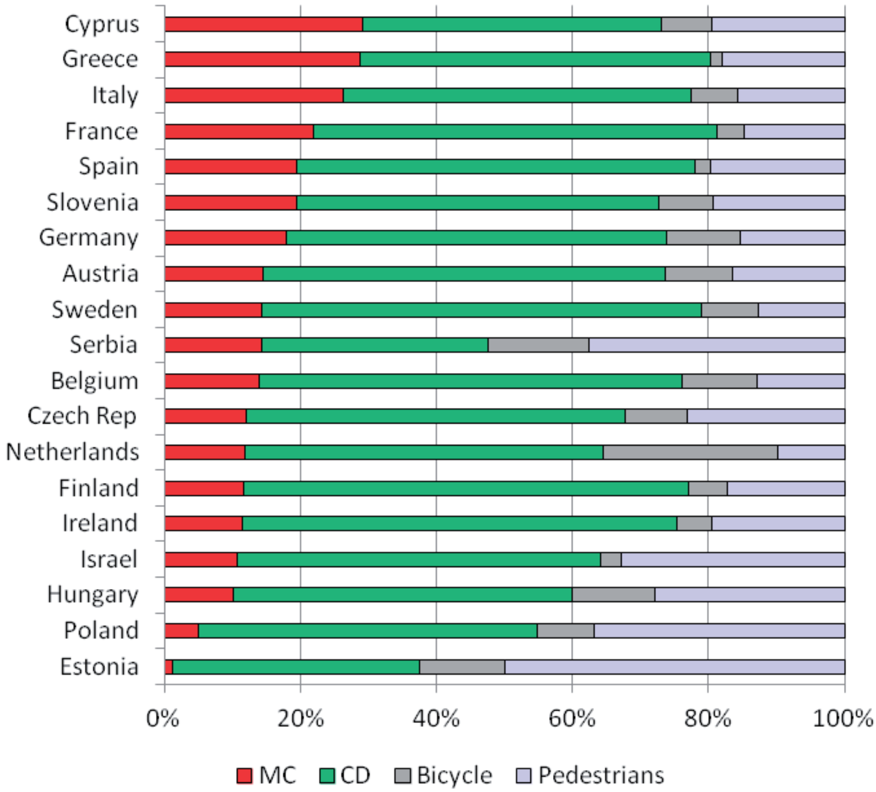

Figure 2: Relative proportion of killed road users in 2008, by country.

Sources: CARE Database, 2010-OECD: *A record decade for road safety*.
Press release, 15 September 2010.

To what extend the differences in road fatalities between countries are linked to structural, behavioural, legal or vehicle intrinsic differences?

One explanation could stem from differences in vulnerability. Indeed, some road users are more vulnerable than others in case of an accident. Typically, pedestrians, bicyclists and motorcyclists are considered as vulnerable road users because they lack the bodywork, seat belt, airbags and most other protective devices that are developed for cars. Pedestrians and bicyclists, as non-motorized road users, are more vulnerable than motorcyclists that are motorized (ETSC, 2005).

Crash risks for specific road user categories are often calculated with regards to the number of travelled kilometres. This calculation always shows that the death risk per kilometre travelled is higher for PTW, pedestrians and cyclists than for car occupants (20 times higher for PTW, 9 times higher for pedestrians and 7 times higher for bicyclists in Europe, ETSC, 2003). However, relating the number of road death to the travelled distance in kilometres may not give a good picture of the situation. Indeed, it is expected that travelled distances are greater for cars that are often choosen for long distance trips on motorways. Kilometres driven on motorways are much safer than on other roads because there is no intersection on motorways. On the contrary, foot, bicycle and motorcycle are often chosen for short distance, urban trips, where exposition to risk is much higher. A good solution could be to relate road deaths to the number of single trips but this data is not available. We propose another approach with the difference between the *relative proportion of killed motorcyclists compared to car occupants* and the *relative proportion of registered PTW compared to cars* (see Table 1). This comparison may be distorted as well because motorcycle is often a secondary transport mode that is used less frequently than car by the owner. Nevertheless, table 1 show relatively high differences between countries. Yet, why would motorcyclists be less vulnerable in Poland than in Cyprus? One can argue that safety equipments are more frequently used in cold weather countries and that motorcyclists may be less protected in hot countries and so, more vulnerable. However, vulnerability is one factor among a set of multiple factors that explain the over representation of motorcyclists in road fatalities.

Table 1: Comparison of killed motorcyclists and registered motorcycles relative proportions (compared with cars) in 2008, by country.

	Relative MC killed compared to CD	Relative PTW registered compared to cars	Difference between the two
Cyprus	40%	11%	29%
Serbia	30%	2%	28%
Greece	36%	17%	19%
Slovenia	27%	7%	19%
France	27%	11%	16%
Italy	34%	20%	14%
Ireland	15%	2%	13%
Hungary	17%	4%	12%
Germany	24%	12%	12%
Sweden	18%	8%	10%
Spain	25%	18%	7%
Belgium	18%	12%	7%
Austria	20%	14%	6%
Netherlands	18%	13%	5%
Finland	15%	13%	2%
Czech Rep	18%	17%	1%
Estonia	3%	3%	0%
Poland	9%	9%	0%
Israel	17%	n.a.	n.a.

Comparing road users imply to identify groups with different compositions. Indeed, comparing motorcyclists' attitudes with car drivers' may be biased due to other differences in sample characteristics. For example, as shown below, motorcyclists are far more male, younger, have fewer children, and are more single than car drivers. Other Road Users are older, more female and more urban than car drivers. Those specificities of each group are important to keep in mind when interpreting comparison results.

Sample characteristics

Sex ratio is very different for each road user category. Females are under-represented for the motorcyclists group (13% in average) but this ratio varies depending on country from 4% in Hungary and Serbia and 30% in Italy (see Table 2). Regarding now car drivers, for most countries, the proportion of female drivers is between 40% and 50%. Finally, two third of the other road users group are women, with slight variations between countries.

Table 2: Proportion of female participants in each road users group.

	MC	CD	ORU
Austria	14%	48%	57%
Belgium	10%	44%	66%
Cyprus	14%	45%	64%
Czech Rep	17%	43%	53%
Estonia	8%	64%	87%
Finland	11%	50%	78%
France	23%	49%	60%
Germany	12%	43%	72%
Greece	13%	43%	88%
Hungary	4%	36%	72%
Ireland	7%	50%	66%
Israel	15%	44%	63%
Italy	30%	44%	50%
Netherlands	26%	52%	61%
Poland	7%	34%	60%
Serbia	4%	27%	53%
Slovenia	6%	44%	79%
Spain	19%	43%	68%
Sweden	19%	54%	70%
Total	13%	45%	66%

Motorcyclists are younger (mean age: 39.5) than car drivers (mean age: 42.8) which are younger than ORU (mean age: 45.2).

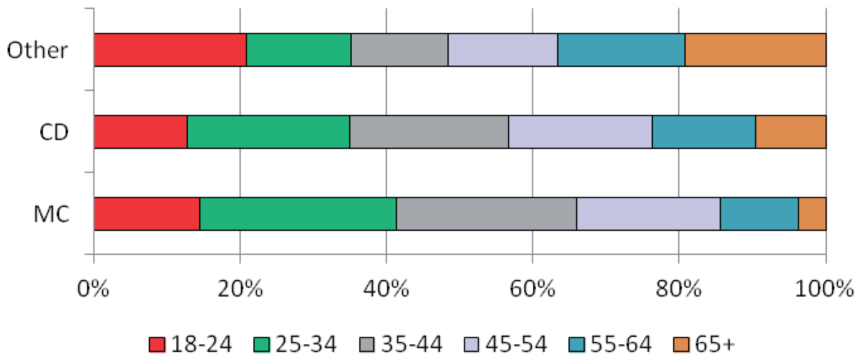

Figure 3: Age distribution in each road users group.

The comparison of the three groups regarding occupation, marital situation and living area shows small difference between groups. The Other Road Users (ORU) are more frequently retired, unemployed or students, widowed and living in a urban area than the two other groups. Motorcyclists are more frequently manual workers than the two other groups.

In this section, comparisons will mostly relate to car drivers and motorcyclists. Indeed, some topics such as driving while impaired or speeding are not of major interest for pedestrians, bicyclists and public transport users. However, general attitudes about road safety issues and measures are compared for all groups of road users. The section consists of four chapters. General attitudes comparisons are addressed by the first chapter. The following chapter, about environmental issues explore in particular the effect of environmental concern on transport mode choice. The third chapter is about driving while impaired. The central issue addressed is the comparison of factors predicting driving under the influence of alcohol between car drivers and motorcyclists. Finally, the fourth chapter deals with speeding issues, comparing especially the reported speeding punishment between car and motorcycle drivers.

Chapter 4.2

Attitudes

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Introduction

Opinions, beliefs and behavioural intentions of different groups of users regarding matters of road safety are a source of relevant information, since they reveal characteristics of their attitudes in relation to mobility and safety, their relations with other users, their experiences and their concerns. Any differences which may be found form the basis on which to implement specific measures to try to reduce road hazards to a minimum and improve mobility conditions.

The aim of this chapter is to analyse and examine the attitudes shown by the three groups of users surveyed in SARTRE 4 study (Car Drivers, Motorcycle Drivers and Other Road Users) and to evaluate both the differences and the similarities between the 19 European countries which participated in the study.

Methodology

The following variables have been taken into account for the comparative analysis between the groups: CO.01 for the frequency of travel, CO.02 to CO.05 for safety perception and social concern of the groups; CO.06 to CO.08 for acceptance of new safety devices and new possible safety measures; and CD.24 and MC.26 for beliefs about factors that may cause accidents. Results were segmented by sex, age and the number of kilometres covered annually. Car and motorcycle drivers were also compared regarding perceived probability of check-controls, number of sanctions and accidents involvement.

The answer scales to questions CO02, CO03, CO04, CO05, CO06, CO07 y CO09 have been reversed so they reflect 1 as the lowest value ("less than once a month" or "not at all"), and 4 as the highest ("nearly daily" or "very").

Statistical analysis of the differences in comparisons were performed with an inferential method (one-way ANOVA completed with post-hoc Tukey test), at significance level of 95%, and a cut-off confidence level of 1.96.

Travel Mode and frequency of travel by three categories of Road Users

Item CO.01 asked interviewees about frequency of using each travel mode out over the 12 months prior to the survey.

Table 1 shows that majority of Car Drivers use a car daily, and the majority of Other Road Users travel by foot daily, whereas in the Motorcyclists group the daily use of cars is even higher than the use of motorcycles. In both Car Drivers and Motorcyclists groups the use of bikes is similar, mostly sporadic; except in The Netherlands where 28% of car-drivers and 28% of motorcyclists, use a bike nearly every day.

Table 1: Frequency of use of different transport modes (co.01).

	Nearly Every Day				1-4 Times a Week				Sporadic Use (1-3 Times/Month + Less than 1Time/Month)			
Have Driven	Car	Moto	Foot	Bike	Car	Moto	Foot	Bike	Car	Moto	Foot	Bike
Car Drivers	70%	1%	45%	7%	22%	2%	25%	14%	8%	98%	30%	79%
Motorcyclists	47%	36%	41%	6%	27%	33%	23%	13%	26%	31%	36%	81%
Other Road Users	2%	0%	79%	18%	8%	1%	14%	14%	90%	99%	7%	68%

The proportion of car drivers and motorcyclists that travelled as motorcycle passenger is quite similar, both groups used that way of travelling sporadically (98%, 93%). And the same happens in the category "car passenger", though car drivers use a little bit more this mode (7%, 5% nearly every day; and 28%, 23%, uses it 1-4 times a week respectively). Also similar proportions of car and motorcycle drivers used nearly every day Public Transport (7%, 5%) and mopeds (1%, 3%).

By countries, Ireland (90%) and Cyprus (89%) stand out as regards car drivers who normally use this vehicle, as opposed to Czech Republic (52%), Serbia (53%) and Hungary (56%). Finland and Slovenia have the highest proportion of motorcyclists that also drove a car nearly every day (both with 76%). It can also be observed that Greece (91%) and Israel (86%) are the countries where the group of motorcyclists uses more that kind of vehicle daily.

On the other hand, the group of Other Road Users make a minimum use of car or motorcycle driving (2%, 0% daily use). They mainly travel on foot (79%) or by public transport (31%). The country with lower percentage of Other Road Users travelling by foot daily is Italy (64%), while Estonia has the highest (87%). In The Netherlands they have the biggest proportion of Other Road Users who travel by bike nearly every day (63%), followed by Belgium, Sweden and Israel (32%, 29% and 28%).

Concerns about social problems

Below is an analysis of the level of concern expressed by the different users about a series of social problems (Figure 1). Thus, road accidents are the main concern for the three groups, followed by unemployment, crime and the standard of health care, in that order. The lesser preoccupation is traffic congestion, though Car Drivers and Motorcyclists are more worried, compared to the Other Road Users group. Females are more concerned than men, in all user groups, on every matter, except for traffic congestion where men and women expressed similar level of concern.

A comparative analysis between the different countries shows a higher level of concern about the considered social problems in Greece, Ireland, and Estonia, in a similar way in the three groups. Greece, in a very prominent position, shows the maximum concern in every matter.

Figure 1. Concern about social problems (very + fairly %) (co.02)

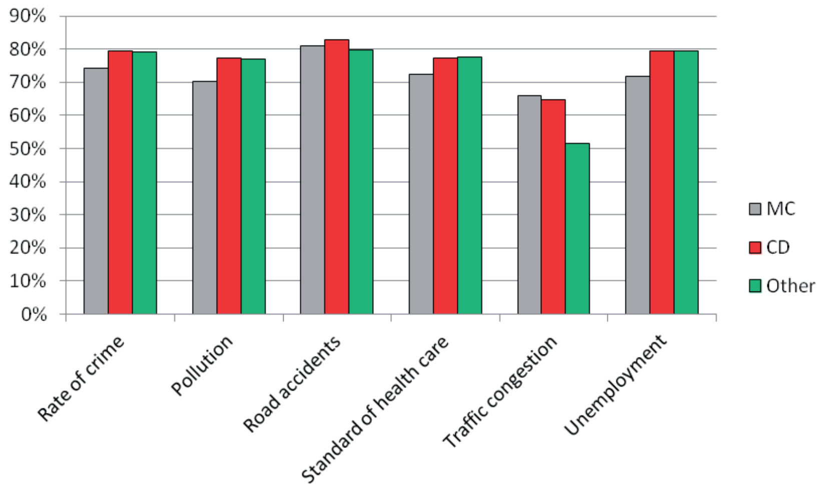

Figure 1: Concern about social problems (very + fairly %) (co.02).

Perceived Road Safety and Government Concern for it

Opinions about roads safety in terms of accidents risk in the participating countries are somehow pessimistic (Figure 2). Only 60% of SARTRE 4 Car Drivers group considers them very or fairly safe. Of Motorcyclists and Other Road Users the percentage that consider roads in their countries safe is even lower (54%). There are no differences in opinions as function of sex or age. Residents of localities with less than 3,000 inhabitants perceive a greater lack of safety on the roads.

As regards to differences between countries, The Netherlands, Austria, Sweden, Germany and Finland are the countries were the roads are considered most safe for travelling both by the groups of Car Drivers and Motorcyclists. This may be related to the fact that these are countries with low accidents rate (See Contextual data in Appendix 3). In fact, among the group of countries participating in SARTRE 4, The Netherlands, Sweden, Germany and Finland, have in recent years, the lowest number of deaths per 100,000 of population, both for drivers and pedestrians, according to data from IRTAD (2011).

On the other hand, the worst evaluation of roads safety comes from Greece, Poland, Hungary and Slovenia. Within each country, the opinions of the three road user groups are similar.

Essentially the same pattern of opinions, across countries and road users, was found for the question about the perceived concern of one's country's government for road safety (CO.04). The countries where road users (especially Motorcyclists and Other Road Users) consider their governments most concerned are Finland, Austria, Sweden and The Netherlands. In the opposite side, Greek and Slovenian governments are least concerned, according especially to opinions of Car Drivers or Motorcyclists.

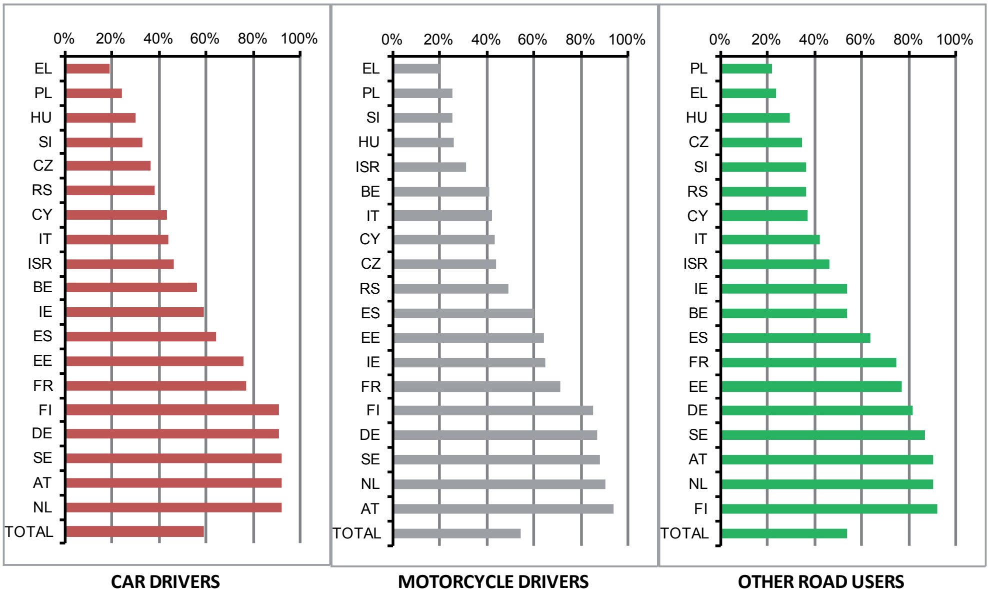

Figure 2: Opinions on roads safety (very + fairly safe %) (co. 03).

Perceived Danger of Transportation Modes

Figure 3 shows that the three road users groups have a common perception of the relative dangerousness of the five transport modes they were asked about. Public transport was rated as the least dangerous and motorcycling as the most dangerous transport mode. Other Road Users rated all modes at somewhat higher danger compared ratings by Car or Motorcycle Drivers.

With respect to personal attributes that may affect risk perception of transport modes, the following observations are warranted: women show a higher perception of danger, which may imply more caution or taking fewer risks; respondents over the age of 55 generally provided higher risk valuations than younger respondents; respondents who reported travelling less than 1,000 km per year also gave higher dangerousness ratings to all modes. Size of town of residence, having been sanctioned for a traffic violation, or involved in an accident did not influence the ratings.

There are clear differences between countries in the level of perceived risk associated with various transport modes, but invariably Motorcycling was perceived as the most risky in every country, and Public Transport as the least so, followed by Walking. Car driving and Cycling are rated in the intermediate positions. The differences between countries in perceived risk of Walking or Cycling are larger than those of the other modes and account for much of the overall difference between countries. In many countries, cycling is considered more risky than driving a car, and even in countries where it is not so, both rate high (with the exception of Spain).

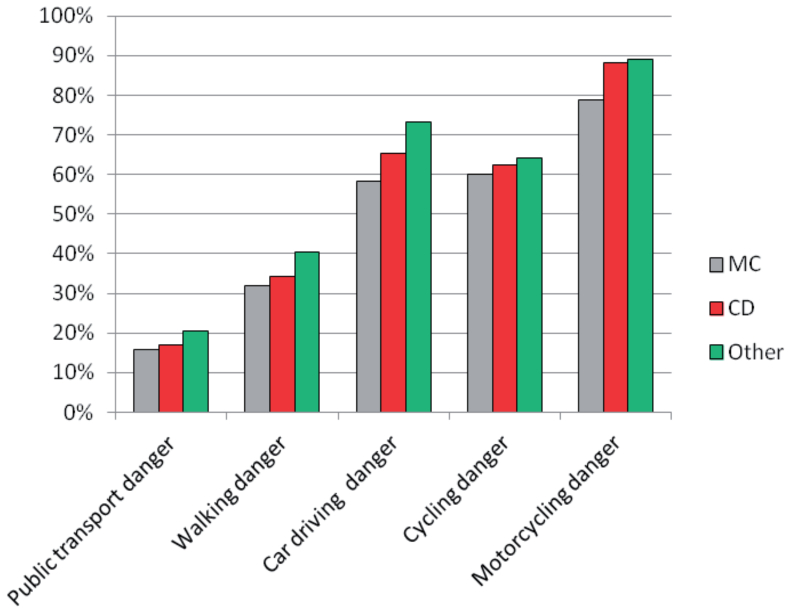

Figure 3: Perceived danger of transport modes (very + fairly dangerous) (co.09).

Motorcycling is perceived as the most dangerous mode by the three groups, but in a higher proportion by Other Road Users and Car Drivers; especially Car Drivers from Italy, Cyprus, Greece, and Estonia; and Other Road Users from Greece, Finland and Cyprus (Figure 4).

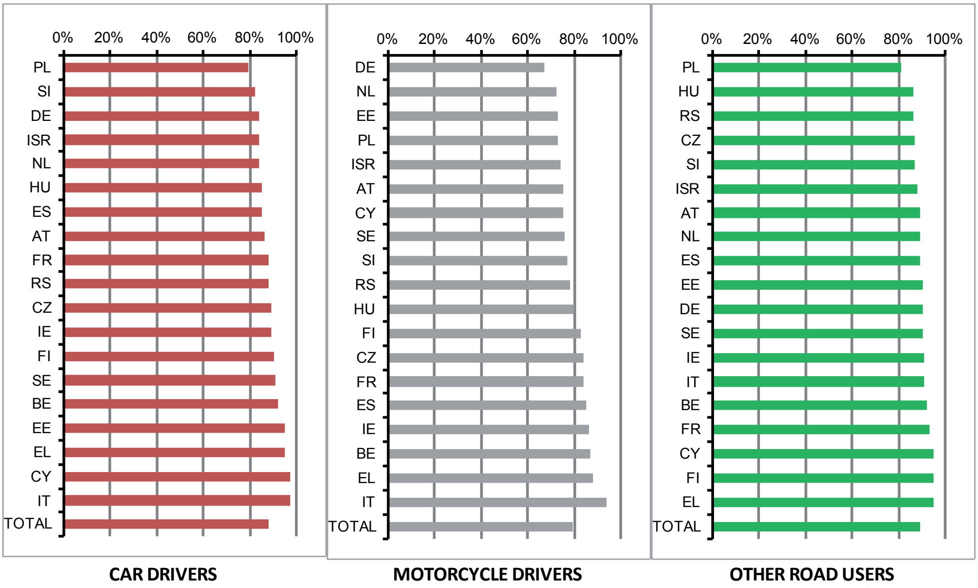

Figure 4: Perceived danger of motorcycling (very + fairly dangerous %) (co.09 item 5).

The perception of *Car Driving* risk is highest in Other Road Users from Greece, Belgium, Czech Republic and Cyprus; among Motorcyclists from Greece, Ireland and Italy and between Car Drivers from Greece, Czech Republic, Italy and Ireland (Figure 5.).

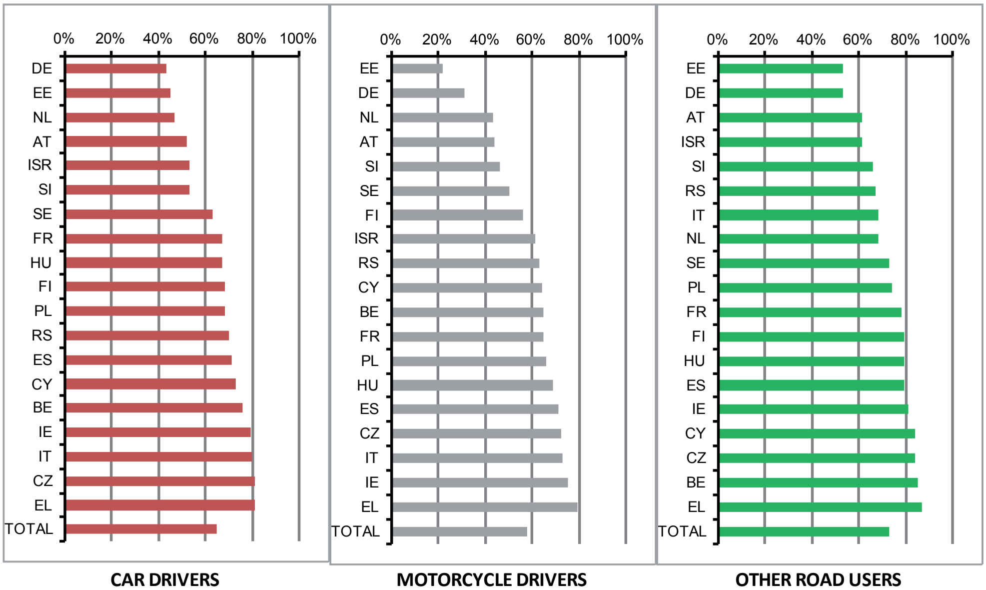

Figure 5: Perceived danger of car driving (very + fairly dangerous %) (co.09 item 4).

Finally, regarding the dangerousness of cycling (Figure 6.), the highest proportions of users from all groups that perceive it as "very or fairly dangerous" come from Ireland, with similar proportions in the three groups considering that riding a bicycle implies high risk. In The Netherlands or Israel, where the use of bicycles is high, its perception as a dangerous mean of transport is below the average.

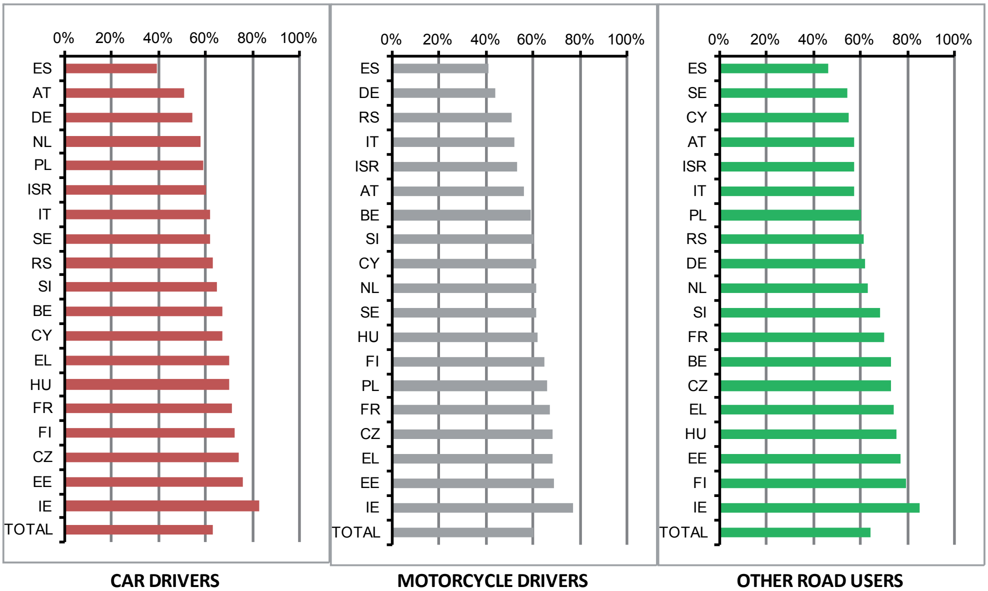

Figure 6: Perception of cycling danger (very+ fairly dangerous %) (co.09 item 2).

Acceptance of new in-vehicle technologies to improve safety (CO.06)

The three Road Users groups expressed high degree of approval for incorporating specific in-vehicle technologies to improve road safety. The strongest support was for the «alcolock» system. Fatigue detection devices that warn drivers to stop if tired, and «black boxes» were also well accepted. There was less support for in-vehicle speed limiters.

Other Road Users (that is, non-drivers) approved more strongly all in-vehicle devices compared to Car and Motorcycle Drivers. Motorcyclists expressed the least support. For example, speed–limiters were approved by 78% of ORU, 64% of Car Drivers and 50% of Motorcyclists (Figure 7).

Other personal attributes associated with higher support for introducing the listed in-vehicle safety devices include:

- Women.
- People over 55 years old.
- Those normally residents in small municipalities (less than 2,000 inhabitants).
- Those who drive less than 1,000km per year by motorcycle or car.

Across Countries, road users from Greece, Ireland, Estonia and Spain put their countries most consistently at the higher end of level of support for in-vehicle devices, while Sweden, Finland, The Netherlands and France were more often at the lower end of support. Within a country, the level of support for a given device was highly correlated for all User Groups (Figures 7 - 11).

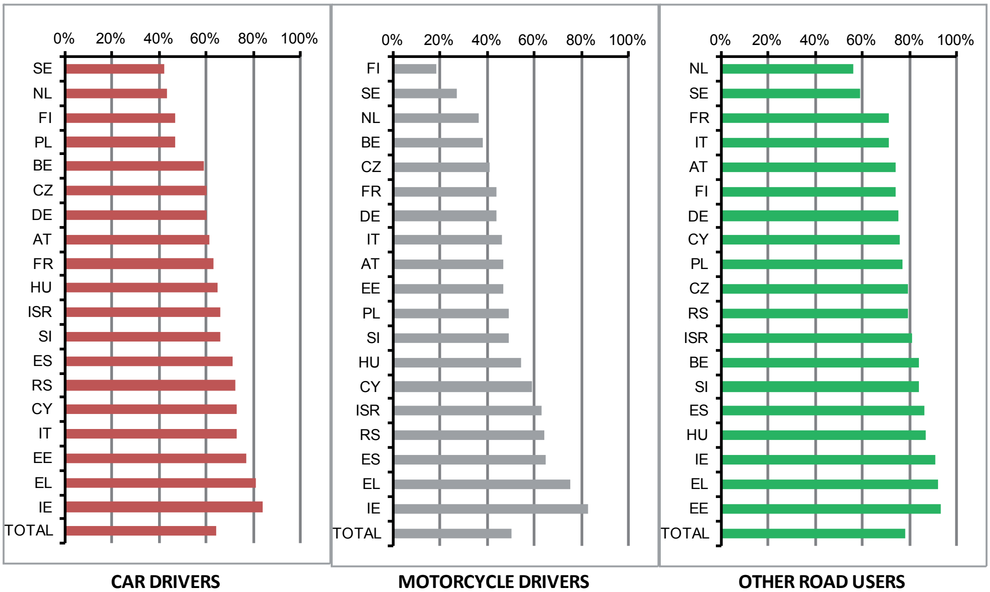

Figure 7: In favour of speed limiters (very + fairly %) (co.06 item a).

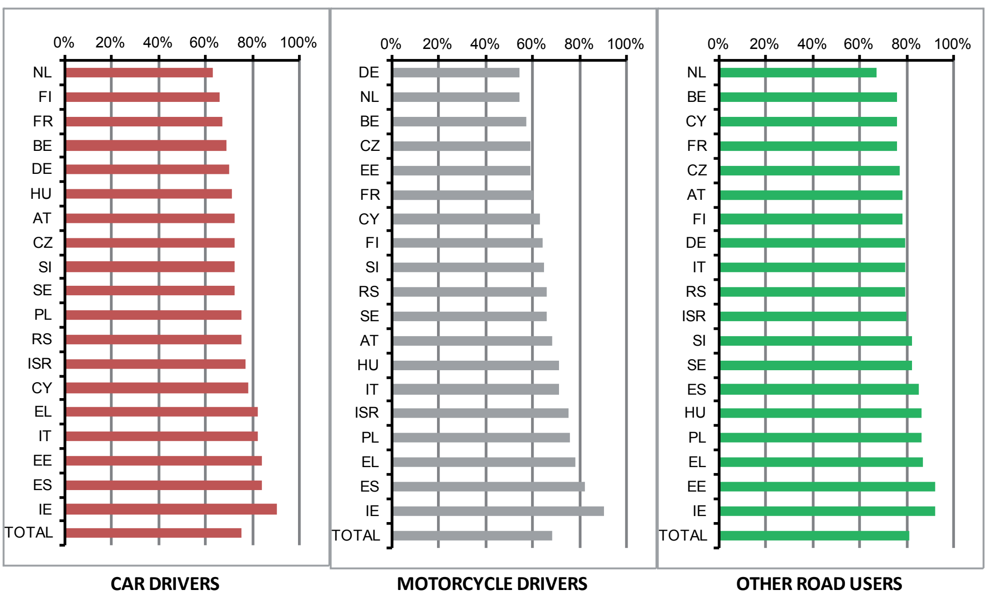

Figure 8: In favour of «black boxes» to identify causes of accidents (very + fairly %) (co.06 item b).

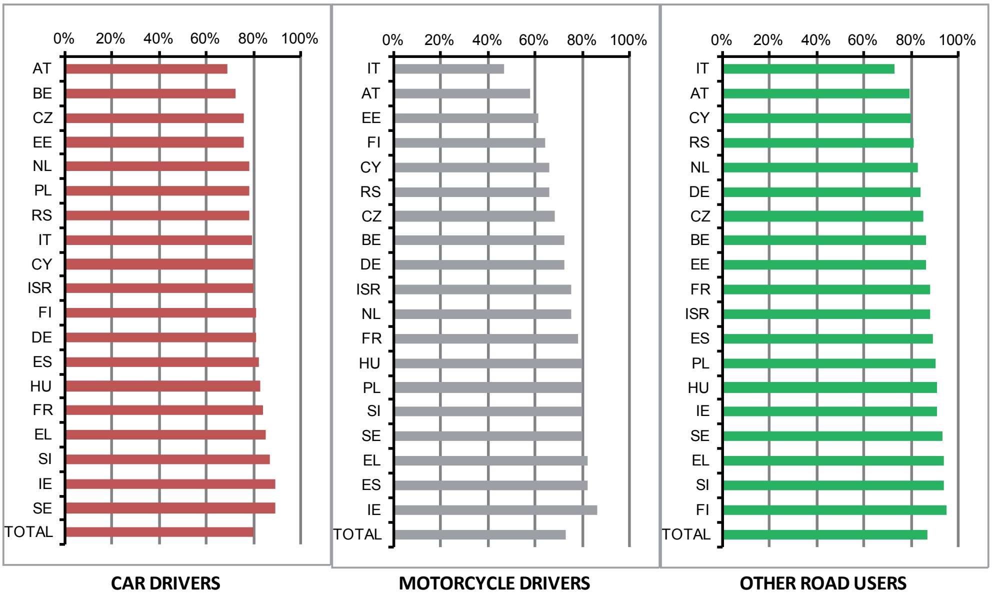

Figure 9: In favour of "alcolock" if legal alcohol limit exceeded (very + fairly %) (co.06 item c).

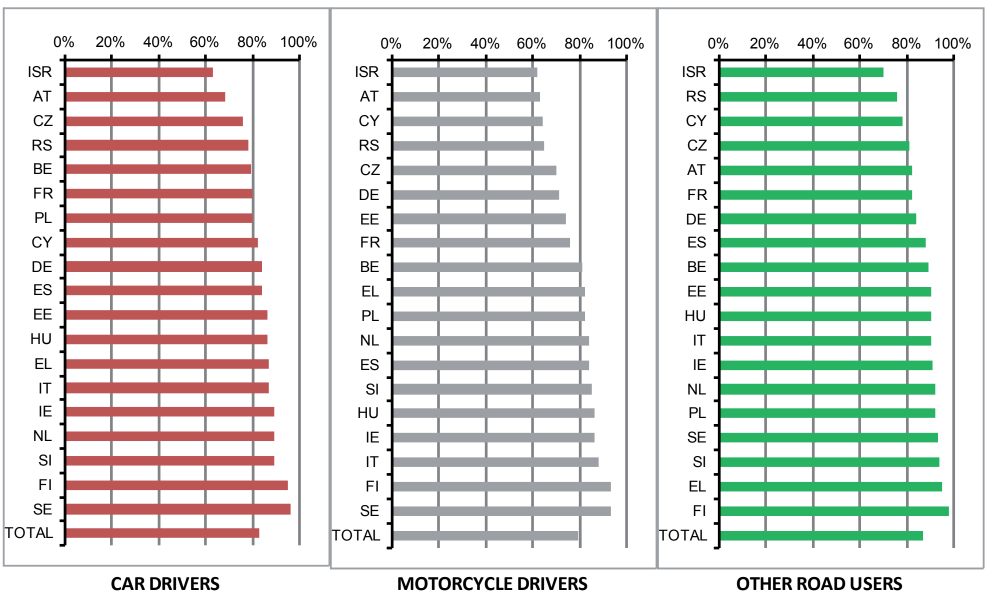

Figure 10: In favour of "alcolock" system if driver is recidivist (very + fairly %) (co.06 item d).

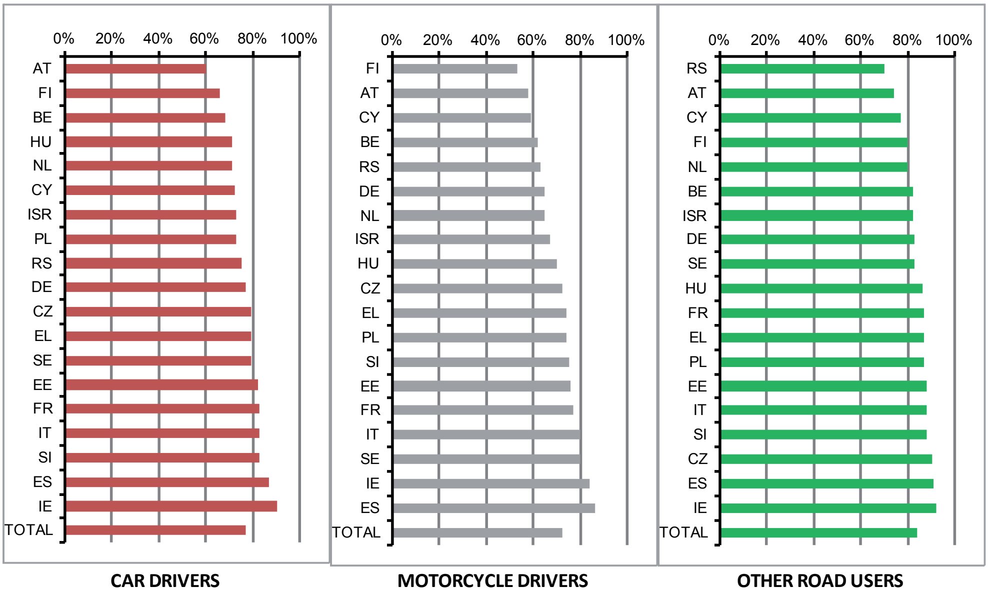

Figure 11: In favour of fatigue detection devices (very + fairly %) (co.06 item e).

However, the extent of country support also varied with the type of in-vehicle device. For example, if we compare Car Drivers' support for Speed Limiter, Black-Box, and Alcolock (Figures 7, 8 and 9, respectively), we see shifts in the relative position of Country mean rating for the three devices. For example, only 42% of Swedish Car Drivers support in–vehicle speed limiters, but over 80% of them favour an Alcolock.

It should be pointed out that Swedish road users are perhaps most familiar with the Alcolock system, as it has been used there more widely than elsewhere (Silverans et al., 2006; SWOV, 2009).

The differences between countries in support of Alcolock are very small, reflecting a high consensus, across countries and road users, to implement an effective in-vehicle device for preventing drink-driving.

The support for in-vehicle devices for fatigue detection was also high (~60%-90%) and distributed across countries in a generally similar pattern as for other devices. Ireland and Spain stand out with the highest proportions in favour of such a mechanism from all groups.

Acceptance of automatic RED Light cameras and Speeding cameras.

Figure 12 presents the overall support (% very + fairly) for enforcement measures based on automatic surveillance of Red Light and Speeding violations, either spot speed or mean speed over a given distance (also known as "section control"). The extent of acceptance is generally over 60%, higher for Red Light than for Speeding; highest by ORU, then by Car Drivers and slightly less by Motorcyclists.

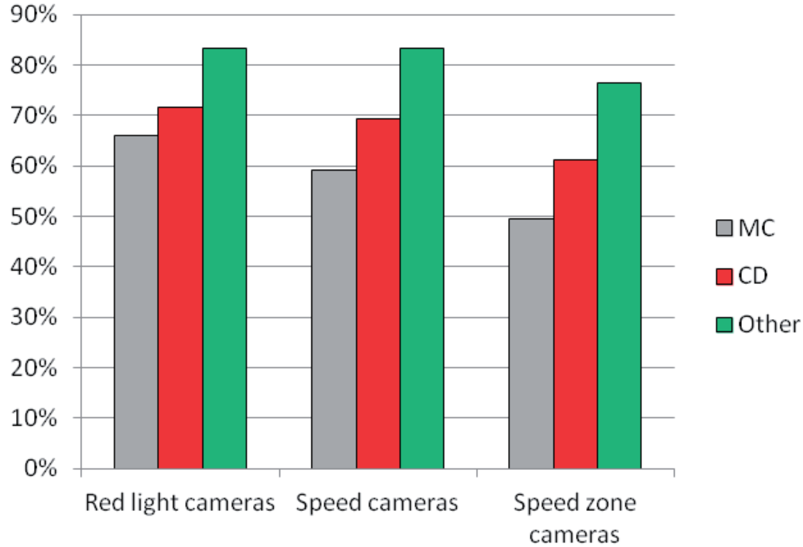

Figure 12: Level of acceptance of surveillance systems (very + fairly) (co.07 items a, b and c).

Country comparisons show fairly large differences in level of support for speed enforcement cameras or speeding control in general. Figure 13 presents the mean 'Strong Support' for three advanced technology measures (Questions CO.07b, CO.07c and CO.06a in the survey) directed at monitoring vehicles' speed and enforcing compliance: the very familiar spot speed camera, the less familiar but increasingly adopted 'section speed control' concept, and the in-vehicle speed limiting device, more familiar in large commercial vehicles, or the yet experimental, and voluntary ISA system[23]. The Country order in Figure 13 is according to % of Car Drivers who strongly supported these speed control measures.

The differences between the most supporting Countries (Ireland and Serbia) and the least supporting (Germany and France) are large and have been expressed by all road user groups; around 70% support by Car and Motorcycle drivers in Ireland and Serbia compared to 18%-34% for driver in Germany and France. (German respondents, in particular, were opposed to in-vehicle speed limiters). In almost all countries, support for automatic speed control by Other Road Users is substantially higher than that of Drivers.

23 - ISA System (Intelligent Speed Adaptation).

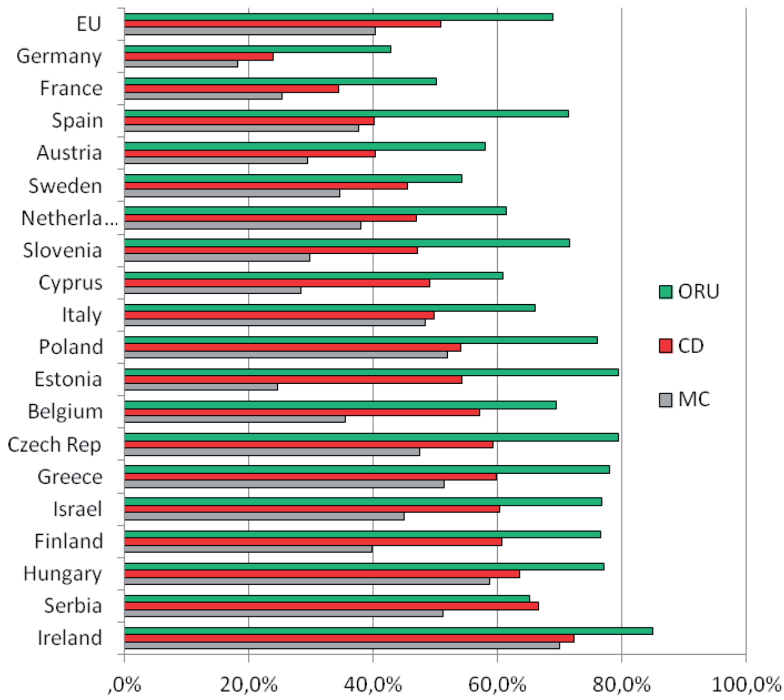

Figure 13: Support for speed control measures by road user and country co.07b, co.07c and co.06a.

The six countries with the lowest level of support for new speed control system (Germany to The Netherlands) are countries with a strong deployment of fixed and mobile camera systems for speeding control, whereas in most of the remaining countries, with higher degree of driver acceptance of speed control devices, actual deployment of efficient speed camera systems and matching speed enforcement practices are still lagging. Finland and Ireland have only recently upgraded their automatic speed enforcement system to handle larger amount of checks and citations. Not surprisingly, in countries with long standing 'productive' speed enforcement systems, many drivers (more so than Other Road Users) do not wish to have more of such systems implemented. However, this does not necessarily mean that they would opt for removing such systems altogether.

Support for Traffic calming measures

All road users rated their approval to four traffic calming measures intended to reduce the use of vehicles or their speeds in urban areas: *more limited speed zones* in populated areas, *more bicycle lanes*, *more sidewalks for pedestrians and more vehicle-free areas* in large cities and towns. The percentage of respondents from each road user group who approved of the measures is shown in Figure 14.

Clearly, the majority of road users are in favour of all the measures to improve the quality of life and safety of residents, pedestrians, and non-motorized road users. As expected, Other Road Users consistently support traffic calming measures to a larger degree than drivers, and Motorcyclists are just slightly less supportive compared to Car Drivers. The most accepted measures are the creation of *sidewalks for pedestrians* (88% by Other User, 80% by Car Drivers, and 77% by Motorcyclists) and *more bicycle lanes* (nearly 80% by all).

People who are mostly in favour of Traffic Calming measures are non-drivers, drivers who drive less than 1,000 km annually, women, those over 55 years old, and people in towns of 100,000 or less.

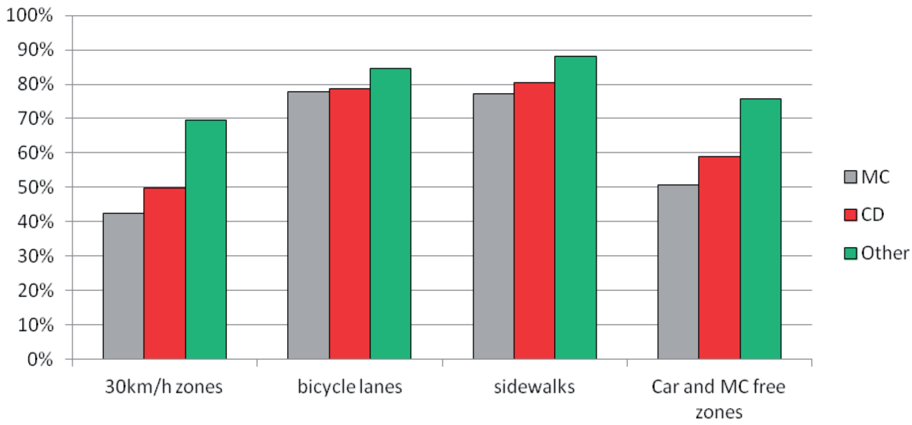

Figure 14: In favour of possible new measures (very+ fairly %) (co.07 items d, e, f , g).

In Country comparisons Greece stand out with particularly high levels of support for most traffic calming measures (excluding bicycle lanes) by all road users, and Estonian not-drivers stand out in 94% support for bicycle lanes.

Attitude towards toughening penalties for selected driving violations

The positions of road user groups towards raising the penalties on five key traffic violations are shown in Figure 15. With the exception of Motorcycle Drivers position on speeding (only 41% support), the majority of all user groups favoured raising substantially sanctions against those who speed, drink-drive, don't use restraints, don't wear a helmet and operate a phone while driving. Other Road Users were most disposed to deal more severe sanctions on traffic violations, followed by Car drivers and least by Motorcycle drivers. Raising penalties on Drink-Driving gained the most support (~80-90%).

Also here, as in other attitude areas, non-drivers, drivers who drive less than 1,000 km annually, women, those over 55 years old, and people in towns of 100,000 or less, are the ones who are more likely to support more severe sanctions for any of the five listed traffic offences.

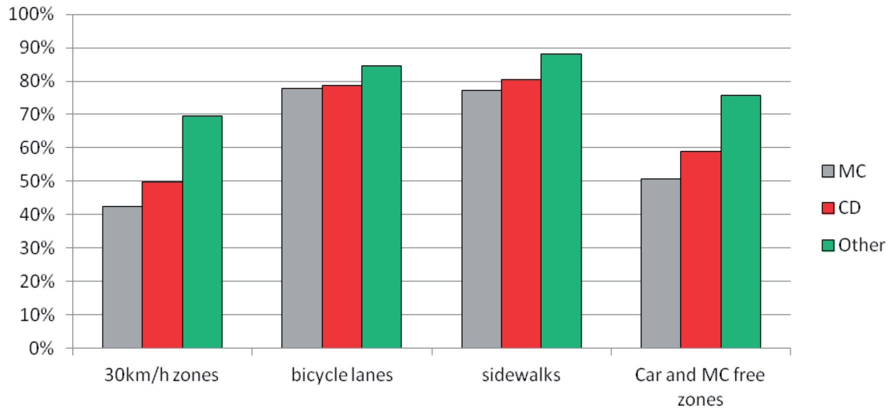

Figure 15: Level of agreement with the toughening of penalties (strongly agree +agree) (co.08).

In country comparisons, three countries stand out for their high levels of supporting tough sanctions: *Hungary* as regards *tougher sanctions for speeding* (91% of Other Road Users, 72% of Car Drivers and 69% of Motorcyclists) *and for driving under the effects of alcohol* (98% of Other Road Users); *Ireland* in relation to sanctions *for not wearing a helmet* (91% Other Road Users) *and for using handheld phones* (89% Other Road Users); and *Cyprus for not using restraint systems* (89% of Car Drivers).

On the other hand, the countries with the most reluctant position towards sanctions toughening are: *France as regards speeding* (only 20% of agreement by Motorcyclists), *Italy regarding driving under the influence of alcohol* (52% by Motorcyclists), *Slovenia in relation to not using restraint systems* (42% by Car Drivers), *Sweden for not using a helmet when driving a motorcycle* (61% by Other Road Users), and *Finland for the use of handheld phones while driving* (30% by Motorcyclists).

Opinions regarding factors which may be the cause of accidents[24]

In order to compare Car Drivers and Motorcyclists opinions and attitudes regarding possible factors that cause accidents, they were asked about main such factors. As can be seen in Figure 16, *Car Drivers give the highest average values* (on a scale of from 1 to 6, where 1 means *never* and 6 means *always*) both for the combination of drinking and driving (average of 4.6) *and drug use and driving* (4.3). In other words, the highest averages mean that users consider these factors to be clear causes of accidents.

The factor least considered to be cause of accidents is fatigue, especially among the group of Motorcyclists.

24 - The information considered in this thematic block only refers to two of the three groups, i.e. Car Drivers and Motorcyclists.

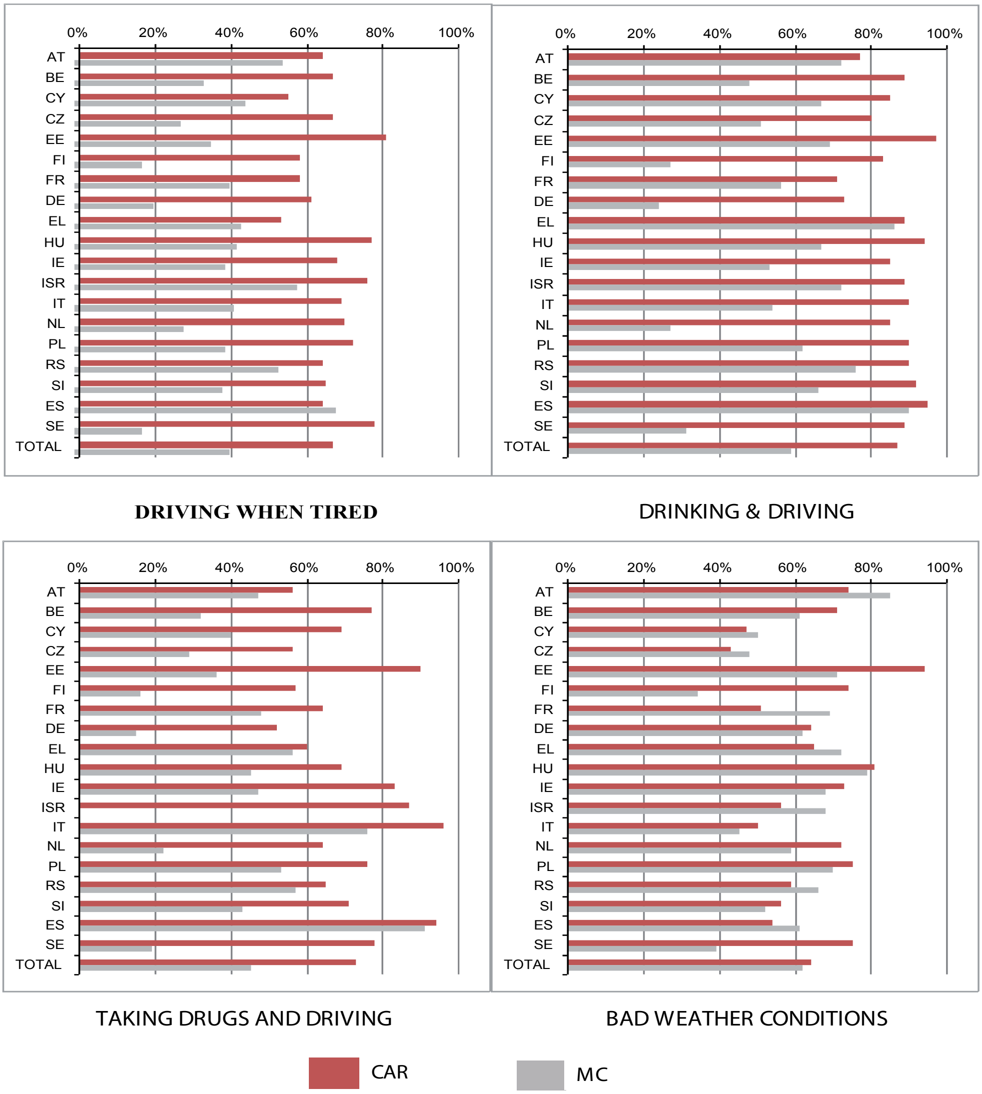

Figure 16: Factors which may cause accidents (often + very often + always) (cd24a,b,c,e and mc26a,b,f,h).

The socio-demographic analysis of the two types of drivers according to their opinions about factors that may be the cause of accidents did not gave clear profiles:

Those Car Drivers giving higher importance to fatigue as a risk factor are: women over the age of 35 who live in towns with more than 2,000 inhabitants. As for the influence of alcohol, drugs and adverse weather condition we would be talking mostly about women, regardless of their age, living in towns with more than 2,000 inhabitants.

In the group of Motorcyclists the results are similar: women give more importance to the influence of fatigue, alcohol and drugs. But in this road users group, men consider the influence of weather conditions in a higher proportion.

Conclusions

The most striking result of the comparison between attitudes and opinions of Car Drivers, Motorcycle Drivers and Other Road Users (non-drivers who primarily walk, use public transport, ride as passengers in cars and ride bikes) is how similar are the attitudes of the sub-groups regarding most issues they expressed their concerns or opinions about.

All three road user groups expressed high concern about various social issues, first and foremost for road safety, followed by unemployment and crime; all rated public transport as the least dangerous and motorcycling as the most dangerous transport mode; all accepted very favourably the idea of equipping vehicles with potentially safety enhancing devices such as speed limiters, Alcolocks, or fatigue detectors; all supported wider use of automated camera surveillance systems, stronger speed control and tougher sanctions for traffic violations; all were in favour of more traffic calming in urban areas.

On just about all issues, Other Road Users, as a group, took the strongest 'pro safety' position (more concern for safety, higher risk perception, stronger support for safety measures) followed by Car Drivers, which in turn were followed by Motorcyclists. Differences between Other Road Users and Drivers were often fairly large (10-20 points on a scale of 100) and differences in opinions of Car and Motorcycle Drivers were typically very small. But in both cases the differences were consistent in the order of scores across many issues and also <u>within-country</u> comparisons of the three groups.

One possible reason for the differences (however not striking) between user groups are the different perspectives (and interests) on mobility, safety, road and street use, enforcement, personal costs, etc. that ORU, Car Drivers and Motorcyclists may have. For example, ORU promoting more in-vehicle devices, speed cameras and tougher sanctions might overlook direct personal costs, which may be considered by drivers.

The other possible explanation for the stronger "pro-safety" stand of ORU (and the relatively least strong position by Motorcyclists) are the differences in demographic composition of the groups. For example, ORU group had 66% females as compared to 45% in the Car Drivers group and 13% in the Motorcycle group; similarly, people 65+ old comprised 5%-35% (in different countries) of the ORU group, 2%-20% of the Car Drivers group and only 1%-11% of the Motorcycle group. That gender, age, (and other attributes of a road user) are relevant to their attitudes was found over and over again in present analysis. On every issue it was found that women, people over 55 years old, people who travelled little, and people living in small towns took stronger 'pro-safety' positions.

It should be pointed out that these findings do not devaluate the importance of differences between User Groups; on the contrary, it underscores the importance of considering all road user groups <u>because</u> each group represents a somewhat <u>different</u> segment of society in terms of needs, opinions, or expectations, no less valid than those of another group.

Country visual comparisons of road user attitudes provide two main impressions. First, the general differences between the three users groups hold up, in most cases, also <u>within</u> countries. Second, when countries are rank-ordered in terms of the strength of the safety position on various attitudes, the relative position changes from scale to scale, without obvious systematic pattern or clustering. Attempts to 'explain' groupings of countries, especially at the ends of ranking scales, with external 'objective variables' such as motorization or fatality rate, did not transfer from one issue to another and there were too many exceptions for trusting an explanation. This suggests that ratings in each country reflect a complex influence of actual un-safety situation, infrastructure provisions, transport mode mix, actual level of enforcement, socio-demographic composition or road user population, general satisfaction from country governance, expectations about road safety and other factors.

Chapter 4.3

Environmentally-friendly travel behaviour

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Introduction

Transport contributes to 19.3% of total greenhouse gas emissions in Europe (Eurostat, 2009). The energy consumption by transport increased by 5% in a decade (from 1996 to 2006) and a considerable amount of this increase is due to road transport by 17% increase. The target greenhouse gas emissions, especially CO2 emissions, and reduction in energy consumption by the EU countries were exceeded mainly because of the emissions released by road transport. This is expected to be the case during the next years as well (EEA, 2011). The impact of individual mobility on the environment cannot be neglected. Automobile use, car ownership, and the distance travelled per passenger by car have increased during the last decades (OECD, 1996). Therefore, discovering preventive measures to reduce the effect of individual mobility on environment remains to be a priority in order to reach a sustainable transport system.

Several strategies and intervention policies have been suggested in order to have a more sustainable transport system. While some measures focus on technological developments, others aim at behavioural change. Technological measures aim to mitigate the negative impact of transport by increasing the fuel efficiency, improving the technology for hybrid and electric cars, and developing more sustainable road infrastructure. Behavioural measures, on the other hand, aim to reduce personal car use and promote the use of other, more sustainable transport modes. Behavioural measures are generally considered to be more effortful, less comfortable, and restrict freedom of mobility. Furthermore, car use is perceived to be more convenient, independent, comfortable, flexible, and fast compared to other means of transport. Additionally, the car has symbolic meaning as a status symbol and means of pleasure (Steg, 2005). Therefore, people prefer technological solutions over behavioural change (Poortinga, 2003). However, technological changes per se are not enough to stabilize reductions in CO2 emissions and compensate for the increasing number of vehicles. The number of cars on the roads should be reduced in order to achieve and maintain reductions in greenhouse gas emissions (EEA, 2011; Steg & Sievers, 2000).

In addition to reducing individual car use, promoting use of other transport modes such as train, tram, and bicycle helps to achieve sustainable transport as well. People are generally automatic in their choice of transport mode and habitually associate certain travel modes with certain goals (Aarts, Verplanken, & van Knippenberg, 1998).

The first aim of the current paper was to investigate road users concerns about pollution due to traffic and transport, and to examine their willingness to accept changes in their travel behaviour in order to reduce the impact of travel behaviour on the environment and to achieve more sustainable travel behaviour. The second aim was to compare road users from different countries. The third aim was to examine the factors contributing to the willingness to change travel behaviour.

Method

Respondents: Responses of 11894 car drivers, 4281 motorcycle riders and 4066 other road users (i.e., cyclists, pedestrians, passengers and moped riders) across eighteen countries in Europe were analysed[25]. Some respondents had randomly missing data on some of the variables.

Measures: The variables selected for the current analyses were mainly about road users' concern about the pollution, willingness to accept changes in their travel behaviour for the environment and the reasons to use a particular transport mode.

Concern about the environment: All road users were asked to report to what extent they were concerned about the polluting effects of traffic and transport on a 4-point Likert-type scale (1= very, 2= fairly, 3= not much, 4= not at all). In the analysis, the categories were reversed, so that higher scores denoted more concern for the polluting impact of traffic and transport.

Willingness to change travel behaviour for the environment: Car drivers and motorcycle riders were asked to what extent they were willing to accept changes in their travel behaviour in order to reduce the effects of vehicle use on the environment. Car drivers were asked eight questions on this scale measuring their willingness to reduce vehicle use, increase the use of public transport, have a car free day each month, increase the use of bicycle, car pooling, car renting, use of moped instead of car and purchase an electric or a hybrid car. Not all of these items were applicable to the motorcycle riders. Therefore, motorcycle riders were asked only the first four items. Respondents answered these questions on a 4-point Likert-type scale (1= very, 4= not at all). The reverse coding was used, and consequently higher scores represented more favourable responses.

Reasons to use a particular transport mode: Motorcycle riders and other road users were asked whether environmental concerns were among the reasons for them to ride a motorcycle and to use other means of transport such as cycling and walking (motorcycle riders were asked specifically whether they were driving the motorcycle for the air pollution reduction, i.e. reduction of CO_2 emission). Participants responded to these questions on a 4-point Likert-type scale (1= very, 4= not at all). Their responses were coded reversely. Higher scores thus indicated stronger emphasis on the reason.

Analyses: We analysed the data mainly in two parts: comparison among the road user groups and comparison among the countries. Analysis of variance and z-tests were used to compare how different road users responded to questions concerning the environment, their travel behaviour and their willingness to change travel behaviour for the environment. Hierarchical linear modelling was used in order to investigate the factors that contribute to the car drivers' and motorcycle riders' willingness to change their travel behaviour.

Results

Concern about the air pollution, willingness to change travel behaviour, and reasons for using a PARTICULAR travel mode

First, we examined the differences between the three road user groups in their concern about the pollution effects of traffic and transport, and the effect of gender on this concern. Table 1 shows the average concern about the pollution among different groups of respondents. Although all groups of road users were quite concerned about the polluting effects of transport, a two-way analysis of variance showed that there was a small difference between the three groups, $F(2, 20155)= 10.60$, $p= .001$, partial $\eta^2= .001$. Motorcycle riders expressed statistically significantly less concern compared to the car drivers (Sidak post hoc test was significant at $p < .001$) or other road users ($p < .001$). In line with the

25 - Israel was not included in the current analyses because the data concerning the topic of the current chapter were not available.

previous research on gender effects on the environmental behaviour, the concern about the pollution was higher among females than males, $F(1,20155) = 190.30$, $p < .001$, partial $\eta^2 = .009$. The gender × road user category interaction term was not statistically significant. Thus, the higher concern by females compared to males was observed in all three groups of road users.

Table 1: Concern for the pollution in different road user groups.

	Males			Females			Total		
Road user category	M	SD	n	M	SD	n	M	SD	n
Car drivers	2.96	0.83	6503	3.15	0.76	5337	3.05	0.81	11840
Motorcycle riders	2.86	0.84	3702	3.09	0.78	568	2.89	0.84	4270
Other road users	2.89	0.86	1373	3.14	0.79	2678	3.05	0.82	4051
Total	2.92	0.84	11578	3.14	0.77	8583	3.01	0.82	20161

Car drivers in our sample held a valid driver's license on average for 20.47 years (SD= 13.93 years) and the mean mileage during the last 12 months was 15,063 kilometres (SD= 17,102 km). The majority of the car drivers in the current sample were habitual drivers. Seventy percent of them reported driving on daily basis. Thus, participants in the car driver category could be considered to be high on individual car use.

We were interested in the car drivers' willingness to accept changes in their travel behaviour in order to reduce the effects of mobility on the environment. Simple descriptive results revealed that the two highest changes that drivers were willing to accept were having a car-free day and car pooling (see Figure 1). These were followed by cycling more frequently, increasing the use of public transport and reducing car use. Car drivers were less favouring the options that suggest buying an electric or a hybrid car, renting a car when they need it, and riding motorcycle more frequently. However, even though their willingness to accept the car-free day and car pooling received the highest scores, meaning they favoured these suggestions most among all the offered alternatives, we have to stress that the average response was slightly lower than 2.5, indicating that the participants' acceptance of the suggestions lied in the middle of the "not much" option and the "fairly" option. Therefore, their attitude to the suggestions was neither very positive nor very negative on these two items. Thus, contrary to the literature, average car drivers in the current sample seem not to reject reducing car use, but seem to be indecisive whether they would accept reducing car use and increase the use of other transport modes such as public transport and bicycle.

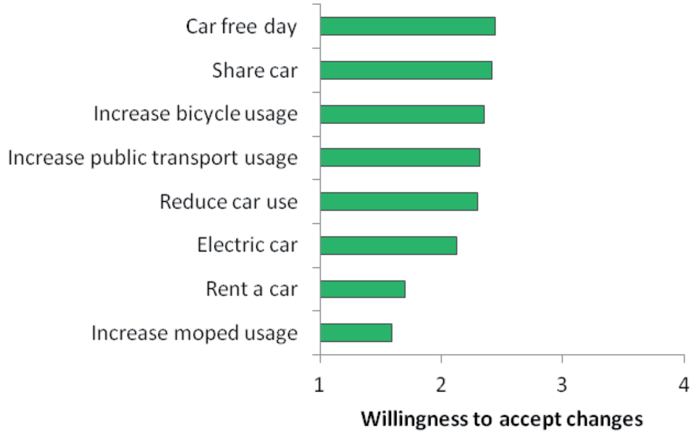

Figure 1: Car drivers' average willingness to accept changes in travel behaviour for the environment.
(1= not at all, 2= not much, 3= fairly, 4= very). Bars denote 95% confidence intervals for the mean. Statistics are based on data from 11867 car drivers.

Motorcycle riders in the current sample (*n*= 4281) held a valid motorcycle license on average for 13.75 years (*SD*= 11.72 years) and have rode on average 6,410 kilometres (*SD*= 8,104 km) during the last 12 months. On average they spent 7.66 months (*SD*= 3.18 months) per year driving their motorcycle. The majority of the current motorcyclist sample rode nearly daily (33.1%) or 1 to 4 times a week (33.9%) in the last year. Thus, they were quite regular riders.

We were interested in the motorcycle riders' reasons to ride a motorcycle (see Figure 2). Their main reason for this activity was the pleasure taken from riding a motorcycle, followed by the feeling of freedom. The convenience reasons such as ease of parking, low costs and avoiding traffic jam were also important for the motorcycle riders (average responses were higher than 2.5). Causing less CO_2 emissions, on the other hand, was not among the main concerns of motorcycle riders for choosing this travel mode. It is worth noting that motorcycle riders also reported that they rarely used their vehicle as "green drivers", i.e. for the purpose of contributing to reduction of traffic jams, *M*= 2.43, *SD*= 1.48 (on a 6-point scale, with 1= never, 6= always).

Figure 2: Level of agreement with different reasons for motorcycle riders to choose this travel mode.
(1= not at all, 2= not much, 3= fairly, 4= very). Bars denote 95% confidence intervals for the mean.

The motorcycle riders' (data were available for 4234 riders) willingness to accept different types of changes in their travel behaviour for the environment is shown in Figure 3. The most favourable change in travel behaviour was to have a car-free day once in a month and to increase bicycle use, though the riders were actually not very prone to these two options. They were, however, even less prone to increasing public transport use and reducing their motorcycle use. Reducing vehicle use was the least favoured change in travel behaviour.

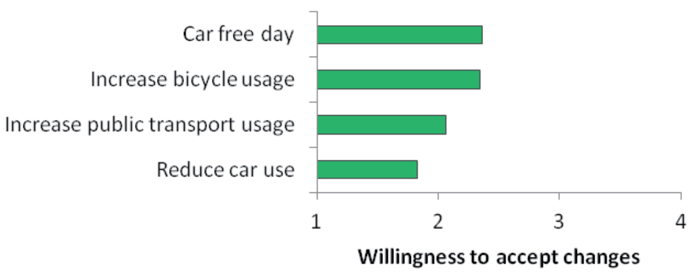

Figure 3: Motorcycle riders' willingness to accept changes in travel behaviour for the environment.
(1= not at all, 2= not much, 3= fairly, 4= very). Bars denote 95% confidence intervals for the mean.

The remaining 4066 participants were other road users including pedestrians, cyclists, car passengers and moped riders. This group showed the highest agreement with the statement that they used transport means other than the individual car or motorcycle because they had no need (there is no necessity to use vehicle, the alternative travel modes were just another means of transport). According to the average score, the next important reasons were the physical exercise and the health and financial reasons. Environmental concerns were not among the main reasons for using alternative travel modes (see Figure 4).

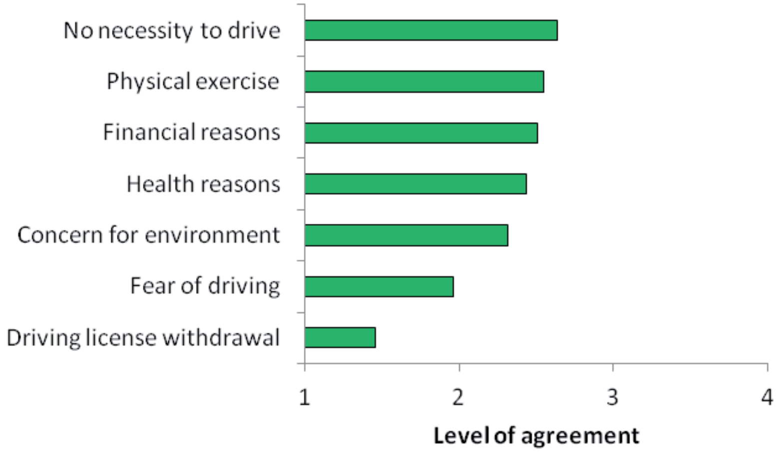

Figure 4: Reasons for other road users to choose this travel mode.
(1= not at all, 2= not much, 3= fairly, 4= very). Bars denote 95% confidence intervals for the mean.

Next, we compared car drivers and motorcycle riders on four common items measuring their willingness to accept changes in travel behaviour (see Figure 5). Motorcycle riders were less willing to reduce the use of their vehicle than car drivers, $z= 28.08$, $p < .001$, partial $\eta^2= .05$. They were also less willing to increase the use of public transport, $z= 13.81$, $p < .001$, partial $\eta^2= .01$, and to have a car free day, $z= 4.14$, $p< .001$, partial $\eta^2= .001$. The two groups did not differ much on their willingness to change behaviour in terms of increasing bicycle use, $z= 0.28$, $p= .782$, partial $\eta^2= .00$. All in all, compared to car drivers, motorcycle riders seem to be less concerned with pollution and less open to reduce vehicle use in order to prevent the effects of transport on the environment.

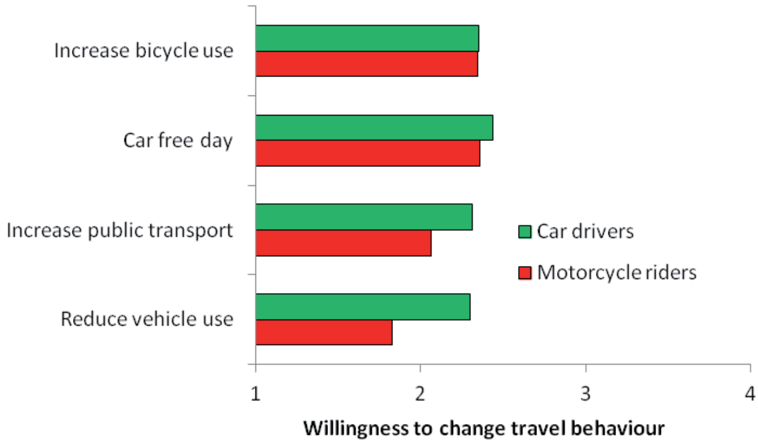

Figure 5: Comparison of car drivers and motorcycle riders on the four common items about the willingness to change travel behaviour for the environment.
(1= not at all, 2= not much, 3= fairly, 4= very). Bars denote 95% confidence intervals for the mean.

Comparison among countries

One of the aims of the current chapter was to compare motor vehicle users coming from different countries. Figure 6 shows the average concern about the air pollution and willingness to change travel behaviour among car drivers and motorcycle users in different countries.

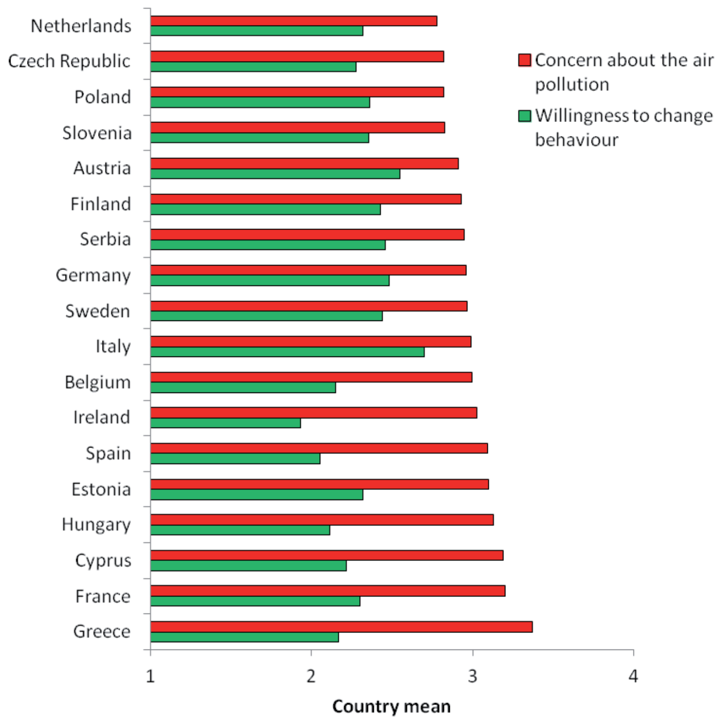

Figure 6: Average motor vehicle users' (car drivers' and motorcycle riders') concern about the air pollution and willingness to change travel behaviour in different countries.
(1= low concern/willingness, 4= high concern/willingness).

When countries were sorted according to the average concern of motor vehicle users about the pollution, average car drivers' willingness to change travel behaviour could not be sorted correspondingly. For example, there was high concern about air pollution in Greece but at the same time motor vehicle users were not willing to change their behaviour much. Ireland had an average concern for the pollution but low willingness for changing travel behaviour. Slovenia, Austria, Finland, Germany, and Serbia had below average concern about the pollution but above average willingness to change travel behaviour. There was a moderate negative correlation (r= –.40) between the average concern about the pollution and average willingness to change travel behaviour across 18 countries.

We then split countries into two groups: those with concern about the pollution higher than the average concern (M_{tot}= 3.003) in our sample (Cyprus, Estonia, France, Greece, Hungary, Ireland, Spain) and those with below-average concern about the pollution (Austria, Belgium, Czech Republic, Finland, Germany, Italy, Netherlands, Poland, Serbia, Slovenia, Sweden).

Table 2 shows car drivers' willingness to change their travel behaviour in countries with high- and low-concern about the air pollution. The two groups of countries differed statistically significantly on all the variables, with residents of low-concern countries exhibiting higher willingness to change travel behaviour. Although the differences between the high- and low-concern countries were statistically significant, η^2 mostly showed small to moderate effect sizes (as η^2 of .0099 constitutes a small effect, .0588 a medium effect and .1379 a large effect; Cohen, 1988). The largest difference between the two groups of countries was observed for increasing bicycle use and renting a car—compared to respondents from high-concern countries, those from low-concern countries were more willing to increase bicycle usage and rent a car.

Table 2: Difference in willingness to change different travel behaviours between the low-concern and high-concern countries.

	Low-concern countries		High-concern countries				
Change in travel behaviour	M	SD	M	SD	z	p	η^2
Car drivers							
Reduce car use	2.36	0.96	2.19	0.95	–9.41	< .001	.008
Share car	2.49	1.07	2.29	1.06	–9.99	< .001	.009
Rent a car	1.89	0.99	1.46	0.78	–26.50	< .001	.054
Increase public transport usage	2.40	1.03	2.19	1.01	–11.08	< .001	.011
Car free day	2.49	1.11	2.35	1.11	–6.53	< .001	.004
Increase bicycle usage	2.58	1.05	2.02	1.07	–27.94	< .001	.064
Increase moped usage	1.66	0.90	1.52	0.85	–8.53	< .001	.006
Electric car	2.24	1.03	1.98	1.03	–13.23	< .001	.015
Motorcycle riders							
Reduce motorcycle use	1.89	0.87	1.74	0.82	–5.71	< .001	.008
Increase public transport usage	2.17	0.97	1.92	0.95	–8.23	< .001	.016
Car free day	2.38	1.09	2.32	1.13	–1.74	.081	.001
Increase bicycle usage	2.55	1.02	2.05	1.04	–15.50	< .001	.054

Note. After listwise deletion, we analysed data of 6567 car drivers and 2506 motorcycle riders from low-concern countries and 4890 car drivers and 1728 motorcycle riders from high-concern countries.

The comparison of the motorcycle riders across high- and low-concern countries gave similar findings to the one for car drivers (see Table 2, section Motorcycle riders). Compared to the motorcycle riders coming from high-concern countries, the ones from the low-concern countries were less willing to change their travel behaviour. The largest difference between high- and low-concern countries was again in the motorcycle riders' willingness to increase the frequency of cycling. Motorcycle riders in the two groups of countries, however, did not differ significantly in their willingness to commit to a car free day.

Then we compared whether the differences among the road user groups in terms of their concern about the air pollution hold across countries. The differences among countries were statistically significant, $F(17, 20139) = 34.46$, $p < .001$, partial $\eta^2 = .028$, but the pattern observed among road user groups changed slightly across the participating countries, $F(34, 20139) = 5.16$, $p < .001$, $MSE = 0.641$, partial $\eta^2 = .01$. In most countries, among the three groups of road users motorcycle riders were least concerned about the air pollution (see Figure 7).

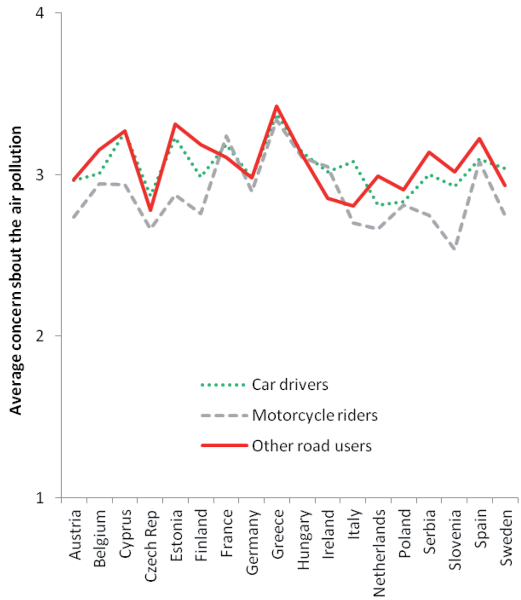

Figure 7: Comparison of road user groups in terms of their concern for the air pollution across countries.
(1= not at all, 2= not much, 3= fairly, 4= very concerned).

Figure 8 shows the comparison between car drivers and motorcycle users coming from countries with low and high concern about the air pollution. Car drivers from high- and low-concern countries differed statistically significantly on all the studied variables: on their willingness to reduce car use, $z= 9.57$, $p< .001$, $\eta^2= .008$, to increase public transport, $z= 11.21$, $p< .001$, $\eta^2= .011$, to have a car free day, $z= 6.59$, $p< .001$, $\eta^2= .004$, and to increase bicycle use, $z= 28.52$, $p< .001$, $\eta^2= .065$. Motorcycle riders from high- and low-concern countries differed according to their willingness to reduce motorcycle use, $z= 5.71$, $p< .001$, $\eta^2= .008$, willingness to increase public transport use, $z= 8.20$, $p< .001$, $\eta^2= .016$, and willingness to increase bicycle use, $z= 15.50$, $p < .001$, $\eta^2= .054$, but they did not differ according to their willingness to have a car free day, $z= 1.76$, $p= .079$, $\eta^2= .001$. In general it could be said that motor vehicle users from the high-concern countries were less willing to change their travel behaviours than the ones from the low-concern countries.

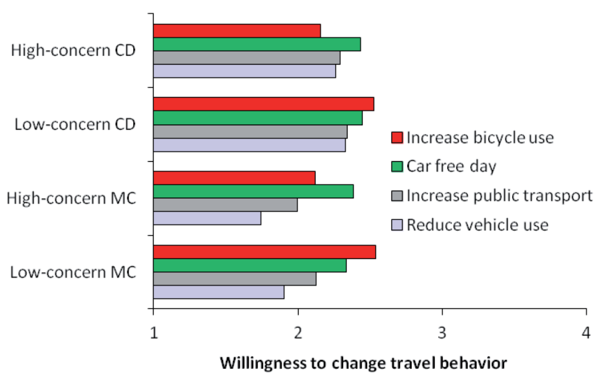

Figure 8: Car drivers' (CD) and motorcycle riders' (MC) willingness to change travel behaviour for the environment in the low- and high-concern countries.

Factors contributing to the motorized road users' willingness to accept changes in travel behaviour to reduce air pollution

The final concern of the current chapter was to detect and understand the factors contributing to the motor vehicle users' willingness to change their travel behaviour for the environment. For car drivers and motorcycle riders, we computed the mean response to four common items measuring their willingness to accept the following changes in travel behaviour: (i) to reduce the usage of the vehicle, (ii) to use public transport more frequently, (iii) to use a bicycle more frequently, and (iv) to accept a car free day each month. The means computed were used as the outcome variables in further analyses.

To control for the between-countries differences in the average willingness to change travel behaviour which could lead to an inappropriate estimation of the regression coefficients for different predictors (see Enders & Tofighi, 2007), hierarchical linear modelling was used to predict car drivers' willingness to accept change in travel behaviour. These models take into account the hierarchical structure of the data—the individuals had been nested within the countries—and the possible differences among the countries on the measured outcome variable. Individuals represented the level-1 units of the analysis and countries represented the level-2 units. Several predictors were simultaneously entered into the model: gender and age (as control variables), individual's concern about the air pollution, and (based on our reasoning that the willingness to change travel behaviour should depend on travelling habits) frequency of car use and mileage in the last year. All interval predictors were group-mean centred and standardized before being entered into the model. In a random-intercept model, only fixed-effects of predictors were analysed using maximum likelihood estimation method.

A similar hierarchical linear model—Model 1—was developed for predicting the motorcycle riders' willingness to change their travel behaviour. The same variables as in the model for car drivers were used, except that the frequency of car use was replaced with the frequency of motorcycle use. We then developed another model for predicting motorcycle riders' willingness to change travel behaviour—Model 2—into which different reasons for using the motorcycle and the green-rider identity were entered as (group-mean centred and standardized) predictors in addition to the ones entered in Model 1.

We found out that the differences among countries represented 10.5% of the total variance of car drivers' willingness to change travel behaviour. With predictors we were able to explain 10.4% of the level-1 variance, i.e. of the differences among the individuals within the countries. In motorcycle riders, differences among countries represented 6.2% of the total variance of their willingness to change travel behaviour. Model 1 predictors were able to explain 7.9% of the level-1 variance, and Model 2 predictors altogether explained 14.2%. Therefore, in our models the examined predictors were able to explain only a small portion of variance of willingness to change travel behaviour.

Table 3 shows that one of the main contributors to both drivers' and motorcycle riders' willingness to change their travel behaviour was their concern about the air pollution. In car drivers, females, younger people, those who drive less frequently and those with shorter mileage were more willing to change travel behaviour. In Model 1 for motorcycle riders, the same conclusions about the predictors could be made, except for the effect of age which was not statistically significant.

Table 3: Results of hierarchical linear modelling for predicting the car drivers' and motorcycle riders' willingness to change travel behaviour in order to reduce air pollution.

Predictors	b	SE_b	t	df	p
Car drivers					
Intercept	2.402	0.049	49.42	18.02	.000
Gender (female)	0.081	0.014	–5.62	10902.25	.000
Age	–0.017	0.007	–2.38	10895.19	.017
Concern about pollution	0.168	0.007	23.73	10895.96	.000
Frequency of vehicle use	–0.134	0.007	–18.47	10895.18	.000
Mileage in the last year	–0.048	0.007	–6.54	10895.28	.000
Motorcycle riders – Model 1					
Intercept	2.337	0.054	43.70	33.28	.000
Gender (female)	0.171	0.033	–5.11	3817.41	.000
Age	0.020	0.011	1.77	3802.73	.077
Concern about pollution	0.158	0.011	14.26	3810.05	.000
Frequency of vehicle use	–0.038	0.012	–3.24	3802.10	.001
Mileage in the last year	–0.040	0.012	–3.44	3802.36	.001
Motorcycle riders – Model 2					
Intercept	2.290	0.054	42.31	32.61	.000
Gender (female)	0.124	0.033	–3.73	3731.00	.000
Concern about pollution	0.134	0.011	12.14	3723.38	.000
Frequency of vehicle use	–0.044	0.012	–3.78	3716.13	.000
Mileage in the last year	–0.036	0.012	–3.09	3716.27	.002
Green-rider identity	0.072	0.012	6.06	3716.21	.000
Reasons for motorcycling					
Saves time	0.020	0.013	1.49	3716.17	.137
Provides pleasure	–0.062	0.013	–4.80	3716.25	.000
It is easier to find parking	–0.015	0.014	–1.06	3716.15	.287
It is cheaper	–0.025	0.014	–1.77	3716.13	.077
For air pollution reduction	0.113	0.014	8.32	3716.29	.000
Rider spirit	–0.040	0.013	–2.96	3716.22	.003
Enjoyment of acceleration and speed	–0.015	0.013	–1.16	3716.50	.245
No other option to get to work/study	0.018	0.012	1.58	3716.09	.115
To avoid getting trapped in congestion	–0.053	0.014	–3.85	3716.21	.000
Gives a sense of freedom	–0.005	0.013	–0.38	3716.07	.705

In Model 2, several reasons for using the motorcycle also appeared significant. Higher willingness to change travel behaviour was reported by motorcycle riders who agreed more that they are green riders contributing to reduce traffic jams and that they ride a motorcycle for air pollution reduction. On the contrary, those who agreed more that they ride a motorcycle because it provides pleasure, because they have the “spirit of a rider”, and in order to avoid getting trapped in the congestion, were less willing to change their travel behaviour.

Discussion and conclusion

We investigated in a large and representative European sample how concerned different groups of road users are about the effects of transport on the environment. Environmental impact of traffic and transport has not been the subject of SARTRE before. The current data are valuable to provide a starting point to examine road users’ main concerns and willingness to adopt sustainable transport modes. Furthermore, the current data are important in terms of enabling us to compare different road user groups as well.

The first objective of this chapter was to investigate road users’ concern for the environment and the relevance of the environmental concerns for the travel mode they choose. Environmental concerns and prevention of air pollution were not among the primary reasons for motorcycle riders and other road users to choose different transport modes than the car. On the contrary, choice of travel mode was influenced mainly by practical reasons such as avoidance of parking problems and traffic jam, and accessibility of other travel modes. Additionally, for the motorcycle riders affective reasons such as pleasure and freedom of riding a motorcycle were also highly influential factors. Thus, pollution seems not to be a determining factor or a primary contributor to travel mode choice.

The second objective of the current chapter was to investigate car drivers’ and motorcycle riders’ willingness to accept changes in their travel behaviour in order to reduce the impact of traffic and transport on the environment. Among the car drivers, the most plausible change in their travel behaviour was having a car free day each month. Car pooling and cycling more frequently were also plausible changes to be accepted. Options that propose reduction in car use and more frequent use of public transport were considered to be more acceptable than the options that suggest giving up on car use such as renting a car only when needed and riding moped or motorcycle. It seems that although drivers reported that they were somewhat willing to accept changes that would result in less comfort and freedom, they still did not favour changes that would require them to give up on car use. This suggests that drivers may be open to change their travel mode but they would not want to abandon car use altogether. Technological solutions, such as obtaining a hybrid or electric car to achieve sustainable travel behaviour, were also not very plausible for car drivers. This might be due to high price and low accessibility of hybrid and electric cars. Furthermore, maintenance of an electric car is more cumbersome because the driver needs to plan charging the car and consider distance of trip in advance. The current findings seem to contradict the findings of the previous research indicating that people prefer technological strategies over behavioural change to achieve sustainable travel behaviour. Nonetheless, drivers’ preferences may change in time. For instance, increased accessibility of electric cars, for example, more charging points and increased privileges to the users of sustainable cars such as parking priorities for the users or electric and hybrid cars, may promote use of environmentally-friendly vehicles. Hence, implementing such policies could ameliorate sustainable behaviours change among motorized road users.

Similar to the car drivers, the two most plausible changes that motorcycle riders were willing to accept in their travel behaviour were a car free day each month and an increase of bicycle use. Options that suggest less freedom and comfort, i.e. reducing motorcycle use and increasing the use of public transport, were less favoured among the motorcycle riders. Considering that the top reasons for motorcycle riders to choose this mode of travel was convenience and affective meaning, it is reasonable to observe that they would not want to lose the privileges of comfortable, free and pleasurable travel.

Motorcycle riders were slightly less concerned about the air pollution as a result of traffic and transport than car drivers and other road users. Compared to car drivers, they were also less willing to change their travel behaviour. This might be because motorcycle riders already cause less pollution than car drivers by switching from cars to motorcycles. So, motorcycle riders have already taken a step towards reducing the effects of their travel behaviour on the environment.

The hierarchical linear modelling revealed that at the level of an individual the concern about the polluting impact of transport is one of the main predictors of the willingness to accept changes in travel behaviour. This is consistent with the previous research that makes a distinction between the intent and impact of pro-environmental behaviour (Gatersleben, Steg, & Vlek, 2002; Stern, 2000). Accordingly, intent perspective is concerned with the motivational basis of pro-environmental behaviour and is influenced by attitudinal variables. Impact perspective is concerned with the consequences of the pro-environmental behaviour and is primarily related to the socio-demographic and socio-economic variables. The policies that aim to change people's travel behaviour should target attitudinal variables such as values, travel goals, or awareness of the environmental problems due to transport.

Willingness to change travel behaviour was negatively related to frequency of vehicle use, mileage made per year, and in motorcycle riders also to avoidance of getting trapped in traffic jams and to hedonic reasons for using a motorcycle. These results may indicate that changes in travel behaviour will be more difficult for people who drive or ride a lot, or who use their vehicle either for pragmatic reasons or for pleasure. Strategies to change their behaviour should perhaps be directed towards ensuring alternative travel modes which are comparably time-efficient and offer a high enough level of enjoyment.

Another objective of the current chapter was to investigate the situation in different European countries. Road users in some countries were much more concerned about the air pollution than road users in other countries. We compared the road users in high- and low-concern countries. They differed in their willingness to accept changes in travel behaviour. Road users from the high-concern countries were less willing to change their travel behaviour. They were less willing to cycle more frequently, to rent a car, to increase the use of public transport, and so on. This is an interesting finding, which at the first glance might seem counterintuitive. However, drivers in the high-concern countries may report higher concern about pollution because the pollution in their countries is worrisome, for instance, due to denser traffic, but this does not necessarily mean that they will be willing to take a counter-pollution action. Perhaps their lower willingness to change travel behaviour is due to insufficient infrastructure in their countries (e.g., lack of segregated cycle facilities or uncomfortable public transit vehicles). Thus, although drivers from the two groups of countries reported of different concern about the air pollution, their willingness to accept changes in travel behaviour in order to reduce the effects of traffic and transport on the environment might be more or less the same if they had the same conditions for using other options of commuting. Such contextual issues should be taken into account when one wants to study the willingness to change travel behaviour.

In conclusion, the current data, which was collected in three road user groups in a large European sample, reveals several important points. First, not all groups of road users may be equally concerned about pollution and equally willing to change travel behaviour. Future studies should examine more systematically why motorcycle riders are less concerned about the air pollution and consequently also less willing to change travel behaviour. Second, there seems to be a positive relation between the concern about the pollution and the willingness to change travel behaviour at the level of an individual, whereas the relation between the average concern and willingness in different countries is negative. The latter finding suggests that increasing the awareness about the air pollution would perhaps not suffice to change the willingness of European citizens to adopt sustainable transport modes. Ways of promoting people's awareness of the necessity of sustainable transport system and reaching their commitment to such a system should go hand in hand with providing easily accessible, efficient and safe modes of transport.

Chapter 4.4

Driving under influence

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Introduction

Despite considerable efforts and the implementation of measures for road safety in European countries (International Transport Forum, 2008), driving under the influence (DUI) of some psychoactive substance remains one of the main causes of road death in Europe (SafetyNet, 2009). A mathematical relationship between Blood Alcohol Content (BAC) and road deaths was established for the first time in 1964 by Borkenstein (cited by International Transport Forum, 2008). Laumon et al. (2005) confirm this relationship and established that the chances of dying on the road are, on average, 8.5 times higher for drivers under the influence of alcohol than for sober ones. Approximately 25% of road fatalities in Europe are linked to alcohol-related road traffic accidents, with great variations among countries - from 5% in Bulgaria to 30% in France, Slovenia and Ireland (International Transport Forum, 2008). Consequences of drink-driving are even greater for young drivers, who are both more sensitive to alcohol and often less experienced in driving (Keall et al., 2004; European Conference of Ministers of Transports, 2006).

According to an European study conducted within the Driving Under the Influence of Drugs, alcohol and medicines (DRUID) project in 13 countries (Houving et al., 2006), an average of 3.5% of European drivers are driving under the influence of alcohol and 1.4% under the influence of medicines. The precise effect of medication consumption on driving is more difficult to establish than for alcohol because of the complexity of the pharmacodynamic processes, further complicated by their interactions with the diseases they aim to address (Walsh et al., 2004). However, many medications have side effects such as reduced alertness, extended reaction time or over-optimism that are clearly inconsistent with driving (Mura et al., 2003). A number of commonly used medications are also likely to produce drowsiness, a major source of single-car road traffic accidents, again especially among the young (Smart et al., 2005; Engström et al., 2003). A recent study established that, in France, 3.3% of road traffic crashes are "attributable to levels 2 and 3 medications" (Orriols et al., 2010).

In such a context, it is crucial to upgrade our knowledge about these determinants of impaired driving. It could indeed contribute to improving the efficacy of future Road Safety actions and thus reduce the number of alcohol/legal drug-related fatalities on European roads.

It is well known that alcohol consumption in a country is related to the overall accident mortality rate (Skog, 2001). Fifty years ago, alcohol consumption was very heterogeneous in Europe: in 1961, alcohol consumption ranged from the equivalent of 2 litres of pure alcohol per year per inhabitant in Finland to 17.7 in France. But over those fifty years, European countries saw their annual alcohol consumption converging toward 10 litres of pure alcohol per person (World Health Organization, 2011). However, the increased homogeneity in overall consumption masks different patterns of consumption in the countries by various groups of road users such as differing preferences for wine, beer and spirits as well as the incidence of binging on alcohol. These inter-country differences need to be understood to facilitate effective policies for different types of road users.

Considering more specifically driving while impaired, some studies have showed that car drivers and motorcyclists do not behave the same way. Indeed, motorcyclists have been found to drink and drive as often as car drivers but with lower BAC (Watson & Garriott, 1992). Moreover, when drinking heavily, motorcyclists typically leave their motorcycle and use their car so as to feel safer: a car is perceived as easier to drive, does not fall over, and offers more protection (Syner & Vegega, 2001). Motorcyclists may thus be trying to compensate for the greater vulnerability of their transport mode by more cautious behaviour (theory of risk homeostasis, Wilde, 1982; Trimpop, 1994).

This chapter will address three goals:

- to describe differences of attitudes towards the use of alcohol and medicines while driving between different groups of road users;
- to explain the differences as far as possible, in particular to highlight predictors of drinking and driving;
- to evaluate the impact of Road Safety measures (such as legal blood alcohol concentration, breath testing and alcohol interlock) on intended behaviour, so as to suggest plans of action that would ideally fit each group of users.

The text is divided into two sections - one focusing on alcohol the other on legal drugs. For each section, descriptive statistics are presented before more detailed analyses. The descriptive statistics focus on differences between user groups and are organized around three themes: psychotropic consumption while driving, attitudes toward related risks, and finally opinions on various road safety measures. The analytic section explores relations between those different factors in order to identify the predictors of drink-driving and the efficacy of existing measures.

Material & method

The survey includes, for motorcyclists (MC) and car drivers (CD), 14 questions directly related to driving under the influence of alcohol and four related to driving under the influence of medicine. The other road users (ORU) were asked five questions related to driving under the influence of alcohol.

The questions fall into three broad topics:

- The first topic deals with ‘driving while impaired’ behaviours. For alcohol-impaired driving, two questions are relative to the respondent’s reported drink driving (*even after a small amount*, *when you may have been over the limit*) and one question is about the respondent’s friends’ behaviour (*Most of your friends would drink and drive a car*). For medicine-affected driving, participants were only questioned about their own use (*Have you driven while taking medication*, *how many times have you been fined for the use of medication at the wheel*).
- The second topic addresses the **perception of road risks** associated with such behaviours. The perception of physical risks and legal risks has been assessed for both alcohol and medicine-affected driving. Physical risks perception corresponds to the estimated link

between road crashes and the use of alcohol at the wheel (*You can drink and drive if you do it carefully*, *Drinking and driving increase the risk of crashing*, *Drinking and driving cause crashes*) or the use of medicine at the wheel (*How dangerous do you think it is to drive while taking medication*). Legal risk perception corresponds to the perceived risk of being checked (*How many times were you checked for alcohol while driving*, *How likely is it that you will be checked for alcohol*).

- The third topic consists of **attitudes towards various measures** taken in order to regulate 'driving under the influence' behaviours: attitudes towards the law (*tolerated BAC threshold*), attitudes towards police checks and fines (*Penalties for drink-driving offences should be more severe*) and finally attitudes towards security devices (*alcohol interlock*).

We also took into account the following variables as potential predictors of drink driving:

- *driving experience*: duration driver's licence held, annual mileage, accident experience;
- demographic factors: *gender*, *age*, *city size*;
- other offending behaviours such as *speeding*, *not using restraint systems* or *not wearing helmet* (when appropriate);
- opinions on policies other than those targetted at lowering the use of alcohol/medicine while driving: *attitudes towards enforcement*, technologies (*speed limiting devices*, *black box data-recording*, *fatigue detection systems*, *automated cameras*) and *penalties* (for not using restraint systems, not wearing a helmet);
- national contextual data such as legal Blood Alcohol Concentration (BAC) threshold, number of road-side tests, alcohol consumption per capita.

In this chapter, where appropriate we reversed the scoring of the scale. Some answers were recorded on a 4-points Likert scale ranging from 1: "very" to 4: "not at all". In this case we reversed the scale in order to facilitate comparison with other questions. Thus, in this chapter higher scores indicate positive answers.

Another issue was scales ranges. Some scales were 4-points while some others were 6-points Likert scales ranging from 1: "never" to 6: "always". In order to facilitate comparisons between answers made on different scales, we standardized the answers given on 6-points scales into 4-points scales by this equation: $1+3(x-1)/5$, where "x" is the participant's answer.

Results. Part 1. Alcohol

Overview

Drink-drive behaviour

The questionnaire includes two questions concerning the interviewee's consumption of alcohol: one evaluating the frequency of trips under a slight influence of alcohol (*after a small amount of alcohol*), the other when he/she may have been over the legal limit (*when one may be over the drinking and driving legal limit*). As was previously seen in SARTRE 3 (2004), the overwhelming majority of Europeans declare that they never drive while probably being over the legal limit for alcohol. This result is consistent with other statistics about driving under the influence of alcohol. Indeed, in Europe "around 3 per cent of journeys are associated with an illegal BAC" (European Transport Safety Council, 1999)[26]. Our analyses will thus focus on the question about driving *"after having drunk even a small amount of alcohol"* for which answers are more varied.

Table 1: "Over the last month, how often have you driven a car /motorcycle after having drunk even a small amount of alcohol?" percentage responding "never" and ANOVA.

	CD	MC	F	eta²
Poland	98	99	ns	-
Hungary	95	93	ns	-
Sweden	92	93	ns	-
Estonia	89	90	ns	-
Finland	**87**	**97**	**2.3***	**.02**
Czech Republic	86	86	ns	-
Ireland	81	84	ns	-
Germany	**67**	**81**	**11.7***	**.02**
Netherlands	**67**	**86**	**8.9***	**.02**
Slovenia	66	74	ns	-
Greece	62	56	ns	-
Belgium	61	68	4.6*	.01
Serbia	58	59	ns	-
Spain	57	56	ns	-
Austria	**56**	**88**	**38***	**.07**
Israel	56	61	ns	-
France	**55**	**70**	**10.1***	**.01**
Cyprus	**49**	**30**	**57.1***	**.05**
Italy	41	51	9.9*	.01

Note: Green shading is used for percentages above 75. Bold indicates p < .001[27] for difference between MC and CD. ***: p<.001, *: p<.05, ns: not significant.

On average, one in ten Europeans admits to driving having consumed alcohol at least once in the previous week. This rate has decreased since the previous survey (SARTRE 3: 20%) but the ranking of countries remains unchanged: the declared drink-drive behaviour is more frequent in southern countries (Italy, Cyprus, and Spain) than in eastern and northern countries (Poland, Sweden, Hungary, Czech Republic, Estonia and Finland).

Both car drivers (CD) and motorcyclists (MC) claim to rarely drink and drive, but drink drivers are consistently less frequent among motorcyclists with Cyprus a notable exception (Table 1).

At the regional scale, motorcyclists claim to drive under the influence of alcohol less often than car

26 - This result, often cited, comes from data collected (or estimated) in 1990 for France, Germany, Great Britain, and Spain and in 1992 for Netherlands (ETSC, 1995). At this time, legal BAC was 0.8g/l in Germany, Great Britain, and Spain, 0.7g/l in France and 0.5g/l in Netherlands, Nevertheless a more recent French study (SAM, 2005), confirms this number in France with 2.7% of drivers found to be above the 0.5g/l limit.
27 - Due to the large large sample size (n^{MC}= 4483, n^{CD}= 12507) we chose a more conservative level of significance when presenting these results.

drivers in five countries (p<.001): Austria, Finland, France, Germany and Netherlands. Among those countries some have high rates of mean reported drink driving (Austria and France) whereas some others have low rates (Finland Germany and Netherlands). Cyprus constitutes an exception: the effect is reversed in this country, with motorcyclists who report drinking and driving more often than car drivers do (p<.001).

Table 2 shows that self-reported as well as friends' drink driving frequencies are estimated to be higher among car drivers than among motorcyclists. Moreover, we found higher scores when the estimate is for friends than when it is for oneself. This could be a manifestation of the social desirability bias: it is easier to recognize deviant behaviour in others. Another explanation could be that the behaviour of an individual reflects the behaviour for his peer group, which may indicate that drink-driving is influenced by descriptive subjective norms (Deutsch & Gerard, 1955).

Table 2: Drink Drive Behaviours of Friends, mean scores.

	MC	CD	F	Eta^2
«Most of your friends would drink and drive a car»	1.65	1.82	134.8***	.008
«Over the last month, how often have you driven a car after having drunk even a small amount of alcohol?»	1.22	1.29	60.2***	.004

Note: ***: p<.001. Reminder: higher score indicate positive answer and scales ranges are standardized.

Regionally, we find the same trends but these are more common: there is now a significant difference (p<.001) between motorcyclists and drivers for 13 countries (Austria, Finland, France, Germany, Netherlands, Belgium, Estonia, Poland, Serbia, Spain and Sweden). Both Italy and Cyprus demonstrated the opposite result: respondents more likely to report their friends driving after drinking among motorcyclists than car drivers. Note that both those countries are characterized by their high levels of alcohol consumption in comparison to other European nations (World Health Organization, 2011).

Attitudes to drink-driving risks

According to the Theory of Planned Behaviour (Ajzen, 1991), behaviours are influenced by the practices of the social group, the personal attitudes towards the behaviour under discussion and the level of perceived control over the behaviour. We thus expect that risk perception influences on-road behaviours. Two attitudes related to perceived risks associated with driving under the influence of alcohol have been assessed in the SARTRE 4 survey: the perceived increase of risk due to the consumption of alcohol (physical risk), and the subjective probability of being prosecuted by the police (legal risk). The first measure is addressed by asking the respondent to evaluate both the compatibility between drinking and driving and the strength of the link between alcohol and road traffic accidents. The second measure is assessed through the interviewee's rating of the probability of being checked by the police when driving under the influence of alcohol and the probability of being checked by the police on a typical journey.

- Physical risk

Results suggest that, in general, Road Safety policies have been successful: most Europeans believe that alcohol is inconsistent with road use (either controlling a vehicle or as a pedestrian). The most concerned appear to be the motorcyclists, followed by the car drivers, then the cyclists and finally the pedestrians (Table 3). In particular, alcohol intake is considered to increase the likelihood of collision with a third party for all respondents, and again follow the same pattern with the highest level of concern for motorcyclists followed by car divers, then by cyclists and finally by pedestrians. This paired set of results invites us to hypothesize that alcohol interferes with the activity of driving especially at the tactical level (Michon, 1979), the one which concerns the positioning among others. The difference between motorcyclists and car drivers may be accounted for by both the *user's vulnerability* and the *vehicle handling difficulty* (a car is easier to drive, see for example Lin & Kraus, 2009). Finally, we observe that if an overwhelming majority of European motorcyclists and car drivers agree on the idea that alcohol plays a major part in road traffic accidents, the most vulnerable of those two (motorcyclists) underestimate it compared to car drivers. This means that motorcyclists downplay the impact of alcohol on road accidents compared to other factors.

Table 3: Physical road risk perception.

	MC	CD	Cyclists	Pedestrians	F	Eta2
«You can drink and drive (walk/ cycle) if you do it carefully»	1.32	1.40	1.88	2.28	1155***	.15
«Drinking and driving (walking, cycling) increase the risk of an accident with another road user»	3.64	3.62	3.37	3.15	342***	.05
«How often do you think that drinking and driving is the cause of being involved in a road accident?»	2.76	3.17	-	-	1073***	.06

Note: ***: p<.001. Tukey's test indicates that all differences between subgroups are significant except between MC and CD on the question "drinking and driving increase the risk of an accident" (3.64 vs 3.62 respectively). Reminder: higher score indicate positive answer and scales ranges are standardized.

- Legal risk

Drivers consider that the probability of being checked on their regular route is fairly low. Despite being seen as rare, police checks are still perceived as being very effective since car drivers as well as motorcyclists perceive a high probability of being caught if they drink before driving (Table 4). There are no significant differences between motorcyclists and car drivers on these questions.

National averages reveal a sub-group of countries where respondents are less concerned by legal risk. It mixes together countries characterized by very different drink-drive rates and by different road side tests rates, such as Italy and Sweden (in 2008, 23 vs. 287 roadside alcohol breath tests per 1000 inhabitants; European Transport Safety Council, 2008). Therefore, the relationship between perceived physical risk (crash) and perceived legal risk (punishment) seems not to be simply linear. It is possible that in a country with a high level of testing like Sweden, people underestimate the number of road-side controls because they are rarely actually driving under influence and may thus feel less concerned about road side tests. In contrast, Italians are driving under influence more frequently and may thus overestimate the probability of alcohol check even though actual control rates are very low.

Table 4: Legal road risk perception.

	MC	CD	F	Eta^2
«please tell me how much you agree: if you drink and drive you will be stopped and fined by the police»	3.17	3.15	ns	-
«On a typical journey, how likely is it that you will be checked for alcohol?»	1.71	1.69	ns	-

Note: ns: not significant. Reminder: higher score indicate positive answer and scales ranges are standardized.

The low perceived probability of roadside breath tests may also be linked to the fact that a majority (59%) of our sample have never been tested during the last three years. In contrast, 18% of respondents declared that they had been tested several times. This could be linked to the fact that controls are usually performed in "at-risk places" such as night clubs exits on Saturday nights (which is corroborated by the fact that younger drivers report more controls than older ones). We can thus imagine that people who never go to these "at-risk places" have fewer chances to be controlled than those who frequently attend such places. Moreover, there is an overall difference between car drivers and motorcyclists. If the overall difference is low, in some countries it can be much higher (in Estonia, Sweden, Finland, Belgium and Netherlands). We believe that this could be due to the fact that some motorcyclists, when they know that they are going to drink alcohol, become car drivers (Syner & Vegega, 2001).

Opinions about road safety policies

Road safety policies operate in three areas: Education, Engineering and Enforcement. The SARTRE questions focused on the final two: *attitude towards the alcohol interlocks*, *attitude towards strengthening existing sanctions* and *personal preferences regarding the legal limit of alcohol*.

Table 5: "How much would you be in favour of using an "alcolock" that prevented the car to start if the driver exceeds the legal alcohol limit for driving?", Percentages responding.

	very	fairly	not much	not at all
MC	44	29	16	11
CD	53	27	13	7
ORU	61	26	9	4
Mean	53	27	13	7

On average, Europeans are supportive of the alcohol interlock (80%). The most favourable are ORU, followed by car drivers and then motorcyclists. The difference between groups is significant ($F= 185.9$, $p <.001$) and increases when examined in detail: the motorcyclists are more likely to reject *openly* the system and conversely, the least likely to *fully* support it (Table 5). The ORU are the most supportive of alcohol interlocks, which is not surprising considering their greater vulnerability and their lower frequency of car use. Motorcyclists, on the other side, may have a culture of less regulation or "free driving".

If we now consider the other devices that were evaluated in the survey (Figure 1), we note that the differences between road users follow the same pattern (MC-CD-ORU). Black-box, speed limiting device and fatigue detection device have their maximum approval rating among ORU and their minimum one among motorcyclists. The biggest gaps concern the speed limiter, which seems congruent with the higher incidence of speeding behaviour by motorcyclists. Conversely, the groups' answers both increase when the question about the alcohol interlock acceptance focuses on repeat offenders (the proportions of CD to MC that are "fairly" or "very" in favour of using an alcohol interlock are 80% vs 73%, which rises to 84% vs 78% when it comes to recidivists).

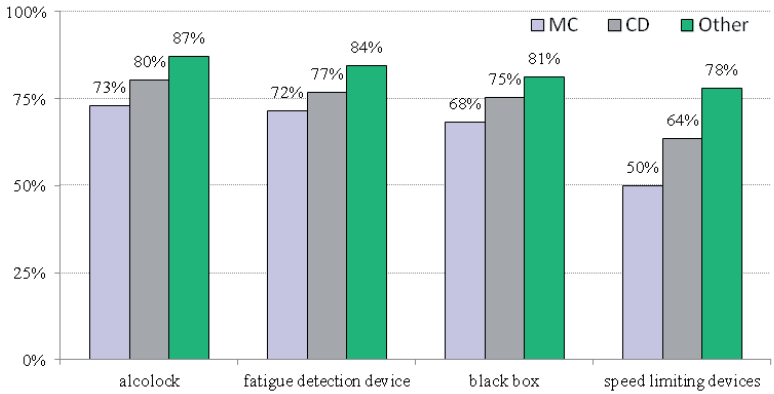

Figure 1. "How much would you be in favour of using?". Very + Fairly.

Personal estimates of a fair BAC limit produce similar results to SARTRE 3. Almost no respondents supported the most permissive option ("people should be allowed to drink as much alcohol as they want") and the average ratings on this issue are low (around 2 on a scale of 1 to 5): this indicates a majority for the more conservative positions (Table 6). Such data suggest that Europeans are unanimously in favour of a regulatory policy, and a majority support the lowering of the current BAC thresholds of permitted consumption with the two groups of drivers agreeing on this issue.

Table 6: "Do you think that car/ motorcycle drivers should be allowed to drink ...", Percentages.

	No alcohol at all	Less alcohol	As much alcohol	More alcohol	As much as they want
MC	51	10	30	8	0
CD	46	13	33	7	0
Mean	48	12	32	8	0

What are the drink-drive predictors?

One of the main issues regarding DUI of alcohol is to identify the factors leading people to this behaviour. Indeed, those factors should be the main targets of public policies aiming at the reduction of driving under the influence of alcohol.

The data collected allow us to compare car drivers and motorcyclists regarding this issue (Table 7). It appears that the three main predictors of driving under influence for both of them are:

1. Friends' drink-drive behaviour.
2. The level of legal BAC.
3. The accuracy of drivers' estimation of the maximum number of allowed units.

Table 7: Linear regression on drink-drive behaviour ("even a small amount").

	CD	MC
Accuracy of legal units estimation	.19***	.22***
Gender	-.11***	-.07**
Attitude to alcolock in cars	.07***	.00ns
Attitude to drink-driving penalty	.11***	.12***
Driven Km	.03**	.08***
Drink drive friends	-.26***	-.26***
Age	-.09***	-.08***
Driving experience	.08***	.03ns
Legal BAC	.21***	.19***
R^2	0.25	0.23

Note: Gender is coded as a dummy variable with 1: male and 2: female. Accuracy of legal units estimation is coded as: 1: underestimation, 2: correct estimation, 3: overestimation. ***: p<.001, **: p<.01, ns: not significant.

The influence of friends' behaviour on drivers' behaviour is the main effect. The social influence of peer groups is well known in road safety issues (Forward, 2009) and our results confirm it with the same impact of friends' behaviour for both car drivers and motorcyclists.

The effect on behaviour of the accuracy of estimation of maximum alcohol units allowed is interesting because this is linked to one of the main problem with alcohol legislation: the limit of BAC while driving is fixed to some acceptable level by authorities but drivers have no means to measure what is their actual level of BAC. This may lead some drivers to overestimate the number of glasses or bottles of a particular alcoholic beverage they are allowed to drink before taking the wheel (Assailly, 1995). Moreover, we should note that there are no apparent differences between car drivers and motorcyclists on this question.

The national level of BAC tolerance while driving also has a positive impact on driving under the influence of alcohol. This finding not only emphasizes the usefulness of legislating to regulate this kind of behaviour but also confirms that this behaviour is still, to some extent, voluntary. In countries with a higher level of tolerated BAC, people tend to make use of this "right" to drink small amounts of alcohol before driving.

The question of causality is often raised when dealing with such analyses. Here, it seems more logical to interpret the relation between drink-drive behaviour and attitude to drink-drive penalty as the first causing the second. That is to say: the more we drink and drive, the less we are in favour of penalty enforcement. This interpretation leads to one important conclusion: people are aware of their behaviour, they know what they are doing but they are not willing to change it.

Analyses on a country level reproduced the general pattern with only slight variations, e.g. Poland where these effects are very small. This appears to be due to few people admitting drinking and driving in Poland, so there is little variability to explain.

Finally, it is worth noting that neither the perceived enforcement (perceived probability of being checked) nor the actual enforcement (number of road side tests per inhabitants) had a strong impact on driving under the influence of a small amount of alcohol among motorcyclists as well as car drivers in the consortium countries taken as a whole. This makes sense in all countries allowing a non-zero BAC: indeed drinking a small amount of alcohol and driving in those countries does not constitute a traffic offence. Finally, being tested is relatively rare as is driving while impaired, which may make the perceived probability of being caught while driving under the influence of alcohol very low.

What is the effect of BAC levels?

The level of tolerated BAC while driving had an impact on drink-drive behaviour. However, the countries studied have three different BAC levels. Two countries have a BAC of zero (Czech Republic and Hungary), four countries allow a BAC of a single unit of alcohol (Estonia, Poland, Sweden and Serbia) and the other countries allow a BAC of 0.5[28].

We observe a gap between countries with the two units limit and the others (Fig.2), but there is no difference between countries with a one unit limit and countries with a zero unit limit ($F_{(2,\ 16922)}$= 492.61, $p<.001$, η^2= .06). Car drivers and motorcyclists adapt almost the same way to local legal limit ($F_{(1,\ 16923)}$= 60.21, $p<.001$, $\eta^2<.01$).

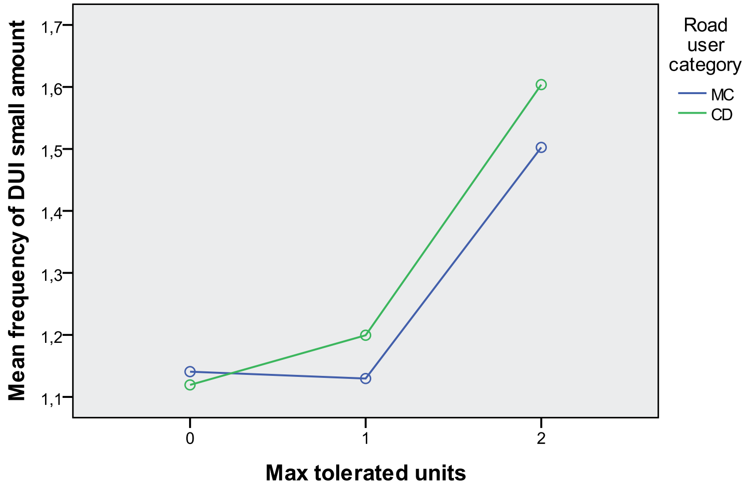

Figure 2: Effect of level of legal BAC on driving under influence of a small amount of alcohol.

Results.

Part 2. Drugs

Toxicological studies indicate that alcohol remains by far the most psychotropic substance present in road accidents (Ogden & Moskowitz, 2004). However, driving ability may also be affected by other pharmacodynamic effects such as blurred vision, heart disease, disorders of balance. Thus, barbiturates, benzodiazepines and antidepressants, to list the most used, are now considered to be somewhat dangerous while driving (Davey et al., 2005). Within SARTRE 4, the most salient points related to medication consumption and driving have been documented: data collection was made for the population of drivers (car or motorcycle), concerning their own consumption (three items) and their perceptions of road risks both physical (two items) and legal (one item).

28 - In SARTRE surveys, alcohol units corresponds to the most frequently observed drinks volumes for a regular glass of each type of alcohol in drinking establishments: 3cl of spirits, 10cl of wine and 25cl of beer. Each glass contains approximately 10g of pure alcohol and increases the BAC by approximately 0.2g/l. So, in countries with a 0.2g/l threshold, a single glass of alcohol (one unit) is tolerated before driving. Of course, these are approximations and there is a large variability among people, especially by gender and weight.

Medicine-affected driving

As with alcohol, Europeans' reported behaviours related to drug-driving reflect a cautious approach: answers show that there are very few who take drugs which may cause drowsiness while driving. Europeans tend to be even more cautious with respect to legal drugs than with alcohol, which can be understood as a result of the lower familiarity with this type of substance: loss of control is probably most feared in the case of a medication with unknown effects than in the case of alcohol intake, which is certainly much more familiar.

The overwhelming majority of interviewees declare *never* to drive after taking such medications. This result corresponds to what was expected. Indeed, driving while being under medical treatment is a very rare behaviour. However, there is a significant difference between the two types of users: car drivers are more likely than motorcyclists to drive while medicated[29]. Once again, we might understand this as a result of the perceived vehicle protection that the former lack, reducing the scope for error.

The scarcity of medicine-affected driving is the clearest result: the number of respondents fined for drug use at the wheel in the previous year is almost zero. The difference between motorcyclists and car drivers is not significant, which could be due to the small difference in consumption, but is more likely due to the near absence of tests for drugs.

Table 8: medicine-affected driving.

	MC	CD	F	Eta^2
«Have you driven while taking medication?»	1.16	1.26	139.0***	.008
«In the last year have you been fined, or punished in any other way, for the use of drugs/medication while driving?»	1.01	1.01	3.93	-

Note: ***: p<.001. Reminder: higher score indicate positive answer and scales ranges are standardized. For the second question, answers were recorded on a multiple choice categorical set with 3 options (1: "never", 2: "only once", 3: "more than once").

Awareness of medicine-affected driving risks

Drugs checks are virtually nonexistent in Europe. Despite this, European drivers seem to be highly concerned by physical risks associated with medicine consumption and driving, especially if they are motorcyclists: on average 84% of car drivers and 85% of motorcyclists said they give credit to warning notices on medication packages.

Table 9: Awareness about medicine-affected driving danger.

	MC	CD	F	Eta^2
«How dangerous is it to drive while taking medication that carries a warning «it may influence your driving ability?»	2.31	2.23	37.82***	.002
«In the last year, how many times have been checked for the use of drugs/ medication while driving?»	1.05	1.04	3.31	-

Note: ***: p<.001. Reminder: higher score indicate positive answer and scales ranges are standardized. For the second question, answers were recorded on a multiple choice categorical set with 3 options (1: "never", 2: "only once", 3: "more than once").

29 - This effect remains identical when age is added as a co-variable in the analysis.

Conclusion

Drink-driving in European countries is a rare behaviour. Indeed, if we consider the percentage of people found to be above the legal limit by police testing, it ranges from 1% to 6% for all SARTRE 4 countries except for Poland in which the percentage is 9.5% (European Transport Safety Council, 2008). However, we know that those roadside breath tests are not random and performed in selected at-risk places and times. According to a random testing study (Houving et al., 2006) from the DRUID project there is a great variability in alcohol use by drivers in Europe (from 0.15% in Hungary to 8.6% in Italy). SARTRE 4 survey allow an estimation of individual drink-driving frequency based on declared behaviour (71.2% declare *never* having driven after having drunk even a small amount of alcohol during last month and 17% "rarely") with again a great variability between countries (from 98.5% in Poland and 94.7% in Hungary to 43.7% in Italy). To support the validity of the self-reported data, we found that there is a high positive correlation ($r= .90$, $p<.001$) between DRUID results based on random breath tests and SARTRE 4 results based on declared behaviour.

Nevertheless, despite this behaviour being relatively uncommon, drink-driving is responsible for approximately 25% of European road deaths (SafetyNet, 2009).

In this chapter, we mainly explored whether car drivers and motorcyclists were thinking or claiming to behave differently regarding driving under the influence of alcohol. Our results show that in most countries motorcyclists drink and drive almost as often as do car drivers. Where there are differences (in Austria, Cyprus, Finland, France, Germany and Netherlands) usually it is the motorcyclists who declare less often to be drinking and driving, with the exception of Cyprus in which it is the opposite. We found no difference between car drivers and motorcyclists regarding their attitudes to drink-driving risk. However, car drivers, motorcyclists and other road users differ on their attitudes regarding road safety measures such as alcohol interlock, fatigue detection device, black box and speed limiting device. For each of those four proposed measures, even if people are mainly favourable to it, the most favourable are "other road users" and the least favourable are the motorcyclists. Taken as a whole, it seems that motorcyclists are keener on self regulation because they prefer less stringent laws but they are slightly more careful than car drivers (see also, Syner & Vegega, 2001).

The perceived probability of being checked is very low for both car drivers and motorcyclists. Unfortunately, this perception corresponds to reality: road side alcohol breath tests are actually rare in most countries. We saw that the number of roadside alcohol breath tests may have a positive impact on actual behaviour, at least in some countries. We therefore suggest that stakeholders increase the number of controls as well as the perceived likelihood of these controls by advertising these control campaigns.

The drink-drive best predictors are identical for car drivers and motorcyclists. Motorcyclists are influenced by their friends' behaviour just as are car drivers. Moreover, in both groups, those who overestimate the allowed amount of alcohol before driving are those who drink and drive the more frequently. Finally, both car drivers and motorcyclists drive under the influence of alcohol more often in countries with the highest legal BAC threshold. These results lead us to suggest undifferentiated measures for car drivers and motorcyclists for drink-driving enforcement. Nevertheless, our results suggest potential useful measures concerning peer group influence on drink-driving (communication campaigns), concerning accuracy of BAC estimation (communication campaigns and development/ spreading of alcohol metering devices) and concerning the legal BAC threshold.

A legal BAC of 0.2 g/l seems to be the best option regardless of the category of road user. Indeed, people living in countries with 0.2 g/l threshold do not drink and drive more often than those in countries with a 0 g/l threshold, but people in countries with a 0.5 g/l threshold do drink and drive more frequently than the other two levels. Nevertheless, the often raised question of a lower limit for motorcyclists (Colburn et al., 1993; Sun, Khan & Swan, 1998) could be considered again in the light of the SARTRE 4 results. Indeed, if motorcyclists tend to self regulate their behaviours, they still drink and drive more frequently in 0.5 g/l countries than in lower BAC countries. The consequences of drink driving are much more severe for motorcyclists than for car drivers because of the “effects on balance, motor coordination, and judgment and [the] more-basic skills [that] are needed to operate [their] inherently unstable vehicle” (Lin & Kraus, 2009). We thus recommend that in countries with a 0.5 g/l threshold, the legal BAC should be lowered to 0.2 g/l, if not for all users, at least for motorcyclists.

Driving under the influence of medicine is considered as an issue neither by Europeans car drivers nor by European motorcyclists. They acknowledge that it can be dangerous, but they mostly declare never to perform such behaviour themselves and they are aware of the absence of testing. It may be that some people actually drive regularly while under medication, but they are not aware that these medications decrease their abilities to drive. If authorities want to increase awareness about this issue, there is a clear need for more information and communication about this topic.

The main message of this chapter is that there is no evidence that it is necessary to treat car drivers and motorcyclists separately regarding the prevention of driving under the influence of legal substances.

Chapter 4.5

Car drivers and motorcyclists perceptions of speeding and speed enforcement

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Introduction

Speed is one of the basic risk factors in traffic (Aarts & van Schagen, 2006). Higher driving speeds lead to higher collision speeds and thus to severer injury. Higher driving speeds also provide less time to process information and to act on it, and the braking distance is longer. Thus the possibility of avoiding a collision is smaller. In short: high driving speeds lead to a higher crash rate, also with a severer outcome.

The aim of this chapter is to compare car drivers and motorcyclists´ perception of speeding and speed enforcement. The term 'car drivers' in this chapter refers to drivers who have a (full) driving licence and have driven a car in the last 12 months. The same apply to motorcyclists which includes all powered, two-wheeled vehicles with at least a 50 cm^3 cylinder capacity. The chapter will start with a brief description of earlier studies, comparing the behaviour and attitude of motorcyclists and car drivers in general, and then focus on our main variables of interest, namely perception of speeding and speed enforcement. In the following sections we describe the method used and the results. The chapter ends with a section discussing the results and main conclusions.

Earlier studies comparisons motorcyclists and car drivers

There have been a few studies that compared behaviour and attitude of motorcyclists and car drivers. In UK, Horswill and Helman (2003) compared speed behaviour and following distance behaviour of motorcyclists and a matched group of non-motorcycling car drivers, using a video-based simulator (study 1) as well as with road side monitoring on 30 or 40 mph roads (studies 2 and 3). This research indicated that motorcyclists travelled faster than a matched group of car drivers, whether measured in the laboratory or by the roadside. The simulator study also indicated that motorcyclists overtake more often and pull out into smaller gaps in traffic. A second question of interest in this research was whether motorcyclists represented a qualitatively different group of people from non-motorcycling car drivers or whether the differences in behaviour observed were a function of the mode of transport. The data supported that last explanation more clearly. In study 1 it was found that motorcyclists who completed the measures as if they were driving their usual car did not differ significantly from car drivers or behaved more safely. Also, motorcyclists and non-motorcycling car drivers did not differ on more general characteristics and attitudes such as sensation seeking, social motives, and attitudes to driving/riding. One important difference was however, that motorcyclists driving a car were faster at detecting hazards than car drivers who did not also ride a motorbike.

In UK, Broughton et al. (2009) compared self-reports on speeding in 30mp/h/50 km/h zones and open rural roads of older car drivers and older motorcyclists (> 35 years). Consistent with theoretical predictions compared to drivers, motorcyclists reported to be more compliant with speed limits in an urban environment and under certain conditions less compliant with speed limits on an open rural road. However, the self-report data were not consistent with actual UK speeding data, based on 26 urban sites. These data indicated that although the proportion of motorcyclists and car drivers who exceed the speed limit in 30 mph zones are about the same, motorcyclists are much more likely to speed excessively. On the other hand, UK data (Broughton et al., 2009) also indicate that motorcyclists are more likely to be riding well below the speed limit compared to car drivers. As the authors point out, it is likely that in the self-report data the subgroup of older, safety-motivated motorcyclists is overrepresented.

In Victoria, Australia, speed measurements at 100 km/h roads indicated that motorcyclists in regional Victoria travelled at higher speeds than other traffic. Whether all speeds were included or only free travelling speeds, motorcycles had a higher mean, median, and 85th percentile speed, were more likely to be travelling in excess of the speed limit, and more likely to be travelling more than 10 km/h above the speed limit (Baldock et al., 2010).

Beside traditional comparisons of behaviour and attitude, recent research has investigated more complex cognitive processes of motorcyclists and car drivers (Walker et al., 2011). A promising new line of research in road safety field is the investigation of mental representation of roads users. Incompatibilities between different groups of road users are one of five key road safety problems that are persistent over time and not easily solved (Elvik, 2010). Insight into differing mental representations of traffic situations can be used to better understand these incompatibilities and in a more practical sense to improve physical roadside measures or improve training procedures. Recently Walker et al. (2011) found evidence that motorcyclists and car drivers have diverging mental representations of particular traffic situations, especially country roads and junctions. For example analysis of mental representations of junctions indicated that car drivers are more oriented towards ‘road position’ and ‘lane manoeuvring’ and towards events ‘coming’ or in ‘front’, whereas motorcyclists are more oriented towards ‘traffic in general’ (as opposed to specific vehicles) and in giving ‘signals’ to other road users.

Earlier SARTRE analysis speeding-related determinants

Driving occurs in a social environment wherein drivers learn what is normal and acceptable behaviour by observing other road users (Zaidel, 1992). The importance of social comparison with other road users to determine own referred speed has been documented (e.g. research mentioned in Berry et al., 2011). In an earlier SARTRE-3 analysis, social comparison was explored, as measured by perception of speeding by other car drivers. In this analysis it was found that the perception of the speed of other drivers, driver age, annual mileage, and experiences with speed control, were related to speeding behaviour on at least one road type Yannis et al., 2004). The main findings concerning speeding behaviour were as follows:

- Younger drivers (< 39 y) exceed speed limit more often on main roads, rural roads and roads in built-up areas.

- Male drivers exceed speed limits more often than female drivers on motorways.

- Drivers with an annual mileage of more than 15000 km exceed speed limits on motorways and main roads more often.

- Drivers with vehicle engine capacity of more than 1300 cc exceed speed limits more often on motorways, main roads and country roads.

- Drivers who believe that other drivers break the speed limits are more likely to themselves reporting exceeding the speed limits on motorways and main roads. Drivers who think that other drivers exceed the speed limits and who drive cars with high engine capacity are more likely to report exceeding the speed limit on country roads. Within built-up areas drivers who exceed the speed limits and who warn other drivers for speed traps, are more likely to speed if they themselves perceive that other drivers break the speed limits.

- Drivers who have been fined for exceeding the speed limit are more likely to exceed the speed limit again on country roads and on roads in built-up areas.

Current research interest and predictions

The focus in this chapter is on two outcome variables that, though not identical to speeding, are closely related to it, perception of speeding by others and experience of speed enforcement. The first outcome variable is closely related to the process of social comparison; the second outcome variable is more directly related to actual speeding behaviour itself.

The following main questions are addressed in this chapter:

1. How do car drivers and motorcyclists compare on perception of speeding of their same vehicle group?
2. How do perceptions of speeding by car drivers and motorcyclists depend on age, gender, annual mileage and engine size?
3. How do car drivers and motorcyclists compare on experiences of speed control and punishment for speeding?
4. How do experiences with speed control and speed punishment depend on age, gender, annual mileage and engine size?
5. Are the national differences in perception of speeding and experiences with speed control and speed punishment similar for car drivers and motorcyclists?

Based on literature findings, we formulate the following expectations:

1. For road types outside built-up areas motorcyclists would more often report speeding by motorcyclists than car drivers would report speeding by car drivers.
2. Car drivers and motorcyclists with large engine size are more likely to speed and to have experience with speed punishment than drivers or motorcyclists with low engine size.
3. The countries with known high levels of speed (camera) enforcement, supposedly being Austria, the Netherlands, Germany, France, Sweden, Belgium, are more likely to have been checked for speeding and received punishments for breaking this rule than other EU countries.

Method

The key questions selected for further analysis in this chapter were the following:

- Questions CD02a-d, MC03a-d: In general, how often do you think other car drivers (motorcyclists) break speed limits on the following roads? (motorways, rural sections on main nation roads outside built-up areas, other roads outside built-up areas, built-up areas) (answer scale from 1= ‘never’ to 6= ‘always’).

- Questions CD05, MC04: On a typical journey, how likely is it that you will be checked for speeding (on your motorcycle)? (Answer scale from 1= ‘never’ to 6= ‘always’).

- Questions CD 06, MC 05. In the past 3 years, have you been fined, or punished in any other way, for breaking the speed limit driving a car (a motorcycle)? (‘No’, ‘Yes only fined’, ‘Yes fined and/or other penalty’).

For the questions on speeding by others and experiences with speed control the three answer categories 'often', 'very often' and 'always' were taken together to constitute an AVO-group of respondents (AVO= '**a**lways', '**v**ery often', '**o**ften'). In the analysis the rates of the AVO-group were compared with the groups of other respondents ('never', 'rarely' and 'sometimes'); moreover, relationships within the AVO-group were examined as well.

The following significance tests were used to test for differences between groups:

- χ^2-test for differences in cross tables,

- ANOVA for differences in means between groups,

- Correlation analysis.

Results

The results are presented in three sections: Perceptions of speeding, frequency of speed control, and experience with speed sanctions.

In the captions of tables and figures in this chapter we briefly refer to car drivers and motorcyclist as 'drivers', and 'motorcyclist'. In most tables only the distribution of AVO-group responses will be presented.

Observance of the speed limits by road categories

The relationship between own speed and perception of the speed of others may work in two directions.

The respondents' speed selection may be affected by how they judge the speed of other road users. It may also work the other way: drivers who themselves speed, perceive other drivers to be more rule-obedient, because other drivers are seen as slow compared to themselves. Table 1 presents the respondents speeding perception of other drivers/motorcyclists (CD/MC).

Table 1: How often the respondents believe that other car drivers/motorcyclists break speed limits on different road types?

	%	Never	Rarely	Sometimes	Often	Very often	Always	Total
On motor-way	CD	1.1	3.5	12.6	30.9	34.1	17.7	100
	MC	1.8	5.6	19.4	30.3	25.3	17.6	100
On main road between towns	CD	1.0	3.3	16.1	37.5	30.5	11.5	100
	MC	1.3	5.4	21.8	33.9	25.3	12.4	100
On country roads	CD	1.4	5.6	21.2	34.7	26.7	10.3	100
	MC	1.7	7.3	23.4	31.9	4.4	11.3	100
In built-up areas	CD	1.9	10.2	28.3	30.9	19.4	9.2	100
	MC	3.5	16.3	29.4	25.9	15.6	9.3	100

Both car drivers and motorcyclists agree that the other drivers/motorcyclists most frequently exceed the speed limit on motorways. Slightly less, but still very frequent speeding by others is reported for main roads outside built-up areas, respectively other roads outside built-up areas. The occurrence of speeding is thought to be most rare on roads inside built-up areas.

Table 2.a summarises the percentage of the responders who think that other drivers/motorcyclists would speed by road types (belong to AVO-group or furnished other answers). Table 2.b presents the

respondents who within AVO-groups often or very often or always think that other drivers/motorcyclists would speed by road types.

Table 2a: How often other drivers/motorcyclists break speed limits on different road types (belong to AVO-group and dropouts)?

	CD		MC	
%	AVO-group	group of other answers	AVO-group	group of other answers
On motorway	82.7	17.3	73.2	26.8
On main road between towns	79.5	20.5	71.6	28.4
On country roads	71.7	28.3	67.6	32.4
In built-up areas	59.5	40.5	50.8	49.2

Table 2b: How often other drivers/motorcyclists break speed limits on different road types (respondents within AVO-groups)?

	CD			MC		
Within AVO group %	Often	Very often	Always	Often	Very often	Always
On motorway	37.4	41.2	21.4	41.4	34.6	24.0
On main road between towns	47.2	38.4	14.5	47.3	35.3	17.3
On country roads	48.4	37.2	14.4	47.2	36.1	16.7
In built-up areas	51.9	32.6	15.5	51.0	30.7	18.3

For each road type, the percentage of respondents who had indicated that they believed that other drivers/motorcyclists often, very often or always (i.e. the AVO-group) speed, is higher for car drivers than for motorcyclists. Accordingly, the motorcyclists consider the other motorcyclists more rule-obedient.

In summary, the percentage of drivers and motorcyclists who consider that the others do not respect the speed limits is very high. Even inside built-up areas 59 and 51 per cent of the car drivers and of the motorcyclists, at least often believe that others would not respect the speed limit.

Further analyses were carried out investigating the effect of age, gender and driving experience. We will be made analyses based on answer rates of AVO-group and on AVO-group subcategories, but tables present only rates of AVO-group. The results showed that for motorways and country roads there are significant differences among the age groups; the AVO-group's percentage is slightly higher in the groups of 18-24 and 25-34, as well as of 35-44 as compared to older age groups. This statement is not true for the group of motorcyclists over 64, i.e. in the group of motorcyclists older than 65 the percentage of those considering that the others exceed the speed limit more often is typical, whilst this rate is significantly lower in the age group of 45-65, see Table 3.

Within the AVO-group's answers (i.e. often, very often and always) it is also true that the younger the driver/motorcyclist is the more often they are to believe that others exceed the speed limit (the average value of correlation is: -0,1, $p<0,01$).

Table 3: How often other car drivers/motorcyclists break speed limits on different road types by age?

	AVO %	Age category						Mean
		18-24	25-34	35-44	45-54	55-64	64+	
On motorway	CD	84.1	84.4	83.6	81.2	81.8	79.2	82.7
	MC	73.6	75.9	74.2	71.2	66.3	72.3	73.2
On main road between towns	CD	81.1	80.7	80.0	78.8	78.3	76.3	79.5
	MC	74.0	72.4	73.2	68.2	67.2	74.2	71.6
On country roads	CD	75.0	73.8	73.5	69.1	69.6	66.8	71.7
	MC	68.9	68.5	70.2	64.3	62.3	70.2	67.6
In built-up areas	CD	59.6	60.6	60.9	59.0	58.8	56.3	59.5
	MC	52.3	53.0	51.9	46.4	48.5	51.8	50.8
100%=	CD	1608	2764	2699	2453	1765	1188	12477
	MC	651	1202	1108	875	478	168	4482

Table 4 shows the percentage of male or female respondents who think that other drivers/ motorcyclists would often, very often, or always speed on the different types of roads.

Table 4: How often other car drivers/motorcyclists break speed limits on different road types by gender?

	AVO %	Gender		
		Male	Female	Mean
On motorway	CD	81.6	84.1	82.7
	MC	73.0	73.5	73.2
On main road between towns	CD	78.6	80.5	79.5
	MC	71.5	71.7	71.6
On country roads	CD	70.6	73.1	71.7
	MC	67.4	69.2	67.6
In built-up areas	CD	59.5	59.6	59.5
	MC	51.5	46.8	50.8
100%=	CD	6861	5615	12476
	MC	3885	598	4483

The results presented in Table 4 indicate that among car drivers females are more likely to believe than males that other drivers exceed the speed limit. Among motorcyclists, there is no difference between male and female motorcyclists in terms of their perception of others.

With regard to car drivers' the perception of male and female drivers was very similar when considering built-up areas. However a significant (but slight) relationship is present, since females are much more inclined to believe that others exceed the limit on motorways, main roads and country roads (χ^2= 13.386; df= 1; p= 0.00; eta^2= 0.0011; χ^2= 6.821; df= 1; p= 0.009; eta^2= 0.00005; χ^2= 9.331; df= 1; p= 0.002; eta^2= 0.0007).

In case of built-up areas male motorcyclists believe to a greater extent than females that others would speed (χ^2= 4.413, df= 1, p= 0.036, eta^2= 0.0011).

Within AVO-group's answers of car drivers, apart from road categories there is no significant difference between the answers by genders, but for motorcyclists for two road categories (the main road outside built-up areas and the country roads) for females it is significantly higher the rate of those considering that others exceed the speed limits less often (two-ways ANOVA – gender's effect main roads: F= 9.320;p= .002;eta^2= .001 country roads: F= 10.189;p= .001;eta^2= .001).

Since the annual mileage of the car drivers and motorcyclists varies a great deal amongst the respondents, an additional group has been developed for this group: this is the group of drivers with an annual mileage over 20.000 km, which includes 20% of the car drivers. 7% of the car drivers and 18% of motorcyclists do not reach an annual mileage of 1 000 kilometres. 19% of the car drivers and 40 % of the motorcyclists drive 1001-5000 kilometres/year (Tables 6).

Table 5: How often other car drivers break speed limits on different road types by annual mileage?

AVO %	Number of kilometres driven in the last 12 months					Mean
	<1000	1001-5000	5001-10000	10001-20000	20000+	
On motorway	83.0	83.5	82.1	82.6	83.1	82.7
On main road between towns	81.5	79.9	79.0	78.5	80.4	79.5
On country roads	72.4	71.4	70.5	71.5	73.3	71.7
In built-up areas	60.8	58.4	58.1	59.2	62.5	59.5
100%=	873	2315	3135	3667	2517	12507

Annual mileage in general does not make a noticeable difference in how respondents judge other drivers' frequency of speeding (see Table 5). The exception to this general result is the finding that drivers with 5 – 10000 vehicle-kilometre records believe significantly less that others exceed the speed limit on roads in built-up areas ($\chi^2_{(4)}$= 13.655, p= 0.008), whereas drivers of 20000+ are more likely to believe that others speed in built-up areas.

Table 6: How often other motorcyclists break speed limits on different road types by annual mileage?

AVO %	Number of kilometres driven in the last 12 months				Mean
	<1000	1001-5000	5001-10000	10000+	
On motorway	78.2	73.0	70.3	72.8	73.2
On main road between towns	76.6	71.0	68.7	71.5	71.6
On country roads	74.9	66.6	65.9	64.7	67.6
In built-up areas	57.0	49.7	49.8	48.4	50.8
100%=	800	1796	1131	756	4483

Motorcyclists who drive less than 1000 annual kilometres are more likely to believe (significantly higher) that other motorcyclists speed (χ^2-tests: p= 0.000 to 0.002) than motorcyclists with larger annual mileage (see Table 6).

On the basis of the correlation analysis there is no significant relationship within the AVO-group's answers between the annual mileage of car drivers and the frequency of others' speeding. Whilst this relationship is significant (p<0.01), though slight (r= +0.08), in the case of motorcyclists. Tables 7 and 8 present the results from the AVO-group by engine size for car drivers, respectively motorcyclists.

Table 7: How often other car drivers break speed limits on different road types by engine size?

AVO%	Engine size (cc)				Mean
	<1000	1000-1299	1300-1999	1999+	
On motorway	81.3	81.9	83.1	82.9	82.7
On main road between towns	79.0	77.9	80.7	78.8	79.5
On country roads	72.6	70.6	72.0	72.0	71.7
In built-up areas	59.6	58.2	60.6	59.1	59.5
100%=	527	2863	6781	1793	11964

Table 7 shows that the percentage is slightly higher in the group of car drivers driving a vehicle with a 1300-1999 cc engine size, except for country roads.

Table 8: How often other motorcyclists break speed limits on different road types by engine size?

AVO%	Engine size (cc)					Mean
	<125	126-250	251-600	601-1000	1000+	
On motorway	73.9	72.4	79.2	72.7	65.3	73.2
On main road between towns	75.1	73.0	75.3	69.7	64.5	71.6
On country roads	69.9	66.9	70.5	67.7	61.2	67.6
In built-up areas	53.3	55.7	51.7	50.3	43.3	50.8
100%=	908	575	958	1348	694	4483

Motorcyclists driving a bike with 251-600 cm3 engine size are more likely to believe that others would speed on motorways. Among the motorcyclists with engine size over 1000 cm3, the same value is the lowest (see Table 8).

For motorcyclists, the correlation between others' speeding and the engine size is independent of the road type significant ($p= 0.01$; $r_{average}= -0.06$). This statement is true also within regard to the AVO-group: the greater the engine size, the lower is the rate of those who believe that other motorcyclists break speed limits.

Analysis by countries

The breakdown of the views concerning the perception of other drivers/motorcyclists has been examined for all road types in different countries. These were classified according to the result of a cross-table analysis highlighting the highest and the lowest values.

Respondents who believe that other drivers/motorcyclists exceed the speed limit (AVO-group) on road types by countries are shown in Table 9.

Table 9: Countries with three most frequent perceptions among drivers and motorcyclists (AVO-groups) of speeding by other drivers/motorcyclists.

	On motorway	On main road between towns	On country roads	In built-up areas
car drivers	Cyprus	Greece	Greece	Estonia
	Sweden	Cyprus	Poland	Poland
	Greece	Poland	Sweden	Greece
motorcyclists	Cyprus	Greece	Greece	Estonia
	Poland	Poland	Poland	Poland
	Greece	Cyprus	Germany	Greece

The countries have been ranked on the basis of the AVO-group's road category ratios and those countries are included in Table 9 which have been mentioned in the first three places within that ranking, while the countries figuring in the last three places can be found in Table 10.

Table 10: Countries with three least frequent perceptions among drivers and motorcyclists (AVO-groups) of speeding by others drivers/motorcyclists.

	On motorway	On main road between towns	On country roads	In built-up areas
car drivers	France	Austria	Italy	Czech Republic
	Ireland	France	Finland	Austria
	Austria	Ireland	Czech Republic	France
motorcyclists	Italy	Ireland	Ireland	Sweden
	Ireland	Finland	Italy	Finland
	Finland	Belgium	Finland	Ireland

On the basis of all responses given to the question on speeding, it can be said that considering all road categories the order of the respondent countries is the following: Greece, Poland and Cyprus; in contrast the responses submitted by Ireland, Finland, Austria, France and Italy indicate that the respondents are less likely to believe that others would exceed the speed limit.

In order to better understand the responses from the different countries only their perception of inside built-up areas were analysed further. The results are presented in Figure 1 and include only those who at least often believe that other drivers/motorcyclists break speed limits (AVO-group). In addition to this, the Figure also includes the speed limit in built-up areas in each country. Selection of the roads inside built-up areas is explained by the fact that the low and high engine size motorcycles are equally running inside built-up areas and on country roads. Consequently, these road categories are most characteristically used by the motorcyclists.

For car drivers and motorcyclists, a significant relationship between the countries and speeding in built-up areas has been found (CD: $\chi^2_{(18)}$= 681.476, p= 0.000, eta²= 0.055; MC: $\chi^2_{(18)}$= 397.026, p= 0.000, eta²= 0.089).

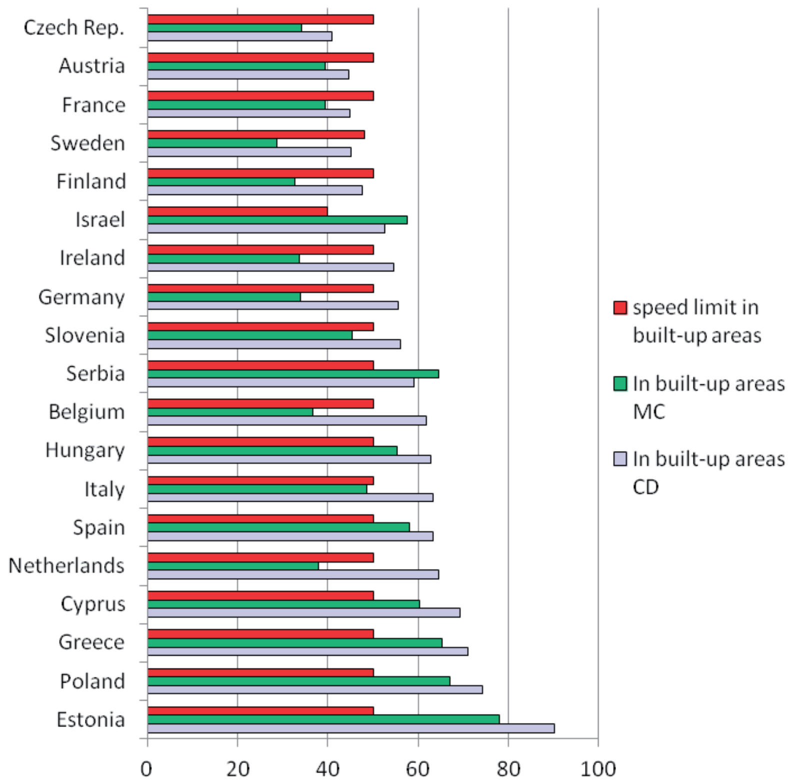

Figure 1: How often other car drivers and motorcyclists break the speed limit in built-up areas by countries (AVO-group)?

With the exception of Serbia and Israel, the general tendency is that car drivers more often believe than motorcyclists believe that other drivers exceed the speed limit. In most countries there is no remarkable difference between the proportion of the motorcyclists' and the vehicle drivers' responses, except in Sweden, Finland, Ireland and the Benelux countries. In these countries the percentage of responses of motorcyclists is substantially lower than car drivers' responses.

The AVO-groups' rate of responses given to speeding inside built-up areas for both driver-categories is the highest in Estonia, Poland and Greece. On the other hand, in the two driver-categories no similar agreement as above occurs for countries in the case of respondents indicating speeding in the lowest rate. In the Czech Republic, Austria and France car drivers are less likely to believe that others would exceed the speed limit. The rate of responses of motorcyclists is the lowest in the Scandinavian countries and in Ireland. These statements are confirmed by the results of the cross-table analysis and the ANOVA analyses, according to which the difference is significant (the absolute values of the Adjusted Residual are higher than 5.0; ANOVA: F= 155,74;p= 0,000).

Correlation of the views on speed limits and speeding

Using the answers given in all road categories the speed limits valid for a given country were compared by a correlation analysis on a macro level. For each road category the average judgement of a given country's respondents and the actual speed limits were also indicated in the analysis.

As a result it can be stated that on the basis of the correlation between the views concerning the speed limit and speeding no significant difference between the different countries has been found. This statement is true for the interviewed car drivers and motorcyclists alike. However, in general for roads outside built-up areas the higher the permissible speed limit, the less likely are the respondents to state that others exceed the speed limit. Only in case of the road category inside the built-up area this correlation is not present, which may be a consequence of the fact that inside built-up areas the maximum permissible speed is the same in almost every country involved in this survey.

The above stated correlation ($r= -0.451$, $p= 0.05$) is significant between the opinion of the interviewed and the permitted speed limit on the main road outside built-up areas.

Frequency of speed control

Table 11 presents the relative frequency distribution of the answers given to the question 'On a typical journey, how likely is it that you will be checked for speeding?'

Table 11: How often car drivers/motorcyclists will be checked for speeding?

%	Never	Rarely	Sometimes	Often	Very often	Always	Total
CD	13.5	41.0	30.0	11.4	3.1	1.1	100
MC	13.0	35.1	32.9	13.1	4.5	1.5	100

The proportions of car drivers and motorcyclists who do not believe that they will be checked for speeding are about the same (13%). For both groups of road users the 'rarely' reply was mostly marked; however, the percentage giving this answer is higher within car drivers. The next frequent answer is 'sometimes', followed by 'often', 'very often' and 'always'. The percentage of those choosing 'sometimes', 'very often', 'often' and 'always' answers is higher amongst motorcyclist than amongst car drivers.

Combining answer categories into AVO-category (always, very often and often), this group includes 15% of the car drivers and 19% of the motorcycle motorcyclists. Consequently, the percentage of the motorcyclists, who think at least 'often' that they will checked for speeding is significantly higher ($\chi^2_{(5)}$= 67.044, p<0.00) than the same group of car drivers.

Tables 12-14 present the results from the AVO-group by age groups, gender, annual mileage and engine size. In the tables the significantly differs values are highlighted.

Table 12: How often car drivers/motorcyclists will be checked for speeding by age groups and gender?

AVO %	Age category						Gender		Mean
	18-24	25-34	35-44	45-54	55-64	65+	Male	Female	
CD	16.8	16.8	16.7	15.1	15.3	10.1	17.2	13.6	15.6
MC	18.9	20.9	19.8	19.7	15.0	7.8	19.5	15.1	19.1

When examining the age categories we observe that the AVO-group's percentage for car drivers and motorcyclists decreases over 45 and 55 years, respectively (see Table 12). The frequency of expected speed control is significantly higher in the age group of 25-34 years old, whilst it is significantly lower for the 65+ group (CD: $\chi^2_{(5)}$= 35.33, p<0.,00; MC: $\chi^2_{(5)}$= 22.114, p<0.00). There is a slight, but significant, correlation between age and the frequency of expected speed control (CD: r= -0.09, p<0.01; MC: r= -0.07, p<0.01). Both amongst car drivers and motorcyclists, males more than females think that police always, very often, or often, control speed.

Table 13: How often car drivers/motorcyclists will be checked for speeding by annual mileage?

	Number of kilometres driven the last 12 months					
AVO %	<1000	1001-5000	5001-10000	10001-20000	20000+	Mean
CD	13.4	12.2	14.5	16.1	20.2	15,6
MC	13.5	18.1	20.3	25.3		19.1

There is a significant relationship between the estimation of the frequency of speed control and the annual driving mileage (CD: r= 0.08, p<0.01; MC: r= 0.05, p<0.01), see Table 13. As the number of kilometres driven increases, the AVO-group's percentage increases as well. The expected frequency of speed control is more significantly lower than the average for motor vehicle drivers with < 10 000 km, and for motorcyclists with only < 1000 km annual mileage. The expected frequency of speed control is more significantly higher for car drivers with 20 000+ km, and for motorcyclists with 10 000+ km annual mileage.

Table 14: How often car drivers/motorcyclists will be checked for speeding by engine size?

Car engine size (cc)			AVO %	
<1000	**1000-1299**	**1300-1999**	**2000+**	**Mean**
13.2	14.3	16.1	18.2	15.6

MC engine size (cc)				AVO %	
<125	125-250	251-600	601-1000	1000+	Mean
18.0	14.7	19.8	20.2	20.3	19.1

If the car driver's answers are examined in relation to the engine size of the vehicle driven, one can see that for car drivers a significant higher AVO-group's percentage goes together with larger engine size. For motorcyclists, except the users of motorcycle with 125-250 cc engine size, it may be stated, that the frequency of expected speed control does not differs more significantly from the average (approximately 20%), in the case of the above mentioned engine size category it is lower by 5% ($\chi^2_{(5)}$= 9.73, p<0.045).

Analysis by countries

Figure 2 presents data on experiences with speed control check per country for car drivers and motorcyclists. In case of car drivers and of motorcyclists concerning the expected frequency of the speed control significantly differ by countries. This statement is confirmed by the cross-table analysis (CD: $\chi^2_{(18)}$= 522.837, p<0.000, eta^2= 0.044, MC: $\chi^2_{(18)}$= 198,288, p<0.000, eta^2= 0.042).

It is interesting that in France, where a large number of speed cameras have been installed at the end of 2002, the AVO-group is only 14 per cent of the car drivers. The question in France was understood as "non automatic' controls. The result is the same for Belgium, they have also a large number of automatic speed cameras installed (1815 in 2010) compared to France (2264 in 2011).[30]

According to car drivers the frequency of the expected speed control in Ireland, Sweden, Germany, Finland and Italy is significantly lower than the average, whereas the same value is judged to be significantly higher than the average in Austria, Slovenia and Spain.

30 - The contextual data of each country comprising the specific number of the annual speed controls were examined. The results were found incomplete and different by size. Consequently the comparison in this respect was ineffectual.

In Poland, Ireland, Italy, Germany and Finland, the motorcyclists deem the expected frequency of speed controls to be significantly lower than the average, whilst the expected rate of speed checks is significantly higher than the average in Spain, Slovenia, Greece, and Austria.

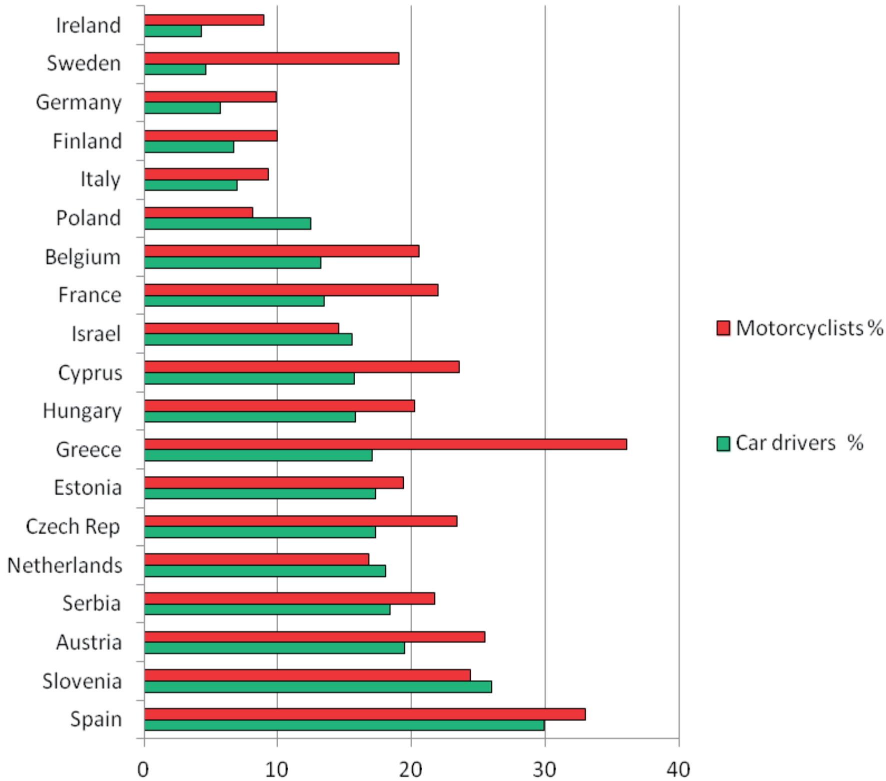

Figure 2: How often car drivers and motorcyclists will be checked for speeding by countries (AVO-group)?

In most countries, the AVO-group's percentage is higher amongst motorcyclists than among car drivers with the exception of Israel, the Netherlands, Poland, and Slovenia where an opposite pattern is found. In Greece, Cyprus, France, Belgium, and the Czech Republic, the percentage of motorcyclists, who at least 'often' think that they will be checked for speeding is essentially higher than the same groups of car drivers. In contrast, Polish car drivers believe that the expected frequency of the speed control is significantly higher than motorcyclists in the same country.

Punishment for speeding

Motorcyclists' estimation of the frequency of speed controls is higher (Table 11), than the percentage of motorcyclists punished for speeding (Table 15). One of the reasons may be that the motorcyclists' annual mileage is lower compared to car drivers' mileage, consequently the probability of being caught is less. This is confirmed by the figures in tables 17, which show how the percentages of drivers or motorcyclists who are punished for speeding increase with the annual mileage.

Table 15: Car drivers and motorcyclists' experience of punishment for breaking the speed limit in the past 3 years by age groups.

		Age category						Mean
	%	18-24	25-34	35-44	45-54	55-64	65+	
No punishment	CD	78.3	72.8	76.3	75.3	79.1	82.6	76.6
	MC	81.1	75.8	80.3	84.2	85.9	86.3	80.8
fined and/or other penalty	CD	21.7	27.2	23.7	24.7	20.9	17.4	23.4
	MC	19.0	24.2	19.8	15.8	14.1	13.7	19.2

If the age categories are examined, one can state that for car drivers and motorcyclists, the percentage of those punished in the last three years is highest in the age group of 25-34 years and lowest among those over 65 (see Table 15). In the case of motorcyclists those over 45 and in that of car drivers the ones over 55 the rate of the punished for speeding is significantly below the average value (CD: $\chi^2_{(5)}$= 57.170, p<0.000, MC: $\chi^2_{(5)}$= 37.21, p<0.000).

Table 16: Car drivers and motorcyclists' experience of punishment for breaking the speed limit in the past 3 years by gender.

		Gender		Mean
	%	Male	Female	
No punishment	CD	71.6	82.6	76.6
	MC	79.5	89.1	80.8
fined and/or other penalty	CD	28.3	17.3	23.4
	MC	20.5	10.8	19.2

Among male car drivers the rate of those already punished for speeding is significantly higher by 10 per cent-points than among females (see Table 16). This statement applies equally for car drivers and motorcyclists (CD: $\chi^2_{(2)}$= 208.022, p<0.000, eta²= 0.017; MC: $\chi^2_{(2)}$= 30.847, p<0.000, eta²= 0.007).

Table 17: Car drivers and motorcyclists experience of punishment for breaking the speed limit in the past 3 years by annual mileage.

	Number of kilometres driven in the last 12 months										Mean	
	<1000		1001-5000		5001-10000		10001-20000		20000+			
	CD	MC	CD	MC	CD	MC	CD	MC	CD	MC	CD	MC
No punishment	91.8	89	84.5	82.1	80.5	78.5	71.6	72.2*	66.1	-	76.6	80.8
fined and/or other penalty	8.2	11.08	15.5	17.9	19.5	21.5	28.4	29.7*	34.0	-	23.4	19.7

* 10000+

Car drivers who reported to drive more than 20 000 kilometres in the last 12 months are most likely to have been punished for speeding during the last 3 years (see Table 17). The percentage of speed punishment receivers among motorcyclists is the highest for riders with a record over 10 000 km annual mileage. This percentage, however, – in accordance with their lower annual mileage – is lower (28%) in comparison with the car drivers' group. Motorcyclists with more than 5 000 km annual mileage and the car drivers with a yearly record of over 10 000 km were more frequently punished for speeding than the average (CD: $\chi^2_{(4)}$= 424.784, p<0.000, eta²= 0.034; MC: $\chi^2_{(4)}$= 75.974, p<0.000, eta²= 0.017).

Table 18: Car drivers and motorcyclists' experience of punishment for breaking the speed limit in the past 3 years by engine size.

	Car engine size (cc)				Mean
	<1000	1000-1299	1300-1999	2000+	
no punishment	82.9	82.2	76.1	67.5	76.6
fined and/or other penalty	17.1	17.7	23.9	32.5	23.4

	MC engine size (cc)					Mean
	0<125	126-250	251-600	601-1000	1000+	
no punishment	88.0	83.9	79.0	78.1	76.3	80.8
fined and/or other penalty	11.1	16.0	20.9	21.9	23.6	19.2

The data shown in Table 18 indicate a relationship between the engine size of the vehicle driven and the punishment for excessive speeding. Both for car drivers and for the motorcyclists it is found that the percentage of drivers/motorcyclists who were punished for speeding is higher amongst drivers/motorcyclists of large engine size motor vehicles. Drivers of cars with 1300+ cc engine size and the motorcyclists with 250+ cc engine size are punished more frequently for speeding than others (CD: $\chi^2_{(3)}$= 146.392, p<0.000, eta²= 0.012; MC: $\chi^2_{(3)}$= 50.98, p<0.000, eta²= 0.011). In both vehicle categories the drivers of vehicles equipped with engines with lower engine size were punished for speeding to a significantly lower rate.

In the case of motorcyclists it is likely that the motorcycles with lower engine size are used inside built-up areas rather, and therefore have less opportunity to exceed the speed limit. The same does not hold for cars with smaller engine size.

Analysis by countries

We used here the answers to punishments' experience of respondents from survey data and the penalty statistics origin from the contextual data file.

For car drivers the percentage punished for speeding is significantly higher in the Netherlands, Austria, Belgium Germany and France; for motorcyclists the same applies to Estonia, Cyprus, Belgium, Austria, the Czech Republic and Finland.

For car drivers the percentage of punished for speeding is the lowest in Greece, Ireland and Sweden, while for motorcyclists this percentage is the lowest in Sweden, Slovenia and Ireland. In some other countries the number of the drivers punished for speeding is significantly lower as compared to the average (CD: Estonia, Israel, Finland and Slovenia; MC: France, Germany, Greece and Poland).

If we combine both driver-categories answers and compare this with penalty statistics in the different countries, the rate of motorcyclists and car drivers punished for speeding is significantly higher in Austria and Belgium. In Greece, Ireland, and Sweden, the number of the punished for speeding is significantly lower for both driver-categories. In different countries there is a correlation among the rates of admitted punishment got for speeding both for car drivers and motorcyclists. This statement is confirmed by the cross-table analysis (CD: $\chi^2_{(18)}$= 698.765, p<0.000, eta²= 0.056, MC: $\chi^2_{(18)}$= 272.677, p<0.000, eta²= 0.061).

Figure 3 presents data on experiences of car drivers and motorcyclists with punishment for breaking the speed limit in the past 3 years per country and shows the specific penalties levied in 2008 in different countries.

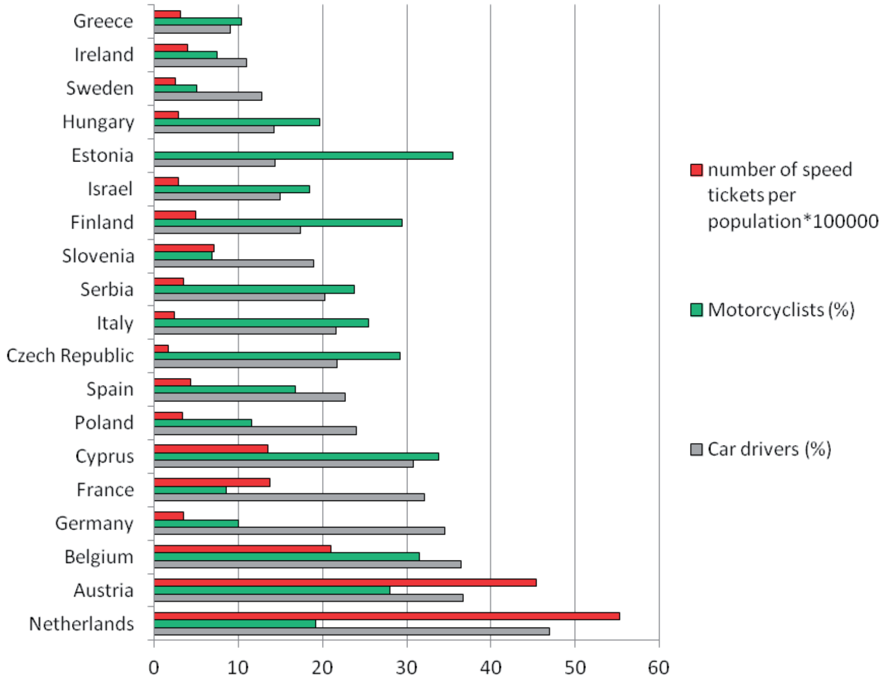

Figure 3: Number of speed tickets in 2008 and experience of car drivers and motorcyclists with punishment for breaking the speed limit in the past 3 years, by countries[31].

The average percentage of a given country's punished responders for speeding in the last 3 years as well as the number of penalties levied for speeding in 2008 were shown in the macro-level correlation analysis.

There is a correlation between the rate of car drivers punished for speeding and the number of punishments (on the basis of correlation analysis r= +0.783, p<0.001), i.e. responders' admitted punishment experience is proportional with the figures described in penalty statistics. We could not ascertain this correlation for motorcyclists. Unfortunately in penalty statistics pertaining to punishment there is no differentiation by vehicle categories.

In Table 19 a summary is given of different nationalities of car drivers or motorcyclist scoring highest or lowest on perceived speed violations by others, experiences with speed controls and speed punishment.

31 - There are no data available for speed-ticket in Estonia

Table 19: Summary of different nationalities of car drivers or motorcyclist scoring highest or lowest on perceived speed violations by others, experiences with speed controls and speed punishment.

Category	Concordance CD/MC	Car drivers	Motorcyclists
Permissible speed limit often exceeded by others	Same	Cyprus, Greece, Poland, Estonia,	Cyprus, Greece, Poland, Estonia
	Different	Sweden	Germany
Permissible speed more rarely exceeded by others	Same	France, Ireland, Austria, Finland, Czech Republic	France, Ireland, Austria, Finland, Czech Republic
	Different	-	-
High frequency speed control	Same	Austria, Spain, Slovenia,	Austria, Spain, Slovenia,
	Different	Netherlands, Serbia	Greece, Cyprus
Low frequency speed control	Same	Ireland, Italy, Finland, Germany	Ireland, Italy, Finland, Germany
	Different	Sweden	Poland
High percentage punished speeders	Same	Belgium	Belgium
	Different	Austria, Germany, France, Netherlands	Cyprus, Czech Republic, Estonia, Finland
Low percentage punished speeders	Same	Ireland, Sweden	Ireland, Sweden
	Different	Estonia, Greece, Hungary	France, Germany, Slovenia

For both Greece and Cyprus it is reported that they believe that other motorcyclists often exceeds limits and at the same time they believe that speed controls are fairly usual. In addition, for Cyprus also high percentages of punished speeders among motorcyclists are reported.

For Poland it is reported that speed limits are often exceeded by motorcyclist but that speed controls experienced by motorcyclists are rare.

Ireland shows the following pattern for motorcyclists and car drivers: less likely to report that others speed, fewer speed controls and low percentage of drivers or motorcyclists punished for speeding.

On the other hand, for the Netherlands and Austria, both a high frequency of speed controls and a high percentage of car drivers punished for speeding, is reported.

Estonia and Sweden are similar in that car drivers of these countries report that speed limit is often exceeded by others, but at the same time percentages of car drivers punished for speeding is low.

For France it is reported that speed offences are more rare whereas percentage of car drivers punished for speeding is high.

Discussion and conclusions

In this chapter we studied differences between motorcyclists and car drivers with respect to perception of speeding by others, experiences with speed controls and with speed punishment, and how these differences were related to driver characteristics and national differences. Before we discuss main findings and conclusions we would like to point out some of the limitations of the present analysis. First, the present analysis is based on self-reports by motorcyclists and car drivers where social desirability, memory and availability biases, or influences from question or answer scale format may have played a role. Second, in the analyses we have not systematically controlled for potentially confounding variables. Third, the results concerning speed perception of others may have been influenced by slightly different wordings of questions for motorcyclists and car drivers. The car drivers had to form their opinion on the other car drivers' speed selection, while the motorcyclists had to judge the decision of a group which included the respondent as well. It cannot be excluded that this difference in question wording may have affected answers. It could be supposed that one is more lenient in judgment when judging a category including oneself instead of a category excluding oneself ('others').

Differences between car drivers and motorcyclists perceptions of speeding by others

Car drivers and motorcyclists are similar in their perceptions of speeding by their group in that both groups of road users report most speeding on motorways, next on main road outside built-up areas and on other roads outside built-up areas, and least on roads inside built-up areas. The percentage of drivers and motorcyclists who consider that the others do not respect the speed limits is very high. Both car drivers and motorcyclists think that the others most often exceed the speed limit on motorways, and next on main roads outside built-up areas and on other roads outside built-up areas. The occurrence of speeding is thought to be most rare on roads inside built-up areas. For example, for built-up areas 59 and 51 per cent of the car drivers and of the motorcyclists, think that other drivers or motorcyclists often, very often or always break the speed limit. For other road types these percentages are between 15 and 25 per cent-points higher.

Although the pattern is similar for both groups, car drivers mention higher percentages of speeding by their group for each road type than motorcyclists. This difference is found for both male and female drivers and motorcyclists, and for nearly all age groups. This finding is a little bit surprising given the fact that previous studies indicate that motorcyclists are more often engaged in speeding on certain road types, especially on rural roads or motorways, than car drivers. The explanation for this unexpected finding could be that the perception of speeding by others is influenced by the number of times or the duration of time own vehicle is overtaken by others. With the use of computer simulations of traffic in two lanes with the same average speed, Redelmeier and Tibshirani (1999) showed that drivers spent more time being overtaken by other vehicles than in overtaking which - according to these authors - leads to the (false) perception that vehicles in other lane travel faster. Since presumably car drivers are much more frequently overtaken by other cars than motorcyclists by other motorcyclists, this false illusion mechanism of perceiving other same type vehicles travelling faster can be expected to be more strongly present among drivers than riders.

Car drivers who comply with the speed limit may frequently be overtaken by other car drivers. For motorcyclists the frequency of overtaking by other motorcyclists might be less since there are fewer motorcyclists on our roads and also that motorcyclists travel at higher speeds where overtaking is less needed. Another explanation is that car drivers are more 'judgmental' since they had to report on speeding by 'others', excluding themself whereas motorcyclists reported on speeding of motorcyclists (including themselves).

Whereas engine size and annual kilometres driven did not affect perception of speeding by car drivers, it did have some effect on speeding perceptions by motorcyclists. Motorcyclists who drove annually less than 1000 km were more inclined to report speeding by others on several road types than motorcyclists who drove more, also, motorcyclists with engine size of over 1000 cc reported less speeding by others on several road types than motorcyclists with lower engine sizes. If we assume that driving less than 1000 km per year indicates relatively low rider experience and that driving with large engine size is more reflective of high rider experience, it seems that these low results point in the same underlying direction. Motorcyclists with more experience seem to observe less speeding by other motorcyclists in built-up areas than motorcyclists with less experience. A similar explanation as before may apply to this case, that is more experienced motorcyclists tend to ride with higher speeds than less experienced motorcyclists, and thus are less often overtaken by other motorcyclist resulting in a reduced perception of speeding by their group.

Differences between car drivers and motorcyclist in experiences with speed enforcement

Generally, motorcyclists report more often being checked for speed than drivers. There could be several explanations for this. First, it is possible that motorcyclists more often travel on roads with speed enforcement. However, in general this explanation seems not very likely. In general drivers ride more kilometres than riders on similar road types. Another explanation that seems equally likely is that motorcyclists are better aware of their traffic environment, including (visible or partly hidden) police speed checks. In the introduction of this chapter, we have described research on differences between drivers and riders in cognitive representations of traffic situations, showing that in some situations motorcyclist have a more total view of the traffic situation. Perhaps riders put more effort in perceiving or monitoring the total traffic environment due to their higher vulnerability. Finally, it could be that in some countries the traffic police are more oriented to catching speed offenders among motorcyclists than among car drivers.

Concerning the self-reports of being ticketed for speeding, in more than half of all countries the percentage is higher among car drivers than motorcyclists. This likely reflects that fact that drivers drive more kilometres than riders. In a few countries - Estonia, Finland - a substantial larger percentage of riders reports being ticketed than drivers. Either riders in these countries could be more prone to speeding or, as has been suggested before, traffic police could be more especially focused on catching speeding riders. It is possible that riders are seen by the police as well as the general public as more ‘reckless’, or more ‘dangerous’ than car drivers. Social stereotypes of reckless or rebellious ‘riders’ may be part of a one-sided perception of the group of motorcyclists. It should be kept in mind that although a part of motorcyclists may be more excessive speeders than drivers, at the same time a part of riders are more cautious and responsible road users than drivers, showing more moderate speed behaviour within built-up areas and a better awareness of traffic environment and other road users and a stronger focus on communication with other road users. The stereotype of the reckless rider is like all stereotypes very one-sided, black-and-white.

Concerning national differences, experiences with speed punishment were most frequently reported in a number of countries which have high intensities of speed camera enforcement, something which also have been intensified in the last decade (Austria, the Netherlands, Germany, France, Belgium, see complementary Table at the end of this chapter). On the other hand, countries with a lower intensity of speed cameras, i.e. Eastern European countries (the Czech Republic, Serbia, Slovenia, Hungary) and South European countries (Italy, Greece) had fewer experiences of punishment.

Summary main conclusions

1. Car drivers report more speeding by others than do motorcyclists, perhaps reflecting that car drivers are more frequently overtaken by other cars than motorcyclists by other cycles or reflecting the fact that car drivers had to judge speeding by other drivers whereas motorcyclists had to judge speeding by their group (including themselves).
2. In accordance with expectations, younger, male drivers./motorcyclists, drivers/motorcyclists with higher number annual mileage or with vehicles equipped with larger engine sizes, report more frequent experience with speed punishment.
3. Whereas in most countries drivers report more often being ticketed than riders – likely as a result of more kilometres driven -, riders more often report experiences with speed checks, either because they may be better aware of the total traffic environment, or because traffic police may be more oriented towards checking and catching speeding riders than speeding drivers.
4. In accordance with expectations in countries with high intensities of speed camera enforcement such as Austria, Belgium, France, Germany, the Netherlands, the experiences with speed enforcement are more often reported.

Complementary table

Intensity of fixed speed camera enforcement in a number of European countries.

Country	Inhabitants in millions*	Number fixed speed/red light cameras**	Ratio devices per number inhabitants	Additional information
'Moderate or high enforcement'				
Austria	8	1100	1: 7.300	?
Belgium	10	1700	1: 5.900	Press communication May 17th 2011
France	65	2500	1: 26.000	Carnis et al. (2008)
Germany	81	3700	1: 22.000	?
Netherlands	17	1400	1: 12.000	ICF Consulting (2003), SWOV (2009)
Sweden	9	1100	1: 8.100	Belin et al. (2010)
UK	63	5500	1: 12.000	ICF Consulting (2003)
'Low enforcement'				
Bulgaria	7	81	1: 86.000	
Portugal	11	30	1: 366.000	
Spain	47	1300	1: 36.000	

* Rounded numbers ** Source: Speed Camera Database accessed 27th October 2011 http://www.scdb.info/

Sources

The Swedish speed camera programme was described and discussed in:

Belin, M-Å, Tillgren, P., Vedung, E., Cameron, M., & C. Tingvall (2010). Speed cameras in Sweden and Victoria, Australia—A case study. Accident Analysis and Prevention, 42, pp. 2165–2170.

Press communication about effectiveness of speed cameras Belgium 2002-2010 Minister Hilde Crevits Flemish Minister for Mobility and Public Works, Tuesday 17 May 2011 accessed 27th October 2011 http://www.ministerhildecrevits.be/nlapps/docs/default.asp?id= 200

Intensification of enforcement since 2002, e.g. as reported by Carnis et al. (2008)

Carnis, L. and Rakotonirainy, A. and Fleiter, Judy J. (2008) Speed enforcement programmes in France and Queensland: First elements for a systematic comparison. In Proceedings High risk road users - motivating behaviour change: what works and what doesn't work?

National Conference of the Australasian College of Road Safety and the Travelsafe Committee of the Queensland Parliament, Brisbane.

Substantial use of speed cameras was reported by ICF Consulting for Netherlands and UK.

ICF Consulting (2003). Costs-Benefit Analysis of Road Safety Improvements. ICF Consulting London.

SWOV (2009). SWOV Fact sheet. Speed cameras: how they work and what effect they have. Factsheet, November 2009, accessed October 27th 2011,

http://www.swov.nl/rapport/Factsheets/UK/FS_Speed_cameras.pdf

Chapter 4.6

Summary and recommendations from road users' comparison

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This section is particular because it compares and contrasts all the road users taking part in the SARTRE study. These results can be very useful for stakeholders when deciding if they should consider a user-specific approach or if they should treat road users as a homogenous group.

The compared groups are: car drivers, motorcyclists, pedestrians, cyclists and public transports users. It is important to keep in mind that these categories are not mutually exclusive and that a given individual can use all those means of transport alternatively. In fact, multimodality is very common, even for a single trip. So when we compare those groups we have to be aware that they are not distinct from each other. Moreover, if some parts of the questionnaire were identical for all groups, some other questions were specific and do not always allow for a full comparison. For example, some topics such as speeding and driving under the influence of alcohol are relevant for car drivers and motorcyclists but not for the other groups.

In the 'comparison section', four topics were presented: attitudes, environment, driving under the influence of alcohol or drugs, and speeding.

Overall, very few differences were found between road users on all the studied topics. However, those small differences were consistent within countries. This means that even when comparing countries with very different attitudes, we almost always found the same ordering between road users groups. The ORU always hold the most "pro safety" and "pro-environment" positions when compared to car drivers and motorcyclists. The Motorcyclists always hold the least "pro safety" and "pro environment" positions, and car drivers always hold a position between the two others, but closer to motorcyclists than to ORU.

This consistency of differences between road users is interesting because it reveals a relationship between transport modes' choices, perceptions and behaviours. However, the method used in SARTRE 4 study did not allow for determining the direction of the effect. Is the chosen transport mode influencing attitudes and behaviour or is it the contrary, in all probability both.

Another interesting result is that even in countries with a high mean level of "pro safety" attitudes and behaviours, the motorcyclists are less pro safety than other road users. Why are motorcyclists always the least "pro safety" group? It seems that they are keener on self-regulation than others. Indeed, one of their primary reasons for choosing the PTW as transport mode is the feeling of freedom it confers. This in turn may also influence their attitudes regarding safety.

Regarding more specifically the environmental issue, motorcyclists were less willing to change their travel behaviour than car drivers. This might be because motorcycle riders believe that "*they* *already cause less pollution"* than others and that "*they have already taken a step towards reducing the effects of their travel behaviour on the environment"* (Chapter 4.3). In fact, the question of whether motorcycles cause more or less pollution than cars have been controversial because it depends on the kind of pollution considered. Some studies (ADEME, 2005) found that, in real conditions of use (Paris area, commuting trip with traffic jam and extra time spent by cars to find parking) motorcycles may cause less CO_2 and CH_4 (greenhouse gas) emissions but more NO_X, CO and SO_2 (local pollutants) than cars.

Motorcyclists and car drivers were compared on the question of driving under the influence of alcohol. In most countries, there is no difference between the two groups of road users. "*Where there are differences (in Austria, Cyprus, Finland, France, Germany and Netherlands) usually it is the motorcyclists who declare less often to be drinking and driving, with the exception of Cyprus in which it is the opposite"*. Moreover, "the drink-drive predictors are identical for car drivers and motorcyclists" (Chapter 4.4). However, considering the extra amount of skills needed to operate a motorcycle compared to a car, it could be argued that the consequences of slight alcohol impairment on driving a motorcycle are more severe than on driving a car. In these conditions, one could have expected that motorcyclists drink and drive less frequently than car drivers. But in most countries, they don't. The best would be if a legal level of 0.2 g/l were implemented everywhere, for all drivers, but if that is not possible, a lower limit for motorcyclists could be considered.

"*Given the fact that previous studies indicate that motorcyclists are more often engaged in speeding on certain road types, especially on rural roads or motorways, than car drivers*" (Chapter 4.5), speeding is an issue on which one could have expected differences between car drivers and motorcyclists. Some differences were found indeed, but not in the expected direction. Motorcyclists were less likely to believe that others would speed than car drivers. This could be interpreted in the light of the perceived frequency of being overtaken, often used as a basis of the estimation of others' speed and of the strong acceleration of motorcycles compared to most cars. This perceived frequency may be lower for motorcyclists among their group than for car drivers among their group. They also report less speed punishment than car drivers in most countries. This could be linked with the lower number of kilometres driven by motorcyclists compared to car drivers. Overall, the comparison of car drivers and motorcyclists regarding speeding raises the question of a potential stereotype of motorcyclists as reckless drivers. Perhaps the reality is more complex. However, since this result wasn't expected, further research would be needed to confirm it.

Recommendations:

- If the topic of a road safety campaign is not specific to one type of road user such as, for example, wearing a helmet for motorcyclists, there is no reason to treat road users separately in road safety campaigns.

- Research and communication about motorcycles' pollution compared to cars' should be developed. It seems that motorcyclists are over optimistic regarding their low contribution to air pollution.

- We recommend a BAC of 0.2g/l for all road users. If, for some reason, this is not acceptable, one could at least consider a BAC limit of 0.2g/l for motorcyclists.

- Future research should explore further the comparison between motorcyclists and car drivers regarding speeding. Meanwhile, it would appear that police speed checks focused especially on motorcyclists are not justified.

General conclusion

General Conclusion

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SARTRE 4 is a tool for all road traffic researchers, practitioners in road safety, engineers, stakeholders, policy makers, road users and anyone interested in transportation issues. This tool is based on a unique setting at the European level, with exceptional data about knowledge of road traffic laws and road traffic risks, perceived risk of apprehension, attitudes regarding road safety issues, reported road traffic behaviours, transport habits and environmental concerns.

The results can provide the basis for benchmarking in the following areas:

- Introducing new legislation or a modification of existing law, which can be useful for harmonization in Europe;
- Introducing intelligent transport systems such as "alcolock", speed-limiting device, fatigue-detection device;
- Providing information that can be used in training and education, but also when developing safety campaigns;
- Promoting more environmentally-friendly mobility.

In contrast to former SARTRE-editions, SARTRE 4 focused on three target groups: car drivers, powered two wheelers, and other road users (pedestrians, cyclists, public transport users). Overall, 21.280 road users were interviewed in 19 countries. In each country, at least 600 car drivers, 200 users of powered two wheelers, and 200 other road users formed the sample. Each of these subgroups was representative of the local composition of the corresponding population and 96% have been questioned face-to-face. In each country, the questions were translated and adapted to the linguistic context. The questions covered various topics related to road safety such as alcohol, drugs, or phone use while driving, speeding, use of advanced driver assistance systems and environmental motivations for transport choice.

Along with numerous safety actions[32] carried out in Europe between 2002 and 2010, which corresponds to the time period when data were collected for SARTRE 3 and for SARTRE 4, the number

32 - The introduction of the automated speed control system in several countries, changes in the content of training courses but also a series of legal regulations regarding seat-belt use, driving licence, drinking and driving, the responsibilities of the vehicle's owner and, the use of mobile phones while driving etc.

of people killed in car crashes in 27 member states went down by 43% (CARE, 2012). However, 30.926 people died on the roads of the European Union during 2010 (ETSC, 2011) which is unacceptable and more actions are therefore needed to reduce the number of accidents. The results from SARTRE 4 include questions measuring road users' motivations underlying their actions and can provide some valuable information about the main determinants behind speeding, driving under the influence of psycho-active substances (drugs, alcohol and medicines) and driving while tired. Moreover, road users do not benefit equally from road safety improvements. For example, on average motorcyclist fatalities have increased by 22% since 2002[33]. Obviously it is urgent to address more efficiently the question of motorcyclists' safety on the road. That is why in SARTRE 4 motorcycling is a key area of inquiry for the first time. With regard to other road users, namely pedestrians, cyclists and users of public transport, we are interested in identifying their motivations in order to encourage all road users towards the use of "soft" transportation modes. We also have to ensure that an increase in soft modes does not increase the number and severity of accidents because pedestrains and cyclists are most vulnerable to the consequences of a road traffic accident.

The results from the SARTRE survey presented in this report showed that car drivers who speed regarded doing so as fun and believed that it could get them to their destination more quickly. They also regarded speeding as normal and socially acceptable. However, this was very different from drinking and driving, which was perceived as substantially increasing the risk of an accident.

A large proportion of motorcyclists regard speeding as a cause of road accidents. Nevertheless, those who drove a sport style motorcycle were the most positive towards speeding and received the most speeding tickets. Drink riding would appear to be something most motorcyclists claimed that they would not do, or at least they regard this as very dangerous, although riders in southern countries were more likely to drink and drive. In general motorcyclist did not perceive the risk of being stopped by the police as very great. Pedestrians were in strong support of enforcement policies and various other safety measures. With regard to cyclists the level of cycling in their own country did not predict their perception of danger, but it did predict their satisfaction with their own safety.

From the comparison of road users, we found that multimodality was very common even for a single trip. However, "other road users" were positive towards road safety and measures taken to improve the environment. The attitude of car drivers and users of powered two wheelers towards drinking and driving was similar, although it would probably be more dangerous for a motorcyclist to drink and ride than for a car driver.

The four different editions of the SARTRE survey cover a period of more than twenty years and are therefore able to monitor change over time both on a European level and on a country level similar to a Eurobarometer. For example, the results from this survey showed that drivers had increased their support for speed cameras, although the support for speed enforcement had reduced in the last eight years. In agreement with their attitudes towards drinking and driving, drivers are more in favour of a decrease of the legal limit than previously.

The SARTRE survey is also exceptional because, in contrast to most other large scale studies, it does not only include the measure of primary objectives (i.e. reduction in accidents, number of violations and sanctions) but also secondary objectives (i.e. the motive behind the actions). Secondary objectives provide us with valuable information that is necessary when designing a campaign, an educational program, or some in-car electronic safety devices. These measures can also be used as a means to assess the effects of different road safety measures.

It is essential to continue to carry out these SARTRE surveys to help meet the challenges of tomorrow such as: the need to adapt road safety policies to the growing number of seniors (in 2060 the percentage of people 65+ will increase from 17% today to 30%), the adaptation to the increasing

33 - However, this average may be misleading because while motorcyclists fatalities increased dramatically in some countries between 2000 and 2008 (Finland, +260%; Hungary, +75%; Poland, +47%; Italy, +41%; Sweden, +31%; Spain, +26%), it decreased substantially in others (Germany, -30%; Netherlands, -25%; Austria, -19%; France, -15%).

number of motorcyclists, cyclists and very small vehicles, the management of interactions between different types of road users, the promotion of environmentally-friendly mobility, the drivers' safe adaptation to technological innovation in-car and on-road, and the promotion of soft modes of transport.

We are aware of the limitations of our study. We know that self-reported data are always subject to social desirability suspicions, but one can expect that, if any, the effect of social desirability would have been similar in every country and should not affect comparisons. We know that, despite all the care taken, translation issues can occur and cause minor consequences for comparability, but we believe that it would not alter the general pattern of results. We know that our data are not perfect, but we have taken care to minimize distortions. We believe that, despite these weaknesses, our work will still make a valuable contribution to transportation research knowledge.

Considering the findings presented in this report, the following recommendations for each of the three target groups are suggested, that is to say car drivers, users of powered two wheelers, and other road users (pedestrians, cyclists, public transport users, car passengers, etc.), and from comparisons between these three groups.

Car drivers

- The generalization of a 0.2g/l legal Blood Alcohol Content (BAC).
- The development of preventive measures against drink driving, including alcohol interlocks.
- Changing positive attitudes towards speeding via education, road safety campaigns and the development of intelligent speed-limiting devices.
- Campaigns targeting mobile phone use while driving and drink driving.

Powered two wheelers

- Development and implementation of risk communication designed for users of powered two wheelers should be based on:
  - Specific knowledge about users of powered two wheelers' expectations, attitudes, motivations and habits concerning drinking and riding, speeding, use of safety equipment and interactions with car drivers.
  - Knowledge about specific motivations for the use of powered two wheelers.
- Overall, regarding the use of motorcycles, riding behaviour and the accident risk of motor cyclists there are many differences among the European countries. Therefore safety measures for motorcyclists should be developed in accordance with the country-specific circumstances.
- We observed a very clear distinction between northern and southern motorcyclists. They are very different in their motivations (and thus profiles), use of safety equipment, drink and drive behaviour, and proportion of road deaths. We thus recommend a different approach to road safety communication in northern and southern countries.
- Risk communication approaches should include internet-based dialogue oriented strategies. In particular, the presentation of safety topics on social network sites seems to be a promising strategy to reach younger people. Improved risk communication should be implemented as part of the process of obtaining a motorcycle licence.
- Legal BAC: we recommend a BAC limit of 0.2g/l for motorcyclists.
- Considering different enforcement strategies depending on the geographical situation of the target country, southern countries should be regarded as priority targets as they have a high proportion of motorcycle use within their populations and a high frequency of drink driving.
- Development and implementation of safety equipment adapted to countries with hot weather.

Other road users

- Policy makers must recognise that road users use a variety of modes, sometimes even in one journey so policy should support the use of multiple modes.
- If policymakers want to increase the use of more environmental friendly modes of transport then they have to ensure that they are perceived to be safe and comfortable. Solutions must be carefully considered for each location, taking into account issues such as weather and physical environment.
- There are a variety of factors that can increase the number of other road users so policy makers need to take care to identify what determines transport choices, e.g. an increase in poverty in a country is likely to increase those having to walk and cycle, in addition to any health promotions.
- Targeting messages on environmental benefits to younger people and health concerns to older people is most likely to increase each group's walking and cycling
- If governments in southern and eastern Europe wish to increase the amount of walking and cycling, they need to communicate to their populations their focus on improving road safety and the urban environment together with explicit plans setting out effective actions.
- Some pedestrians do not support 30 km/h zones so the focus should be on a combination of measures, i.e. speed limits and better road layouts.
- Pedestrians are active agents in the urban environment whose safe behaviour should be enabled by road layouts designed for them – and not just cars - rather than enforced by penalties.
- Cycle paths are associated with higher levels of cycling and perceived personal safety so their construction – or separation of cyclists from other traffic - should be the first choice for increasing cycling
- Enforcement of drinking and cycling penalties and penalties for ignoring red lights should be strict, with penalties increased if necessary.
- Cyclists seem over-confident in their own ability to cycle safely so safety campaigns need to focus on the risks to "someone like you", without making cycling seem overly dangerous which could discourage people from cycling.

From road users comparisons

- Road safety campaigns: if the topic is not specific to one type of road user such as, for example, wearing a helmet for motorcyclists, there is no reason to treat road users as separate groups in road safety campaigns.
- Environment: research and communication about pollution from motorcycles compared to cars should be developed. It seems that motorcyclists are over optimistic regarding their contribution to air pollution.
- Legal BAC: we recommend a BAC of 0.2g/l for all road users. If, for some reason, this is not acceptable, one could at least consider a BAC limit of 0.2g/l for motorcyclists.
- Speeding: future research should explore further the comparison between motorcyclists and car drivers regarding this issue. Meanwhile, it seems that police speed checks focused especially on motorcyclists are not justified.

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Appendices

1 - Questionnaire

SOCIAL ATTITUDES TO ROAD TRAFFIC RISK IN EUROPE, 4th edition

Questionnaire
Reference version in English

A. Country

Austria	Österreich	AT	1
Belgium	Belgique / Belgie	BE	2
Cyprus	Kypros / Kıbrıs	CY	3
Czech Rep	C eská republika	CZ	4
Estonia	Eesti	EE	5
Finland	Suomi / Finland	FI	6
France	France	FR	7
Germany	Deutschland	DE	8
Greece	Elláda	EL	9
Hungary	Magyarország	HU	10
Ireland	Éire/Ireland	IE	11
Israel		IL	12
Italy	Italia	IT	13
Netherlands	Nederland	NL	14
Poland	Polska	PL	15
Serbia	Republica Serbska	RS	16
Slovenia	Slovenija	SI	17
Spain	España	ES	18
Sweden	Sverige	SE	19

B. Questionnaire Nb |__|__|__|__| (4 digits)

C. Language

Arabic	1
Czech	2
Dutch/Flemish	3
English	4
Estonian	5
Finnish	6

French	7
German	8
Greek	9
Hebrew	10
Hungarian	11
Italian	12
Polish	13
Russian	14
Serbo-Croatian	15
Sloven	16
Spanish	17
Swedish	18

D. Region

(Please see the Eurostat NUTS document. Take the NUTS1 level definition. For exemple a questionnaire filled in Paris refers to «France», NUTS1 «Ile de France», code FR1, it will be coded here as 01, 2 digits)

E. Size of town |__|__|__|__|__|__|__| inhabitants (7 digits)

! General notes: in this questionnaire, a motorcyclist is a user of a Powered Two-Wheels with engine size >50cc, excluding moped.

Distance or speed unit is in Km or Km/h. If appropriate collect miles or miles/h and convert !

«Good morning / afternoon, would you mind completing a short questionnaire with me? It should take no more than 20 minutes and it relates to road safety and driving habits.»

Selection and quotas criteria

The poll agency is expected to find people to populate the representative sample according to 'Survey guidelines' instructions, divided into 3 sub-samples. The interviewee are

*... eligible as **MotorCyclist***

F. Do you have a driving license that allows you to ride a motorcycle > 50cc? ☐ Yes

G. Have you ridden a motorcycle > 50 cc in the past 12 months? ☐ Yes

NOTE: Respondent must answer yes to both F. and G. to be eligible as a MotorCyclist.

*.... eligible as **CarDriver***

H. Do you have a (full) car driving license or permit? ☐ Yes

I. Have you driven a car in the last 12 months? ☐ Yes

NOTE: Respondent must answer yes to both H. and I. to be eligible as a Car Driver.

*...eligible as **OtherRoadUser***

J. What was your most frequent mode of transport during the last 12 months?

Driving a car ☐ 1

Riding a motorcycle > 50cc ☐ 2

None of the above ☐ 3

NOTE: Only those who code 3 at J. are eligible as a Other Road User.

SQ1. Interviewee selected as:

Motorcyclist ☐ 1

Car driver ☐ 2

Other road user ☐ 3

SQ2. Gender M ☐ 1 F ☐ 2

SQ3. Age

a) last birthday?|__|__| years old (2 digits)

b) for quotas

17-24	1
25-34	2
35-44	3
45-54	4
55-64	5
65+	6

SQ4. What is your occupation? (2 digits)

Self employed	Farmer, Fisherman	☐ 01
	Professional lawyer, accountant, etc.	☐ 02
	Business-owner of shop, craftsman, proprietor	☐ 03
Employed	Manual worker	☐ 04
	White collar, office worker	☐ 05
	Middle management, trainee	☐ 06
	Executive, top management, director	☐ 07
Not employed	Retired	☐ 08
	Housewife, not otherwise employed	☐ 09
	Student, military service	☐ 10
	Unemployed	☐ 11

End of selection and quotas criteria

Beginning COmmon section

During this interview I would like to talk to you about different issues concerning individual mobility. Your answers will only be used for scientific and statistical purposes. First of all you will be asked some general questions.

Travel behaviour

(SHOW CARD 6)

CO01. During the last 12 months on average how often did you travel by...

	Nearly daily	One to four times a week	One to three times a month	Less than once a month
a) car as a driver	☐ 1	☐ 2	☐ 3	☐ 4
b) car as a passenger	☐ 1	☐ 2	☐ 3	☐ 4
c) motorcycle (> 50 cc) as a driver	☐ 1	☐ 2	☐ 3	☐ 4
d) motorcycle (> 50 cc) as a passenger	☐ 1	☐ 2	☐ 3	☐ 4
e) walking	☐ 1	☐ 2	☐ 3	☐ 4
f) cycling	☐ 1	☐ 2	☐ 3	☐ 4
g) public transport	☐ 1	☐ 2	☐ 3	☐ 4
h) moped (<= 50 cc) as a driver	☐ 1	☐ 2	☐ 3	☐ 4

(SHOW CARD 1)

CO02. How concerned are you about each of the following issues?

	Very	Fairly	Not much	Not at all
a) Rate of crime	☐ 1	☐ 2	☐ 3	☐ 4
b) Pollution	☐ 1	☐ 2	☐ 3	☐ 4
c) Road accidents	☐ 1	☐ 2	☐ 3	☐ 4
d) Standard of health care	☐ 1	☐ 2	☐ 3	☐ 4
e) Traffic congestion	☐ 1	☐ 2	☐ 3	☐ 4
f) Unemployment	☐ 1	☐ 2	☐ 3	☐ 4

CO03. Thinking specifically about the risk of accident, how safe do you think the roads are in our country to travel on?

Very	Fairly	Not much	Not at all
☐ 1	☐ 2	☐ 3	☐ 4

CO04. How concerned do you think the Government is about road safety?

Very	Fairly	Not much	Not at all
☐ 1	☐ 2	☐ 3	☐ 4

CO05. How much would you agree that our roads have become safer over the past 10 years?

Very	Fairly	Not much	Not at all
☐ 1	☐ 2	☐ 3	☐ 4

CO06. How much would you be in favour of using...?

		Very	Fairly	Not much	Not at all
a)	Speed limiting devices fitted to cars that prevented drivers exceeding the speed limit	☐ 1	☐ 2	☐ 3	☐ 4
b)	A 'black box' to identify what caused an accident	☐ 1	☐ 2	☐ 3	☐ 4
c)	An "alcolock" that prevented the car to start if the driver exceeds the legal alcohol limit for driving	☐ 1	☐ 2	☐ 3	☐ 4
d)	An "alcolock" that prevented the car to start for recidivist driver that exceeds the legal alcohol limit for driving	☐ 1	☐ 2	☐ 3	☐ 4
e)	Fatigue detection devices that warn the driver to stop if he/she was too tired to drive	☐ 1	☐ 2	☐ 3	☐ 4

CO07. How much would you be in favour of the following measures?

		Very	Fairly	Not much	Not at all
a)	Automated cameras for red light surveillance	☐ 1	☐ 2	☐ 3	☐ 4
b)	Surveillance of speeding at a single point by automated cameras	☐ 1	☐ 2	☐ 3	☐ 4
c)	Surveillance of speeding between two distant points by automated cameras	☐ 1	☐ 2	☐ 3	☐ 4
d)	More "30 km/h" zones in built-up areas	☐ 1	☐ 2	☐ 3	☐ 4
e)	More bicycle lanes	☐ 1	☐ 2	☐ 3	☐ 4
f)	More sidewalks for pedestrians	☐ 1	☐ 2	☐ 3	☐ 4
g)	More car and motorcycle free zones in built-up areas	☐ 1	☐ 2	☐ 3	☐ 4

(SHOW CARD3)

CO08. Do you agree or disagree with the following statements?

		Strongly agree	Agree	Neither	Disagree	Strongly disagree
a)	Penalties for speeding offences should be much more severe	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b)	Penalties for drink-driving offences should be much more severe	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c)	Penalties for not using restraint systems should be much more severe	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d)	Penalties for not wearing a helmets on a motorcycle should be much more severe	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e)	Penalties for using a handheld phone while driving should be much more severe	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

(SHOW CARD 1)

CO09. How dangerous do you consider each of the following transportation modes to be regarding accidents?

	Very	Fairly	Not much	Not at all
a) Walking	☐ 1	☐ 2	☐ 3	☐ 4
b) Cycling	☐ 1	☐ 2	☐ 3	☐ 4
c) Public transport	☐ 1	☐ 2	☐ 3	☐ 4
d) Car driving	☐ 1	☐ 2	☐ 3	☐ 4
e) Motorcycling (motorcycle > 50 cc)	☐ 1	☐ 2	☐ 3	☐ 4

End of COmmon section

For CarDrivers continue question CD1. For MotorCyclists skip to question MC1. For OtherRoadUsers skip to question ORU1.

Section for CarDrivers
***Only those who answered yes to both QH and QI are eligible to answer this section.**
****Respondents who fill out this section CAN NOT also fill out Motorcyclists or Other Road users sections.**

CD01. How many kilometres/miles would you estimate you have driven in the past 12 months?

|__|__|__|__|__|__| kilometres/miles (6 digits)

***If respondent is only aware of number of miles, record miles and covert to kilometres after survey is completed.**

I - Speeding

(SHOW CARD 2)

CD02. In general, how often do you think other car drivers break speed limits on the following roads?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Motorways	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Main roads between towns	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Country roads	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Built-up areas	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

(SHOW CARD 1)

CD03. I'm going to read out some statements to you concerning driving a car 20 km/h over the speed limit in a residential area. Please tell me in each case how much you agree with each.

	Very	Fairly	Not much	Not at all
a) It makes driving more pleasant	☐ 1	☐ 2	☐ 3	☐ 4
b) It will take you to the destination quicker	☐ 1	☐ 2	☐ 3	☐ 4
c) Increase the risk of being involved in an accident with another road user	☐ 1	☐ 2	☐ 3	☐ 4
d) You will be stopped and fined by the police	☐ 1	☐ 2	☐ 3	☐ 4
e) Most of your friends would drive 20 km/h over the speed limit in a residential area	☐ 1	☐ 2	☐ 3	☐ 4

(SHOW CARD 2)

CD04. Over the next month, how likely would you be to drive at 20km/h over the speed limit in a residential area?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

CD05. On a typical journey, how likely is it that you will be checked for speeding?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

CD06. In the past 3 years, have you been fined, or punished in any other way, for breaking the speed limit driving a car?

No	☐ 1
Yes, only fined	☐ 2
Yes, fined and/or other penalty	☐ 3

II - Seat belts and child restraints

CD07. Do you ever carry a child (or children) in your car?

Yes	☐ 1	
No, never	☐ 2	(Goto CD09)

CD08. How often do you make children travelling with you wear seat belt or use appropriate restraint on the following roads?

	Never	Rarely	Sometimes	Often	Very often	Always
a) On motorways	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) On main roads between towns	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) On country roads	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) In built-up areas	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

III - Drinking and driving

(SHOW CARD 1)

CD09. I'm going to read some statements to you concerning drinking and driving a car. Please tell me in each case how much you agree.

	Very	Fairly	Not much	Not at all
a) You can drink and drive if you drive carefully	☐ 1	☐ 2	☐ 3	☐ 4
b) Drinking and driving increase the risk of an accident with another road user	☐ 1	☐ 2	☐ 3	☐ 4
c) If you drink and drive you will be stopped and fined by the police.	☐ 1	☐ 2	☐ 3	☐ 4
d) Most of your friends would drink and drive a car	☐ 1	☐ 2	☐ 3	☐ 4

(SHOW CARD 2)

CD10. Over the last month, How often have you driven a car after having drunk even a small amount of alcohol?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

CD11. Over the last month, how often did you drive a car, when you may have been over the legal limit for drinking and driving?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

(SHOW CARD 4)

CD12. In your opinion, how much alcohol can we drink before driving and still remain under the legal limit? (Write in number of units)

|__|__| (2 digits)

CD13. People have different opinions about what the legal limit should be. Which of the following statements best matches your opinion? Do you think that car drivers should be allowed to drink...

No alcohol at all	☐ 1
Less alcohol than at present	☐ 2
As much alcohol as at present	☐ 3
More alcohol than at present	☐ 4
As much as they want	☐ 5

CD14. In the past 3 years, how many times were you checked for alcohol while driving a car?

Never	☐ 1
Only once	☐ 2
More than once	☐ 3

(SHOW CARD 2)

CD15. On a typical car journey, how likely is it that you will be checked for alcohol?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

IV - Fatigue driving

CD16. If you feel tired while driving, what actions do you usually take to overcome this state?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Pull over and take a break	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Sleep	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Consume caffeine/"energy" drink	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Turn on the radio / increase its volume	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

e) Talk on the phone	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
f) Talk to passengers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
g) Open a window/ lower heat/on air cond.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
h) Ask a passenger to take over driving duty	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

CD17. In the past 12 months while driving, how often did you realize that you were actually too tired to drive?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

CD18. In the past 12 months, how often did you stop and take a break because you were too tired to drive?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

V - Accident experience

CD19. In the past 3 years, how many accidents have you been involved in, as the driver of a car, in which someone, including yourself, was injured and received medical attention?

|___|___| (2 digits)

CD20. In the past 3 years, how many damage only accidents have you been involved in, as the driver of a car?

|___|___| 2 digits)

VI - Environmental issues

(SHOW CARD 1)

CD21. In order to reduce air pollution, how much are you willing to accept the following suggestions:

	Very	Fairly	Not much	Not at all
a) Reduce the usage of your car	☐ 1	☐ 2	☐ 3	☐ 4
b) Share a car with colleagues to go to work place (car pooling)	☐ 1	☐ 2	☐ 3	☐ 4
c) Renting a car when you just need it (car sharing)	☐ 1	☐ 2	☐ 3	☐ 4
d) Use public transport more frequently	☐ 1	☐ 2	☐ 3	☐ 4
e) A car free day each month	☐ 1	☐ 2	☐ 3	☐ 4
f) Use a bicycle more frequently	☐ 1	☐ 2	☐ 3	☐ 4
g) Use a moped/motorcycle more frequently	☐ 1	☐ 2	☐ 3	☐ 4
h) Spend an extra amount of money on a hybrid or electric engine when buying a new car	☐ 1	☐ 2	☐ 3	☐ 4

VII Road user interaction, ITS use and driving style

CD22. Does the car that you drive most often have:

	Yes	No
a) Navigation system, built-in or portable	☐ 1	☐ 2
b) An anti-lock braking system (ABS)	☐ 1	☐ 2
c) Seat belt reminder	☐ 1	☐ 2
d) A system that detects 'fatigue' and warn you to stop driving	☐ 1	☐ 2
e) Electronic tag for collection of tolls (highways-cities-tunnels etc.)	☐ 1	☐ 2

(SHOW CARD 2)

CD23. When driving a car, how often do you...?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Follow the vehicle in front too closely	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Give way to a pedestrian at pedestrian crossings	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Drive through a traffic light that is on amber	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Make/answer a call with handheld phone	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
k) Make/answer a call with hand free phone	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

VIII – Cause of accident.

CD24. How often do you think each of the following factors are the cause of car drivers being involved in a road accidents?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Driving when tired	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Drinking and driving	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Taking drugs and driving	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Make/answer a call with handheld phone	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
e) Bad weather conditions	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
j) Inexperience (less than 3yrs driving)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
k) Aged people driving (65 and over)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

IX - Questions about the interviewee

CD25. About the car you usually drive, is it a car with engine size of...?

Less than 1,000CC	☐ 1
From 1,000 to 1,299CC	☐ 2
From 1,300 to 1,999CC	☐ 3
2,000CC or more	☐ 4

CD26. How many years car driving experience have you had?

|___|___| years (2 digits)

(SHOW CARD 1)

CD27. How dangerous do you think it is to drive while taking a medication that carries a «warning: it may influence your driving ability»?

Very	Fairly	Not much	Not at all
☐ 1	☐ 2	☐ 3	☐ 4

(SHOW CARD 2)

CD28. Have you driven while taking such medications?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

IV - Fatigue driving

CD29. In the last year, how many times have you been checked for the use of drugs/ medication while driving?

Never	☐ 1
Only once	☐ 2
More than once	☐ 3

CD30. In the last year have you been fined, or punished in any other way, for the use of drugs/medication while driving?

No	☐ 1
Yes, only fined	☐ 2
Yes, fined and/or other penalty	☐ 3

End of section for CarDrivers

Section for MotorCyclists (riding motorcycle >50cc)

***Only those who answered yes to both QF and QG are eligible to answer this section.**

****Respondents who fill out this section CAN NOT also fill out Car Driver or Other Road users sections.**

MC01. In total, about how many kilometres/miles have you driven a MOTORCYCLE in the last 12 months?

|__||__|__||__|__||__| kilometres/miles (6 digits)

MC02. In total, about how many kilometres/miles have you driven a CAR in the last 12 months?

|__||__|__||__|__||__| kilometres/miles (6 digits)

I - Speeding

(SHOW CARD 2)

MC03. In general, how often do you think motorcyclists break the speed limits on the following roads?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Motorways	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Main roads between towns	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Country roads	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Built-up areas	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

MC04. On a typical journey, how likely is it that you will be checked for speeding on your motorcycle?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

MC05. In the past 3 years, have you been fined, or punished in any other way, for breaking the speed limit driving a motorcycle?

No	☐ 1
Yes, only fined	☐ 2
Yes, fined and/or other penalty	☐ 3

II - Helmets and protective equipment use

(SHOW CARD 2)

MC06. When driving a motorcycle on each of the following road types on an average journey, how often do you wear a helmet?

	Never	Rarely	Sometimes	Often	Very often	Always
a) On motorway	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) On main road between towns	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) On country roads	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) In built-up areas	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

MC07. When driving a motorcycle on an average journey, how often do you...?

	Never	Rarely	Sometimes	Often	Very often	Always
a) wear a full face helmet (Helmet that covers entire face)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) wear a "jet" helmet (half/open face)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) fasten your helmet	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) wear a technical jacket meant for a motorcycle	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
e) wear a back protection equipment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
f) wear technical shoes/boots meant for motorcycle	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

g) carry a passenger	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
h) carry a passenger without wearing a helmet	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

(SHOW CARD 1)

MC08. I'm going to read out some statements to you concerning helmets. Please tell me in each case how much you agree.

	Very	Fairly	Not much	Not at all
a) In most accidents helmets reduce the risk of serious injury for drivers and passengers	☐ 1	☐ 2	☐ 3	☐ 4
b) If you drive carefully it is not really necessary to fasten a helmet	☐ 1	☐ 2	☐ 3	☐ 4
c) I enjoy driving a motorcycle without wearing a helmet	☐ 1	☐ 2	☐ 3	☐ 4
d) Most of my friends use a helmet when driving a motorcycle	☐ 1	☐ 2	☐ 3	☐ 4
e) I only wear a helmet because it is the law	☐ 1	☐ 2	☐ 3	☐ 4

MC09. In the past 3 years, have you been fined, or punished in any other way, for not wearing/fastening a helmet?

No	☐ 1
Yes, only fined	☐ 2
Yes, fined and/or other penalty	☐ 3

III - Drinking and driving

(SHOW CARD 1)

MC10. I'm going to read out some statements to you concerning drinking and driving a motorcycle. Please tell me in each case how much you agree.

	Very	Fairly	Not much	Not at all
a) You can drink and drive if you drive carefully	☐ 1	☐ 2	☐ 3	☐ 4
b) Drinking and driving increase the risk of an accident with another road user	☐ 1	☐ 2	☐ 3	☐ 4
c) If you drink and drive you will be stopped and fined by the police.	☐ 1	☐ 2	☐ 3	☐ 4
d) Most of your motorcycle-driving friends would drink and drive a motorcycle	☐ 1	☐ 2	☐ 3	☐ 4

(SHOW CARD 2)

MC11. Over the last month, How often have you driven a motorcycle after having drunk even a small amount of alcohol?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

MC12. Over the last month, how often did you drive a motorcycle, when you may have been over the legal limit for drinking and driving?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

MC13. In your opinion, how much alcohol can we drink before driving and still remain under the legal limit? (Write in number of units)

|__|__| units (2digits)

MC14. People have different opinions about what the legal limit should be. Which of the following statements best matches your opinion? Do you think that motorcycle drivers should be allowed to drink...

No alcohol at all	☐ 1
Less alcohol than at present	☐ 2
As much alcohol as at present	☐ 3
More alcohol than at present	☐ 4
As much as they want	☐ 5

MC15. In the past 3 years, how many times have you been checked for alcohol while driving a motorcycle?

Never	☐ 1
Only once	☐ 2
More than once	☐ 3

MC16. In the past 3 years, have you been fined, or punished in any other way, for driving a motorcycle while under the influence of alcohol??

No	☐ 1
Yes, only fined	☐ 2
Yes, fined and/or other penalty	☐ 3

(SHOW CARD 2)

MC17. On a typical motorcycle journey, how likely is it that you will be checked for alcohol?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

IV - Fatigue driving

MC18. In the past 12 months while driving a motorcycle, how often did you realize that you were actually too tired to drive?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

V - Accident experience

MC19. In the last 3 years, how many accidents have you been involved in, as the driver of a motorcycle, in which someone, including yourself, was injured and received medical attention?

|__|__| acc. (2 digits)

VI - Environmental issues

(SHOW CARD 1)

MC20. In order to reduce air pollution, how much are you willing to accept the following suggestions:

	Very	Fairly	Not much	Not at all
a) Reduce the usage of your motorcycle	☐ 1	☐ 2	☐ 3	☐ 4
b) Use public transport more frequently	☐ 1	☐ 2	☐ 3	☐ 4
c) A car free day each month	☐ 1	☐ 2	☐ 3	☐ 4
d) Use a bicycle more frequently	☐ 1	☐ 2	☐ 3	☐ 4

VII - Road users interaction, ITS use and driving style

(SHOW CARD 2)

MC21. When driving a motorcycle, how often do you...?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Follow the vehicle in front too closely	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Give way to a pedestrian at pedestrian crossings	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Drive through a traffic light that is on amber	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Overtake when you think you can just make it	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
e) Flashed the lights or used the horn in anger	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
f) Use phone system in the helmet	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
g) Use electronic tag for payment if tolls (highways, cities-tunnels etc.)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

MC22. Have you completed advanced motorcycle skill courses?

Yes ☐ 1 No ☐ 2

(SHOW CARD 1)

MC23. While driving a motorcycle, how dangerous do you think is...

	Very	Fairly	Not much	Not at all
a) weaving in and out between cars when traffic is dense in urban area	☐ 1	☐ 2	☐ 3	☐ 4
b) weaving in and out between cars on a highway	☐ 1	☐ 2	☐ 3	☐ 4
c) overtaking between lines on highway/beltway	☐ 1	☐ 2	☐ 3	☐ 4
d) overtaking a vehicle on the right	☐ 1	☐ 2	☐ 3	☐ 4

MC24. Now I will ask you some questions about your main reasons for driving a motorcycle. How much do you agree with the following: do you drive a motorcycle because...

	Very	Fairly	Not much	Not at all
a) Of saving time reasons	☐ 1	☐ 2	☐ 3	☐ 4
b) It provide pleasure (fun/recreation)	☐ 1	☐ 2	☐ 3	☐ 4
c) It's easier to find parking	☐ 1	☐ 2	☐ 3	☐ 4
d) It's cheaper to use than a car	☐ 1	☐ 2	☐ 3	☐ 4
e) For air pollution reduction (CO2 emission)	☐ 1	☐ 2	☐ 3	☐ 4
f) Because you have the "spirit of a biker/rider"	☐ 1	☐ 2	☐ 3	☐ 4
g) Enjoy acceleration and high speed	☐ 1	☐ 2	☐ 3	☐ 4
h) Don't have a car	☐ 1	☐ 2	☐ 3	☐ 4
i) No other options when getting to work/study	☐ 1	☐ 2	☐ 3	☐ 4
j) To avoid getting trapped in congestion	☐ 1	☐ 2	☐ 3	☐ 4
k) Gives you a sense of freedom	☐ 1	☐ 2	☐ 3	☐ 4

(SHOW CARD 2)

MC25. Now I will ask you some questions about the purpose of using your motorcycle. Are you mainly using your motorcycle as:

	Never	Rarely	Sometimes	Often	Very often	Always
a) A commuter for home-work travels	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) A sport-rider liking high speeds on road	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) A rambler for fun	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) A member of a community biking group	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
e) A "green driver" contributing to reduce traffic jam	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
f) A traveller for long distance travel	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

IX – Cause of accident

MC26. How often do you think each of the following factors are the cause of motorcyclists being involved in a road accidents?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Motorcycling when tired	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Drinking and motorcycling	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Following too closely the vehicle in front	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Driving too fast	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
e) Taking prescription medicines and motorcycling	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
f) Taking drugs and motorcycling	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
g) Traffic congestion	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
h) Bad weather conditions	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
i) Poorly maintained motorcycle	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
j) Poorly maintained roads	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

X - Questions about the interviewee

MC27. What engine size is the motorcycle you usually drive?

|___|___|___|___| cc (4 digits)

MC28. What kind of motorcycle do you usually drive?

|___|___|___|___|___|___|___| (see code on show card 7)

MC29. How many years have you been driving a motorcycle?

|___|___| years (2 digits)

MC30. In an average year, how many months do you use a motorcycle?

|___|___| months (2 digits)

(SHOW CARD 1)

MC31. How dangerous do you think it is to drive while taking a medication that carries a «warning: it may influence your driving ability»?

Very	Fairly	Not much	Not at all
☐ 1	☐ 2	☐ 3	☐ 4

(SHOW CARD 2)

MC32. Have you driven while taking such medications?

Never	Rarely	Sometimes	Often	Very often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

MC33. In the last year, how many times have you been checked for the use of drugs/ medication while driving?

Never	☐ 1
Only once	☐ 2
More than once	☐ 3

MC34. In the last year have you been fined, or punished in any other way, for the use of drugs/medication while driving?

No	☐ 1
Yes, only fined	☐ 2
Yes, fined and/or other penalty	☐ 3

End of section for MotorCyclists

Section for OtherRoadUsers

***Only those who answered code 3 at QJ are eligible to answer this section.**
****Respondents who fill out this section CAN NOT also fill out Motorcyclists or car drivers sections.**

Motivations for not using a car or a motorcycle

(SHOW CARD 1)

ORU01. How much would you agree or not with each of the following being reasons for walking/cycling/using public transport?

	Very	Fairly	Not much	Not at all
a) financial reasons	☐ 1	☐ 2	☐ 3	☐ 4
b) health reasons	☐ 1	☐ 2	☐ 3	☐ 4
c) environmental reasons	☐ 1	☐ 2	☐ 3	☐ 4
d) no necessity /just other means of transport	☐ 1	☐ 2	☐ 3	☐ 4
e) fear of driving	☐ 1	☐ 2	☐ 3	☐ 4
f) need of more physical exercise	☐ 1	☐ 2	☐ 3	☐ 4
g) driving licence withdrawal/ban	☐ 1	☐ 2	☐ 3	☐ 4

II – Use of transport means

ORU02. On average, how many kilometres per day you usually travel by the following:

a) walking	__ __ km (2 digits)
b) cycling	__ __ km (2 digits)
c) public transport	__ __ km (3 digits)
d) car passenger	__ __ __ km (3 digits)
e) moped (<= 50cc)	__ __ km (2 digits)

III – Travelling style

(SHOW CARD 2)

ORU03. As a pedestrian, how often do you...?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Cross the road when it's a red light for pedestrian	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Cross streets at places other than the pedestrian crossing	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Avoid certain streets or intersections because they are too dangerous	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Wear reflective clothing	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
e) Have to walk on the street because of parked cars or other barriers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
f) Make/answer a call with handheld phone	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
g) Use MP3/iPod/music devices	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

(SHOW CARD 1)

ORU04. As a pedestrian, thinking about the area in which you walk on, how satisfied are you with the following?

	Very	Fairly	Not much	Not at all
a) Pavements	☐ 1	☐ 2	☐ 3	☐ 4
b) Separation of pedestrians and cyclists	☐ 1	☐ 2	☐ 3	☐ 4
c) Safety	☐ 1	☐ 2	☐ 3	☐ 4
d) Speed of the traffic	☐ 1	☐ 2	☐ 3	☐ 4
e) Volume of traffic	☐ 1	☐ 2	☐ 3	☐ 4
f) Number of street lights	☐ 1	☐ 2	☐ 3	☐ 4
e) Number of places to cross the street	☐ 1	☐ 2	☐ 3	☐ 4

if ORU2. b) is "zero" à skip ORU05 and ORU06 and go to ORU07.

(SHOW CARD 2)

ORU05. As a cyclist, how often do you...?

	Never	Rarely	Sometimes	Often	Very often	Always
a) Cross the road when it's red light	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Avoid certain streets or intersections because they are too dangerous	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Wear reflective clothing	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
d) Wear a bicycle helmet	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
e) Cycle on the pavement to avoid car traffic	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
f) Make/answer a call with handheld phone	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
g) Use headlamp when cycling in dark	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
h) Use MP3/iPod/music devices	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
i) Cycle on wrong side	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

(SHOW CARD 1)

ORU06. As a cyclist, concerning the route you usually take, how satisfied are you with the following?

	Very	Fairly	Not much	Not at all
a) Cycle paths	☐ 1	☐ 2	☐ 3	☐ 4
b) Safety	☐ 1	☐ 2	☐ 3	☐ 4
c) Speed of the traffic	☐ 1	☐ 2	☐ 3	☐ 4
d) Volume of traffic	☐ 1	☐ 2	☐ 3	☐ 4
e) Number of street lights	☐ 1	☐ 2	☐ 3	☐ 4

if ORU2. c) is “zero” à skip ORU07 and go to ORU08.

ORU07. As a public transport user, concerning the route you usually take, how satisfied are you with the following?

	Very	Fairly	Not much	Not at all
a) Frequency of public transport	☐ 1	☐ 2	☐ 3	☐ 4
b) Density of the public transport network	☐ 1	☐ 2	☐ 3	☐ 4
c) Safety	☐ 1	☐ 2	☐ 3	☐ 4
d) Quality/comfort of vehicles	☐ 1	☐ 2	☐ 3	☐ 4
e) Accessibility	☐ 1	☐ 2	☐ 3	☐ 4
f) Price	☐ 1	☐ 2	☐ 3	☐ 4

IV - Road users interaction and travelling style

(SHOW CARD 2)

ORU08.When travelling in general, as a pedestrian, how often do you...

Never	Rarely	Sometimes	Often	Very often	Always	
a) Get very annoyed with car drivers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Get very annoyed with motorcyclists	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Get very annoyed with bicyclists	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

note: if ORU2. b) is “zero” à skip ORU09 and go to ORU10

ORU09.When travelling in general, as a cyclist, how often do you...

	Never	Rarely	Sometimes	Often	Very often	Always
a) Get very annoyed with car drivers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
b) Get very annoyed with motorcyclists	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
c) Get very annoyed with bicyclists	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

(SHOW CARD 1)

ORU10. I'm going to read out some statements to you concerning drinking and walking/cycling. Please tell me in each case how much you agree.

	Very	Fairly	Not much	Not at all
a) You can drink and walk if you do it carefully	☐ 1	☐ 2	☐ 3	☐ 4
b) You can drink and cycle if you do it carefully	☐ 1	☐ 2	☐ 3	☐ 4
c) Drinking and walking increase the risk of an accident with another road user	☐ 1	☐ 2	☐ 3	☐ 4
d) Drinking and cycling increase the risk of an accident with another road user	☐ 1	☐ 2	☐ 3	☐ 4

ORU11. In the past 3 years have you been involved in a road accident as a…

a) Pedestrian	Yes ☐ 1	No ☐ 2
b) Cyclist	Yes ☐ 1	No ☐ 2
c) Car passenger	Yes ☐ 1	No ☐ 2
d) Motorcycle passenger	Yes ☐ 1	No ☐ 2
e) Moped rider (<= 50cc)	Yes ☐ 1	No ☐ 2

End of section for Other road users

Following section is COmmon for all

CO10. Which of the following applies best to you at the moment?

Single	☐ 1
Living as married	☐ 2
Married	☐ 3
Separated or divorced	☐ 4
Widowed	☐ 5

CO11. Do you have children? Yes ☐ 1 No ☐ 2

CO12. If yes, how many? |__|__| (2 digits)

CO13. What level of education did you achieve?

Primary school	☐ 1
Secondary school	☐ 2
Further education	☐ 3
None	☐ 4

CO14. How would you describe the area where you live?

Rural/village	☐ 1
Small town	☐ 2
Suburban/city outskirts	☐ 3
Urban/city/large town	☐ 4

EXPLAIN THAT THIS IS FOR BACKCHECK PURPOSES ONLY.

RESPONDENT NAME:____

TEL NO:____

ADDRESS:____

____

Annex of Questionnaire – SHOW CARDs

CARD 1

Very	Fairly	Not much	Not at all

CARD 2

Never	Rarely	Sometimes	Often	Very often	Always

CARD 3

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

CARD 4

One unit of alcohol	= ½ pint beer	
	= 1 glass wine	= 12 cl
	= 1 single spirit	
i.e. 1 pint beer or double spirit = 2 units		

CARD 5

Drivers should be allowed to drink:

…no alcohol at all
…less alcohol than at present
…as much alcohol as at present
…more alcohol than at present
…as much alcohol as they want

CARD 6

Nearly daily
1 to 4 times a week
1 to 3 times a month
Less than once a month

CARD 7

1) Conventional street style or Naked Motorcycle

Code 1

2.) Sport style Motorcycle

Code 2

3.) Touring style Motorcycle

Code 3

4.) Touring-Enduro, Enduro or Offroad style Motorcycle

Code 4

Code 4

Code 4

5.) Chopper or Cruiser style Motorcycle

Code 5

6.) Scooter style Motorcycle

Code 6

2 - Important changes since SARTRE 3

Austria

2002	Every driver involved in an injury accident has been tested for alcohol (unless killed or unconscious). However, it is not permitted in Austria to test a corpse, so the estimated number of unreported cases is still high.
2003	Introduction of graduated driver training (multiphase driving licence).
2005	Introduction of roadside screening tests in drink driving enforcement. The new instruments should therefore be applied in every roadside check. The risk of being tested for drink driving is very low in austria. There is on average one check per austrian citizen every 33 years.
2005-05-01	An obligation for drivers to carry reflective vests in their vehicles. Drivers have to put on the garment when they are on the road after a breakdown or accident outside built-up areas.
2005-07-01	Introduction of the penalty points systems. The system will allow for better control of repeat and high risk offenders. The model uses the “three strikes and you are out” concept. If a driver commits the same traffic offence for the second time within two years, he or she will face specific measures such as driver-improvement or re-education courses, depending on the nature and severity of the offence. In case of a third offence within two years, they will lose their driving licence for at least three months. Sanctions covered include driving under influence of alcohol and the non-use of child safety restraint use. The penalty point system does not include any chargeable offences for speeding or non-seat belt use.
2005	A seat belt campaign “Seat Belts Save Lives: Life has priority” which stresses how es-sential the use of seat belt is to save lives in traffic accidents. The campaign addresses Austria’s low seat belt wearing rates.
2009-08-01	New sanctions were introduced in Austria for drink driving. For a BAC between 0.5-0.79 a driver will receive a fine of between 300 EUR and 3,700 EUR and lose one demerit point. In case of a third offence the driver faces a 3 month licence withdrawal. For a BAC of between 0.8-1.19 the fine is at 800-3,700 EUR, a one month license withdrawal and coaching. The coaching course lasts for half a day and confronts the driver with the dangers of drink driving and counsels them about their behavior: the cost is 100 EUR. If it is the second offence the licence is withdrawn for at least 3 months; for the second offence within a time period of five years the driver will take part in a rehabilitation programme. For offences between 1.2 and 1.6 offenders participate in a programme that is made up of 4-5 sessions over a number of weeks. Offenders look at the dangers of drink driving more intensively and discussions of experiences take place in group discussions. For a BAC of 1.6 or higher a higher fine of 1,600-5,900 EUR is paid together with a license withdrawal of at least 6 months, driver rehabilitation, assessment and the intervention of a public health officer. For novice drivers a first offence for a BAC of over 0.1-0.49 immediately results in driver rehabilitation and the prolonging of the probation period. If the novice driver has a BAC of 0.5 or higher, then they will participate in driver rehabilitation and the prolonging of the probation period as above but also supplementary sanctions. Professional drivers also face stricter measures with higher fines and loss of demerit points and licence withdrawal depending on the BAC level.
2009-08 -01	Very excessive speeding has been penalised more severely. Exceeding the speed limit by more than 30 km/h now results in penalties between eur 70 and eur 2 180

2009-08 -01	01 Children less than 150 cm must use suitable child restraints. These must at least comply with test standard ECE 44 in the version 03 (ECE44/03). Car drivers are responsible for buckling up all children up to the age of 14.
2009-11	The Austrian Transport Ministry and the Austrian Road Safety Council together with other partners launched a new campaign focusing on prevention and awareness building around the issue of dink driving. The aim is to show people the possible consequences of drink driving and driving on other peoples' lives. The title of the campaign is: „Drink Driving: could you live with that?". The broad media campaign will include TV, radio and cinema spots, new media such as Facebook, roadside posters and ads on public buses.

Belgium

2002	Stopping or parking less than 1.5 metres from a pedestrian crossing is forbidden,
2003	All moped riders must use a helmet
2004	Cyclists are allowed two-way usage of one-way roads when indicated
2004-03-01	Number of changes were made to the new traffic law in Belgium. The amended law introduces a new classification of traffic law violations, including three different degrees of “serious offences” which are linked to heavy fines. Some of the “very serious offences” have now been changed back into “normal offences”.
2005-04-04	Class B mopeds must drive on the road
2006-03-31	A new traffic law came into force in Belgium on 31 March 2006, introducing a new and “more logical” categorization of traffic offences. The sanction is now in proportionate to the risk of creating a danger. A large scale campaign was set up in April to inform people and more than 1 million ‘fine-cards’ describing the sanctions were distributed via the police.
2007-02-01	Reduction of maximum speed limit for heavy load trucks weighing over 3.5 tonnes to 90 km/h on highways. Interdiction for trucks above 7.5 tonnes to overtake on motorways in the rain.
2007-03-01	Revision of the rule on giving way to vehicles coming from the right. Obligation for class b mopeds to use cycle paths in more than 50 km/h areas.
2007-05-12	New breath tests and analyses.
2009-01-01	Increase in penalties for hit and run and for repeat offenders.
2009-06-01	Obligation for fluo vest in each car.
2009-07-12	Alcolock Legislation in Belgium. In Belgium a new framework law was recently adopted in Parliament on the 4th of June 2009. This supplementary regulations on the operational considerations and other technical aspects were published on the 9th of December 2010. These cover issues such as supervision of the data registered by the alcolocks, type-approval of the alcolocks, approval of service-providers and monitoring agencies, etc. In order to optimize the long-term effects of driving with the alcolock, the alcolock programme contains a specific driver improvement course. The drivers will cover the costs of installing and using the interlock, but the judges may substract a part of these costs from the fine. The new law entered into force on the 1st October 2010. The new law allows the judges to limit the driving license of any drink driving offender (not only recidivists) to vehicles equipped with an alcolock The alcolock will allow the offender to seek help and continue driving with the ‘help’ of the alcolock. The tresholds of the interlocks will be set at 0.09 mg/l exhaled air (the equivalent of 0.2 BAC, which is lower than the legal limit of 0.5) - the reasoning is that the driver would otherwise be banned from traffic, with the alcolock they have a ‘second chance’, so a stricter system makes sense.
2009-07-31	Introduction of legislation on saliva test for drugs; executed by 1st October 2010.
2010-09-16	The entire centre of Brussels is now limited at 30km/h.

	Regular campaigns on drink driving. Bob drink driving campaign, whereby one driver is nominated not to drink and to chauffeur other revellers home safely. The six week long campaign, which is run by the Belgian Road Safety Institute (IBSR/BIVV) enjoys the support and co-operation of the government, federal and local police, local and national transport services, the insurers and brewers. Both the police and the government stressed the need to link intensified alcohol checks to the media campaign. Police aim to test at least 180.000 drivers during the campaign period (start November 2010 – end January 2011). Small-scale BOB campaigns for specific target groups will be implemented in 2011 throughout the whole year.
	Regular campaigns on speed, seat belts, mobile phones …
	There is currently a political discussion about a lower limit (0.2 g/l) for novice drivers (those licensed for less than two years), truck drivers and motorcyclists.

Cyprus

2005	A new speed management pilot scheme will start this autumn in Cyprus with the introduction of 7 mobile and 5 fixed cameras in places where there is a high fatality rate, along highways and in urban areas. Currently the country uses about 200 mobile laser devices to enforce speed limits. If the initiative is successful Cyprus is planning to increase the number of safety cameras to 126 over the next two years. New legislation requires to put signs before the camera. Speeds are currently being monitored at future points of installation of the cameras in order to be able to assess the differences in speed before and after the introduction of the speed cameras, and the public will be informed of these figures. Cyprus also expects with this measure to prevent young drivers from customising their cars to reach higher speeds, an increasing problem in Cyprus.
2006	In Cyprus the legal blood alcohol level was recently reduced from is 0.9mg/ml, the highest in the EU, to 0.5 mg/ml. A special 0.2 mg/ml BAC limit for new drivers (first three years) and professional drivers was also proposed but not passed.
2010	The speed management scheme with cameras is planned to begin operation again during 2011 as the pilot scheme started in 2005 now suspended in 2006 due to unforeseen problems in the tendering procedure.

Czech Republic

2001-01-01	The following measures have been in force: Priority for pedestrians on pedestrian crossings, Daytime running lights during the winter period, Priority of vehicles at roundabouts, Obligatory use of child restraining devices on motorways and dual carriageways outside urban areas, Obligatory use of cycle helmets for children up to 15 years in 2001 and to age 18 in 2006.
2006-07-01	The new legislation introduces a new 12 point demerit system. For instance 7 points will be removed if a driver refuses a breath test. In addition, higher fines were introduced with the lowest fine being set at 1,500 crowns (approximately 50 EUR). Police are also able to confiscate the driving license on the spot for serious offences.Other changes involve making driving under the influence of alcohol over 1.0 BAC a criminal offence. The new act also proposed a number of additional safety measures such as the mandatory use of daytime running lights throughout the year and the extension of the compulsory use of child restraint systems to all types of road. Aside this, new responsibilities have been given to the Ministry of Interior and to the National Police Force for road accident prevention.
2009	The Ministry of Transport and the traffic police jointly launched the campaign “Safe Holiday 2009”
	The Designated Driver Campaign “Let´s agree” targeting young drivers was successfully continued.
	A new safety campaign, “If you don’t think, you will pay”, was initiated to target the most dangerous behaviours (aggressive driving, drinking and driving, speeding, and failure to wear seat belts).

Estonia

2001	The new Traffic Act came into force, introducing a number of important legislative measures: the legal alcohol limit for drivers is 0.1 milligrams in blood (BAC), or 0.2-0.49 in breath tests, drink-driving when BAC is over 0.5 milligrams, cyclists aged 10 to 15 years and moped riders aged 14 to 15 years must obtain a licence, two level motor vehicle driver training system (preliminary level and basic level), all driver candidates must pass training at driving schools, technical conditions for seasonal speed limits, technical conditions for motor vehicles harmonised with EU directives, new rules on road accident registration.
2002	Changes in regulation about bicyclist and moped driver licensing and examination. Regulations established for 10..15 year old bicyclist and 14...15 years old moped driver examination and drivers' licensing
2002	Penalties changed - first case of drink driving. From Sep 1st, 2002 drink driving could be fined by administrative penalty and/or drivers licence withdrawal or arrest. Second case will be fined as criminal offensive either by fine, or prison and/or withdrawal the licence
2008	Changes in Traffic Law (December.27). Changes in fining : 1. Speeding: Up to 20 km/h over limit: max fine is 1800 EEK (115 EUR) instead of 600 (38 EUR), Up to 40 km/h: max fine is 6000 EEK (383 EUR) instead of 3000 EEK (192 EUR). 2. Non used seat belts: Fine is now 3000 EEK (first case) up to 6000 EEK (repeated offensive).
2009	Changes in drink driving definitions (levels remained unchanged)
2010	Introduction of speed cameras. First 16 speed cameras were installed on Tallinn-Tartu Road (May 2010) + 8 cameras on Tallinn-Pärnu Rd (December)
2010/2011	The Estonian Parliament (Riigikogu) accepted the new Traffic Law, and originally this was planned to adopt since January 1st, 2011. BUT- as a lot of experts and NGO's (Association of Driving Schools - for example) found there misunderstandings and new aspects in the text and there was so many critics against this new law, we had a discussion in Estonia how we must proceed. In November that was absolutely unclear what will be the situation between three options- to decline the new law, to postpone it's adoption or to proceed as originally planned. Only a few days before the New Year the Parliament made it's final decision to postpone the adoption of the new Traffic Law by six months, and under present circumstances it will be get into power since July 1st, 2011, but there is still a chance that some articles will be changed by this time. So we are in a very strange situation. Even there are not so many extreme changes, some smaller ones are probably possible.

Finland

2003-01-01	• Helmet wearing is compulsory for all motorcycle and moped riders. While it has been mandatory to wear a helmet while cycling since 2003, this is not enforced. The bicycle helmet usage rate was 25% in 2004, 29% in 2005, 33% in 2007 and 31% in 2008. Most small children wear helmets, but teenagers and elderly people tend not to do so. The usage rate in the Helsinki area is about 50%, but rates in northern Finland are much lower. • Pedestrians must in general use a proper reflector when walking on roads in the dark (The Road Traffic Act §42) • Prohibition to use mobile phones while driving a motor vehicle (The Road Traffic Act §24a)
2003-02-01	Zero tolerance for drugs and medicines use in traffic
2004	Reduction of tax on alcohol
2004-09-01	Doctors have an obligation to inform the police about driving license holders with a permanent impairment to drive (The Road Traffic Act §73a)
2005-03-01	Consequences of traffic offences to drivers' licenses have become stricter (The Road Traffic Act §73a)
2005–2008	BAIID experiment (alcohol interlocks will be mandatory for school buses in August 2011)
2009	Harmonization of the impostition of fines related to speeding
2010	Experiment for mean speed control by police cameras
campaigns	"Turvallisuus on pieniä tekoja" (Small actions to improve safety) 2004-2007 Campaign for helmet use for cyclists 2006 "Jos otat, ota kuski" (Abstinence in traffic) 2004–2006
Ongoing campaigns	"Valppain mielin"(On guard) 2009 – www.valppainmielin.fi (Finnish, Swedish)

France

2003	Speed cameras and the driving license on probation. France has launched a driving license on probation, which gives the holder only 6 instead of 12 penalty points for a period of three or two years depending if he has completed a voluntary training course. Only if no point has been lost during this period, the amount will be increased to the customary 12 points.
2004	France has introduced a new BAC limit of 0.2 mg/ml for drivers of buses and coaches. Sanctions imposed for violations of the new rule will be the same as for violations of the 0.5 hg/ml general limit, i.e. a fine and 6 points on the driving license.
2008-01	Strengthened technical control of cars due to aging fleet and taking into account some technological evolutions of the vehicles. The new points of control are: dampers, brakes' safety and new measurement of pollution.
2008-07	Compulsory reflecting jacket and triangle. Cyclists must wear a reflecting jacket outside urban areas at night
2008-07	Creation in urban areas of traffic calming zones in order to allow a better coexistence of all modes of travel. In these zones, priority is given to pedestrians who are not obliged to travel on sidewalks, the speed limit of motor vehicles is 20 km/h and one way streets are two-way for cyclists. The ways in and out of these areas are delimited by two new specific panels.
2008-08	New decree allowing a saliva test, much easier than the previous urine test, for the road side control of drivers under drugs influence. If the test is positive, a blood control is decided for determining the exact rate of drug of the driver. In case of confirmation the driver may be punished to two year jail, 4500 €fine and three year withdrawal of driving license.
2009	First implementation of red light cameras started at the beginning of 2009
2009-01	Strengthening of the legislation for driving a 125 cc motorcycle. Since January 1st, the drivers who got their B License (private car) after 01/01/2007 are obliged to follow a three hours training.
2009-08	Mandatory alcohol interlock in school buses
2010	In France the government launched a new film "Unbearable", as part of its campaign to reduce drink driving amongst young people. The short spot, prepared only for the Internet, was criticised by some in the media as being too violent.
2011-01	From January the 1st, a 7 hours training will be mandatory for B license holders (private car), who never had driven a motorcycle before, in order to be allowed to drive a 125cc motorcycle.

Germany

2003	Germany toughened up its traffic laws to include stricter sanctions for the use of hand-held mobile phones by motorists and cyclists, the non-use of seat belts in coaches as well as dangerous overtaking. Since 1 April 2004 tougher sanctions apply also to speeding offences committed by trucks and coach drivers.
2003	Almost all German Länder introduced pilot projects to test voluntary further training seminars for holders of probationary driving licences. If young drivers completed such a seminar, their license probation period of two years was reduced by one year. The pilot projects ended in 2009
2005	Accompanied driving from the age of 17 on was introduced on a trial basis in all Länder. Following a positive evaluation this measure became federal law on January 1st 2011.
2007-08-01	A zero BAC limit for young drivers (< 21 years) and novice drivers in the probationary period was introduced.
2009-02-01	From the 1st of February stricter laws came into force for following up traffic offences including drink driving. The fine has been doubled to 500 EUR for a first offence, for a repeat offence this increases to 1,000 and by a third offence 1,500 EUR. Young and novice drivers who do not stick to the 0.0 BAC Alcohol limit pay a 250 EUR fine.
	• recommendation for the application of day€time€unning lights • carrying out of nation€wide safety campaigns (i.e. “Hast Du die Größe?”, “Runter vom Gas” and others) • ESP has been introduced broadly in the vehicle fleet.

Greece

2001	New legislation was introduced to add breath-test limits to the existing blood test limits for alcohol and a lower limit (0.2 g/ l) is introduced for professional drivers (heavy goods vehicles, school buses and coaches), motorcycles and moped riders.
2000-2004	Intensification of enforcement mainly for speeding, drink-and-drive, seat belt and helmet use
2000-2010	Large project of upgrade of the national road network (motorway length from 350 km in 2000 has been increased to 1400 km)
2001-2005	Implementation of the first national road safety strategic plan. The Inter-Ministry Committee is established (2001) and the respective Secretariat (2003). Ministries develop and implement their first action plans.
2001-2010	Intensification of road safety campaigns by public and private bodies.
2003	The Road Code revision introduces more compulsory driving obligations (e.g. seat belt use in rear seats, etc.).
2007	The revised Road Code, which came into force on April 2007, imposes higher fines to several serious offences, e.g. up to 350 EUR for speed violations and driving license suspension up to 60 days.
2005-2010	Implementation of the second national road safety strategic plan. Ministries develop and implement their action plans.

Hungary

2001	The speed limits outside built€up areas were raised.
2004-04-01	Stricter penalty point system, replacing the earlier system which was introduced in 2001. Under the new rules, drivers can receive up to three instead of only one point for minor offences. This is expected to increase the deterrent effect of the system, because drivers now run a higher risk of reaching the maximum number of 18 points, upon which the driving licence is withdrawn.
2008-01-01	The number of automatic speed cameras is increasing progressively. The most important legal prerequisite for their use was the introduction of owner responsibility (i.e. The owner of a vehicle is responsible for the offences caused by the vehicle). This rule was introduced on 1 January 2008 and entered into force on 1 May 2008.
2008-01-20	So€called “zero tolerance” rule against drinking and driving entered into force. It means that the driving licence can be withdrawn on the spot if the driver is under the influence of alcohol (even a small amount of alcohol).
2009-03-01	Introduction of the so-called automatically issued, camera-detection based administrative fine (speeding, driving , passing through a red signal, offense of parking regulations, etc.).
2009-08-01	From 1 August 2009 some sanctions became more severe. The penalties for not wearing the safety belt, not using the child restraint system (CRS) or using a hand€held mobile phone while driving have been significantly increased. For example, the penalty for using a hand€held mobile phone while driving is HUF 10 000 inside built€up areas (ca. EUR 40), HUF 15 000 outside built€up areas (ca. EUR 60) and HUF 20 000 on motorways (ca. EUR 80). The penalties for not using CRS are HUF 15 000, HUF 30 000 or HUF 45 000 and those for not using the safety belt or safety helmet are HUF 10 000, HUF 20 000 or HUF 30 000, depending on road category. The increases could be useful from the point of view of road safety, but could also be problematic, as higher penalties will be imposed without demerit points.

Ireland

2005	In Ireland, the success continues of "Traksure" an AXA motor insurance initiative for young male drivers who can show their commitment to safe driving. Two hundred new drivers have taken up the scheme alongside three thousand others who are either on, or have passed through the scheme. Traksure is a small box which is fitted to a vehicle which uses GPS satellite technology to identify what speed a vehicle has been traveling at any given location. This information is then transmitted periodically back to a monitoring station using the GSM mobile phone network. The scheme can thus identify and reward young male drivers who drive within the speed limit and, conversely, take action against those drivers who don't do so. Taking the cost of the system into account participating drivers can expect to save around 40% on their motor insurance costs over three years. The product has been jointly developed by AXA Insurance with the west of Ireland Technology Company CELtrak and Dublin based insurance brokers O'Reilly Cullen and is so far unique in Europe.
2010-07	Ireland introduced a lower legal BAC level for drivers. The previous legal BAC limit of 0.8g/l will go down to 0.2 for novice and professional drivers including taxi drivers and hauliers and to 0.5 for all other drivers.
	Ireland has introduced mandatory alcohol testing, which allows the police (once authorised by a senior officer) to carry out roadside screening tests on drivers without any previous suspicion of intoxication. This has led to an increased rate of drivers being tested.

Israel

2008	Israel passed a controversial universal bicycle helmet law, but it is little enforced
2010	A law requiring all new passenger cars imported after 1 January 2010, and all buses imported after 1 January 2012, to have Electronic Stability Control

Italy

2003	The introduction of a penalty point system for breaking the Highway Code
2003	Obligation for drivers to carry reflective vests in their vehicles and obligation to wear a reflective vest when leaving a vehicle on the road side
2003	Increased enforcement of wearing helmets for motorcyclists including increased fines
2005	The Italian Government has recently approved a decree partially modifying the penalty point system. This decree follows the Italian Constitutional Court ruling that had declared unconstitutional some norms of the law. The new decree will first and foremost give back the points to those drivers who had seen their points reduced even if they had declared that somebody else was driving their vehicle when the infraction was made. Moreover, the new decree halves the supplementary fines charged for those drivers who refuse to declare who was driving their vehicle. The fines will not be in the range of 500-2,000 but in the range of 250-1,000.
2006	On the main Italian motorways the Tutor system has been used. The system checks a vehicle's average speed limit in a section of approximately 10-25 km.
2010	New legislation adopted in Italy will introduced a new 0 BAC limit for novice and professional drivers. Zero tolerance, with an alcohol limit of 0;00 g/l is now applied for novice drivers having passed the license less than three years before, drivers aged eighteen to twenty one years old, professional drivers, taxi drivers and truckers. Employers will be allowed to dismiss them if their licences are suspended for driving without respecting the 0.00 g/l limit. For all the other categories of drives the penalties will increase if they are caught driving with a blood alcohol level higher than 0.5 g/l. With a BAC 0.0 and 0.5 (for novice and professional Drivers) the fine will be 155-624 plus penalty point withdrawal. The penalties in case of road accidents will be doubled. With a BAC between 0.5 and 0.8 sanctions are increased by one third, and the vehicle is detained for 180 instead of 90 days. The penalties in case of road accidents will still be doubled. If the BAC is higher than 1.5 the driver can be arrested for not less than 6 months (3 months with the previous legislation) up to one year. The Italian legislator also introduced a test on alcohol and drug abuse as one of the conditions to obtain the license. The new law also prohibits the sale of alcohol in public places. Finally, the alcohol tests will have to be made available to customers in all restaurants, pubs, and discos.

Netherlands

2002	With a probationary license drivers can loose their license if they are caught for 3 severe traffic violations within a period of 5 years. After 3 severe violations license is suspended and drivers are required to undergo practical and theoretical driving test. Failure on either of these tests will result in loss of license. If beginning drivers are caught drinking-and-driving with a BAC > 0.81 they are required to follow a 3-day educative programme on traffic and alcohol
2003	A five year road safety information campaign was launched focused on seatbelt, alcohol etc.
2006	The Netherlands have introduced a new BAC limit of 0.2 mg/ml for novice drivers. This new limit applies for the first five years after obtaining a driving licence to drivers who obtained their novice driving licence on or after 30 March 2002.
2007-04	New regulation on driving times and rest periods for heavy vehicles (European Directive)
2008-01	New driving test
2008-04	20% increase in the amount of fines
2008-06	Information campaign on fatigue
2008-08	Educational campaigns to prevent blind spot crashes
2008-10	Light Educational Measure Alcohol (LEMA) for drivers who slightly exceed the maximum allowed amount of alcohol
	Educational Measure dangerous Behaviour (EMG): aggressive motor vehicle drivers must follow a special course
2009-03	Compulsory post€test for truck drivers
2009-08	Obligatory post€test for bus drivers
2009-10	New category of driving licence for mopeds
2009-05	Ban on mobile phone use for light moped riders
2009-05	Speed limit of 90 km/h on trunk roads and motorways for any car or delivery van with a light trailer
2010-06-01	The Alcohol Interlock Programme Bill was passed by the Senate on 1st June 2010 and became law on 4th June 2010. The draft ministerial regulations setting out the technical requirements for alcohol interlocks and vendors are expected to be finalised in autumn 2010. The Ministry is aiming to introduce the alcohol interlock programme as a measure for serious alcohol offenders from mid-2011.
2011-01	Accompanied driving (under preparation). The proposal would allow young people to start driving lessons at age 16.5 and obtain their driving licence at 17 upon passing a standard driving exam. Then, until they are 18, they would be able to drive only when accompanied by an experienced driver who met certain requirements in terms of driving experience and behaviour. From the age of 18 it will remain possible to pass the driving test and drive unaccompanied immediately afterwards.
	Practical exam for light moped riders (under preparation).
	All lorries within the European Union must have blind spot mirrors (under preparation, January 2011)

Poland

2002-2006	Programme to treat high risk sites on roads managed by the General Directorate for National Roads and Motorways
2004-05-01	Poland has adapted its speed limit for urban roads to match the legal requirements in the existing EU Member States. The national parliament adopted a limit of 50 km/h during the day, but insisted on keeping the old limit of 60 km/h at night time from 11pm to 5am. Jednocze€nie podniesiono limit pr€dko€ci na autostradach ze 120 na 130 km/h,
2005-09	The first national seatbelt campaign started in the mid-September in Poland. On the basis of the research results the campaign targets young people (18-25) and the main message addresses those rear seat passengers. The slogan is “the last bash” when a young man, unfastened on the rear seat, bashes out through the windshield for the last time in his life. The media mix includes TV, radio, billboards, posters in clubs, discos etc., bus backs and there is intensive PR envelope?. The campaign will run in September – October. It covers the whole country and is supported with increased enforcement of seatbelt use by the police. An umbrella logo “Turn on thinking” was inaugurated and will be used in future road safety campaigns.
2005-12	Poland launched a public awareness campaign on the use of seat belts and child restraint systems as part of the European campaign EUCHIRES. The campaign is addressed primarily to children aged 4 to 12 and their parents and is designed to promote safety and restraint systems for children, when they are in a car. The slogan of the Polish campaign is “The Armadillo Club Buckle Up”. The main organiser of the campaign is ETSC’s member Motor Transport Institute in a joint effort with the Ministry of Education, Police and Public Communication Foundation. Along with the media campaign the road police have intensified their involvement, kindergartens and schools have launched a special series of classes on the safe carriage of children. The campaign will run until the end of November
2006-06	A letter from Prosecutor General to prosecutors asking them to impose tougher drink drive policies. A new penal measure was recommended, i.e. seizure of the car considered a tool to commit a crime (in the case of a fatality accident, a reoffender or BAC> 1 %o).
2007-04	Daylight running lights become mandatory during the whole day and whole year.
2008	The General Directorate for National Roads and Motorways launched its programme “Roads of Trust”. Its strategic objective is to reduce by 75 per cent the number of road deaths on national roads until 2013. The programme covers all national roads and involves engineering measures to improve the safety of all road users, extend the system for automatic speed limit enforcement (speed cameras) and non-standard educational measures designed to change unsafe behaviour of road users.
2010-01	Tougher penalties for drink driving (BAC > 0.5 %o). In the case of a fatality or severe injury accident, the driver may be banned from driving for good.
2010-12-31	New speed limits: - on motorways from 130 to 140 km/h - on dual carriageways – from 110 to 120 km/h
2002-2010	Numerous campaigns promoting safe road traffic behaviour mostly addressing alcohol, speed and restraints. The campaigns are run by central and regional bodies, private companies and NGOs.

Serbia

2002	The National Assembly increased fines for traffic offences 7 to 10 times ("shock therapy"). This was backed by all media, experts in traffic and transport and the police. After one month of the campaign, traffic police intensified the control and sanctioning of offences. Especially controls directed at police officers who made offences were organized, which increased the effectiveness of the campaign.
2009	• Obligation for drivers to carry reflective vests in their vehicles; • Obligation for pedestrians to carry reflective vests when they walk outside of urban areas; • Prohibition of using mobile phone while driving; • Prohibition of heaving and using of antiradar devices in vehicles; • Defining of the violent driving; • Obligation for using the seat-belts on back seats; • Max. BAC: drivers of passenger cars 0,30; • Speed limit in built-up areas 50km/h; • Obligation for using child restraint systems for transport of children; • Obligation for using daytime running lights for passenger cars; • Probationary driving license for novice drivers; • Penalty point system for traffic offences

Slovenia

2005-01-01	A new Road Safety Act came into effect on the 1 January 2005 introducing changes to the penalty system, driver training and legal blood alcohol level. Radar jamming devices which interrupt police speed checks have also been banned. To improve traffic behaviour, tougher sanctions are introduced as well as rehabilitation programmes for drivers with penalty points. A two-phase driver training model is introduced whereby drivers complete a second course two years after their first driving test. A 0.0mg/ml blood alcohol level already in force for professional drivers is extended to other groups such as drivers transporting children.
2005	Slovenia is stepping up its automated speed enforcement. The Roads Administration, together with the mo-torway company DARS and the traffic police, will introduce new fixed cameras by autumn 2005 on its high speed motorway network. Slovenia is planning to introduce a total of 4 fixed speed cameras and 18 boxes by 2006, including some on rural roads.
2009	Slovenia is in the pilot project phase of the voluntary installation of interlock devices for private cars and public transport. They have introduced the interlocks to Ljubljana`s public transport company and for the first experiment 7 busses were fitted with devices for 2 months. The important goal of this was to show passengers and other traffic participants in the city of Ljubljana, that bus drivers perform their job with a high degree of responsibility, that they drive sober and are ready to prove this every minute using an interlock. All non-professional drivers were urged to follow this example of sober driving. On November 11th - St. Martin's day - and December 2008 the Ministry of Transport organised actions to prevent driving under the influence of alcohol or drugs. During this action they also promoted busses in the municipalities of Kranj and Ljubljana fitted with alcohol interlock devices
2009-01	"Pedestrian" – Activities aiming to increase general pedestrian safety. The-Campaign included media campaigns and activities in primary schools.
2009-02	"Fasten your life!" – Activities for the promotion of seat belt usage. The Campaign was launched on radio and TV stations and billboards, and promoted via different events (8-22 February)
2009-03	"Stop! Life has precedence" – Activities for better road safety on rail and Interchange crossings. It included a media campaign with spots on local radio stations and billboard advertising. (3€13 March 2009)
2009-03	"Do not overlook!" – Activities to increase two€wheeler safety. This Preventive campaign included co€operation with government and civil institutions, especially the ones intended for motorcyclists. The campaign included radio and TV spots, billboards, online banners, etc. (26 March – 19 April 2009)
2009-04	"40 days without alcohol" – Activities for greater awareness about alcohol abuse. It was held in collaboration with the Slovenian Caritas and Med.Over. Net Institute (25 February – 11 April)
2009-04	"Hurry slowly!" – Occasional week€long campaigns intended to increase Awareness about the consequences of speeding. They included radio and TV spots and a billboard campaign.

Spain

1999-05-06	Major changes had been introduced on alcohol limits which were reduced from 0.8 to 0.5 gr/l of blood.
2004-01-01	New law came into force concerning: limitations for mobile phones, revised speed limits for some vehicle categories, tunnel safety, emergency vests, cycling, new types of signs and signals, an increase in the quantity of sanctions and the extension of B1 licences for driving motorcycles under 125 cc without taking further exams or issuing an A licence. A very important issue of the 2004 reform was the status change of some traffic offences from administrative to penal infractions.
2005-07	Obligation for drivers to carry reflective vests in their vehicles and to use them in case that the driver and/or passengers have to come out of the vehicle in the road.
2006	Came into force the Penalty Point System (Ley 17/2005, July 19)
2007	Creation of the administrative centre to manage fines generated by speed cameras.
2007	The reform of the Spanish Penal Code was carried out at the end of 2007: new possible sanctions regarding alcohol, speed and driving without licence.
2008	33 new fixed speed cameras were installed at sensitive locations in 2008. A new administrative centre was set up in 2008to improve the effectiveness of the sanction process.
2008	Special road surveillance and enforcement campaigns: • Speed controls: Two special speed control campaigns were carried out (April and August). • Controls on the use of safety belt (February). • Control on the use of motorcycle and moped crash helmet (May). • Control on the use of mobile telephones (November). • Special campaigns on alcohol tests (June and December). • Campaign on school buses (September). • Campaigns on trucks (March and October). • Campaign on buses (July). • Inspection on road works (July).
2007-2008	• Increased enforcement for drink driving. The number of controls has doubled in five years. • Promotion of non€alcoholic beer: 10% of consumption is now non€ alcoholic. • Promotion of designated drivers • Increased enforcement of safety belt and helmet use

Sweden

2004	An enhanced enforcement operation carried out in 2002, combined with information and a doubling of the on-the-spot fine, resulted in a 5% increase in seat belt use in urban areas. So-called “blitz” enforcement actions of one week are repeated in Sweden every 6 months.
2004	Since 2004 new buses must be equipped with seatbelts.
2005	Compulsory safety helmets for bicyclists younger than 15 years.
2008	The Swedish government made the final legislative changes needed to put a new speed limit system in force. The new system includes a larger number of speed limits (10 steps, ranging from 30 km/h to 120 km/h) and new instructions aimed at making speed limits correspond better to the safety requirements and capacity of the various roads. A review of all Swedish roads began in autumn 2008 and continued in 2009, with speed limits changed as necessary.
2008	At the end of 2008, around 2 000 kilometres of roads had median barriers, mostly the wire type (2+1, 1+1). Research has shown that the risk of fatal, or severe, accidents on these roads has dropped by 75€80%, which is higher than expected.
2009	Installation of road€safety cameras enforcing speed limits continued in 2009. At the end of 2008 almost 1 000 were in use, covering more than 2 700 kilometres.
2009-01-01	The Swedish Transport Agency (Transportstyrelsen) was established on 1 January 2009 to gather judicial expertise from the national transport agencies for road, railway, shipping and aviation. This agency will have the overall responsibility for drawing up regulations and enforcement. On 1 April 2010, the Swedish Road Administration will merge with the Swedish Rail Administration and some other, minor, transport agencies to form a new state authority responsible for traffic planning and road infrastructure.
2009-02-01	Sweden introduced compulsory rules for governmental authorities concerning environmental and traffic safety requirements when purchasing a vehicle. The goal is that 75% of governmental authority vehicles shall be fitted with alcolocks by 2012.
2009-10-01	The Parliament has decided that moped class 1 will continue to be allowed for 15€year€olds (contrary to an EU directive), but they will be required to have a specific driving licence “AM” and education is compulsory. A driver’s permit is compulsory for class 2 mopeds.

3 - Contextual data

Basic data

	1. Area of country (Unit: 10^3 km^2)	2. Total population (Unit: 10^6) 2010	3. % of population living in urban area of different size
Austria (AT)	83.86	8.38	66
Belgium (BE)	30.51	10.83	97
Cyprus (CY)	5.90	0.80	69
Czech Republic (CZ)	78.87	10.51	74
Estonia (EE)	45.23	1.34	69
Finland (FI)	336.6	5.35	61
France (FR)	547.03	64.71	76
Germany (DE)	357.02	81.80	88
Greece (EL)	131.94	11.30	61
Hungary (HU)	93.03	10.01	65
Ireland (IE)	70.28	4.47	60
Israel (IL)	20.77	7.65	92
Italy (IT)	301.23	60.34	67
Netherlands (NL)	41.53	16.58	66
Poland (PL)	312.68	38.17	62
Serbia (SRB)*	88.36	7.5	60
Slovenia (SI)	20.27	2.05	51
Spain (ES)	504.85	45.99	76
Sweden (SE)	449.96	9.34	83

Source: Ad. 1. and 2 - Eurostat (2010) : http://epp.eurostat.ec.europa.eu/; Ad. 3. - NationMaster: http://www.nationmaster.com/graph/peo_per_liv_in_urb_are-people-percentage-living-urban-areas
(SRB) * - Official report from Serbian Republic Statistics Institute, 2002

		4. Number of people licensed to drive a motorcycle by PTW class (50-125 cc, 125 cc and more)	5. Minimum age for acquisition of driving license for PTW by size category (50-125 cc, 125 cc and more)
Austria (AT)	50-125 cc 125 cc and more	n.a. (only new licences) n.a. (only new licences)	18 21
Belgium (BE)	50-125 cc 125 cc and more	n.a. number of people licensed is not registerd in Belgium on a national level	18 18
Cyprus (CY)	50-125 cc 125 cc and more	n.a.	18 21
Czech Republic (CZ)	50-125 cc 125 cc and more	73 006 2 019 658	16 18
Estonia (EE)	50-125 cc 125 cc and more		16
Finland (FI)	50-125 cc 125 cc and more	Data available on new motorcycle licences issued by year and on the total amount of motorcycles and moped registered	16 18
France (FR)	50-125 cc 125 cc and more	1 000 000 (a) 4 500 000 (b)	16 18
Germany (DE)	50-125 cc 125 cc and more	6 222 488 7 053 277 * * The statistics only consider licenses issued or adapted after January 1 1999.	16 18
Greece (EL)	50-125 cc 125 cc and more	n.a.	18
Hungary (HU)	50-125 cc 125 cc and more	n.a.	16 18
Ireland (IE)	50-125 cc 125 cc and more		
Israel (IL)	50-125 cc 125 cc and more		
Italy (IT)	50-125 cc 125 cc and more	 3 5500 000	16 18
Netherlands (NL)	50-125 cc 125 cc and more	In 2010 only 2,3% of registered motorcycles had 50 - 125 cc engine size; over 97% had a higher engine size.	18 (>49 cc)
Poland (PL)	50-125 cc 125 cc and more	21 795 4 497 494	16 18
Serbia (SRB)*	1) 50-125 cc 2) for motorcycle with power no biger than 35 kw 3) for motorcycles and hard tricycles with motor power more than 15 kw	n.a.	16 18 24

Slovenia (SI)	50-125 cc 125 cc and more		
Spain (ES)	50-125 cc 125 cc and more	11 113 (A1*) 146 625 (A**) 859 179 (B***) *Licences of each kind issued in 2008. Their total census up to 2008 has to be calculated (e.g. people that could drive a big motorcycle: A licence alone + B,A + C,A + D,C,A + other combinations…) **B licence holders with 3 years of experience can also drive motorcycles up to 125cc (since 2004 / 07 / 02)	16 18
Sweden (SE)	50-125 cc 125 cc and more		

Source: (SRB)* - Serbian Traffic Safety Law ("Offical Journal", no. 41, 2nd June 2009)

Road Network

	6. Total network length of all public roads (Unit: 10^3 km)	7. Length of motorways (Unit: 10^3 km) 2008
Austria (AT)	106,962	1696
Belgium (BE)	153,595	1763
Cyprus (CY)	12,118	257
Czech Republic (CZ)	55,653 + 74 919 of local roads	691
Estonia (EE)	57,565	104
Finland (FI)	79,132	739
France (FR)	1,027,002	11529
Germany (DE)	644,480	12645
Greece (EL)	117,000	948
Hungary (HU)	197,534 (2008)	911,2 (2008) 1055 (2010)
Ireland (IE)	95,752	269
Israel (IL)	18,096	146
Italy (IT)	473,159	6629
Netherlands (NL)	136,135	2494
Poland (PL)	384,830	849,4
Serbia (SRB)*	56,158	500
Slovenia (SI)	20,403	696
Spain (ES)	667,063	13515
Sweden (SE)	215,000	1855

Source: IRTAD Database; http://en.wikipedia.org/wiki/List_of_OECD_countries_by_road_network_size (SRB) * - Report of the Public Enterprise „Roads of Serbia“ (2009)

Types of Vehicles

	8. Total number of passenger cars (Unit: 10^3) 2008	9. Total number of PTW (> 125 cc) (Unit: 10^3) 2008	10. Number of Motorbike registered (between 50 cc and 125cc) 2008
Austria (AT)	4285	362	301
Belgium (BE)	5131	388	n.a. Only number of motorbikes registered less than 125cc but not between 50cc and 125cc
Cyprus (CY)	444	22,4	20,9
Czech Republic (CZ)	4423	352	478
Estonia (EE)	551,8	17,6	0,07
Finland (FI)	2700	204	217
France (FR)	31109	1898	1959
Germany (DE)	41321	3659	769
Greece (EL)	5024	1299	
Hungary (HU)	3055	22,4	141,54 (all motorcycle over 50 ccm)
Ireland (IE)	1953	37 (2007)	
Israel (IL)			
Italy (IT)	36105	6124 (2009)*	2840 (2009)**
Netherlands (NL)	7542	606	1000 (606 officially registered)
Poland (PL)	16080	669,4	312,5
Serbia (SRB)*	1486	27,73	
Slovenia (SI)	1045	41,6	40,38
Spain (ES)	22145	1539,76 The erased is the total number of motorcycles.	961,06
Sweden (SE)	4279	269,3	92,81

Source: http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/main_tables
(SRB) * - Annual Serbian Traffic Police Directorate data (2009)
(IT) * - ACI - probably overestimated because historical motorbikes registered (about 1.000.000 not circulating), ** - ACI - probably overestimated because of different driving plate system they do not declare the cancelled (about 400.000 not circulating). These estimates are made by the number of motorized two wheels automotive service per year.

Behavioural data, legislation and enforcement

Alcohol

11. Alcohol consumption per capita	2003	2006	2009
Austria (AT)	11,1	11,1	11,1 *
Belgium (BE)	10,6	n.a.	n.a.
Cyprus (CY)	11,5	9,5	n.a.
Czech Republic (CZ)	12,1	11,9	12,1 (2007)
Estonia (EE)	9,0	12,0	10,2 *
Finland (FI)	9,3	10,1	10,2
France (FR)	11,4	12,9	12,3
Germany (DE)	12,0	10,1	9,9 (2008)
Greece (EL)	9,0	n.a.	n.a.
Hungary (HU)	11,1	11,2	10,0 (2008)
Ireland (IE)	13,7	13,4	
Israel (IL)	2,5		
Italy (IT)	10,45 *	8,1 **	8,1 **
Netherlands (NL)	9,7	n.a.	7,6
Poland (PL)	7,86	8,79	9,06
Serbia (SRB)	n.a.	n.a.	n.a.
Slovenia (SI)	6,7		
Spain (ES)	10	In that survey, the stated consumption remains very little under 10	Idem
Sweden (SE)	6,0		

Source: WHO: http://apps.who.int/whosis/database/core/core_select_process.cfm
(AT) - * - OECD 2007
(EE) * - Eesti Konjunktuuriinstituut
(IT) * – WHO-HFA, ** - OECD, 2007

	12. Max. BAC: drivers of passenger cars	13. Max. BAC: novice drivers	14. Max. BAC: professional drivers
Austria (AT)	0,50	0,10* * Experience up to 2 years	0,10
Belgium (BE)	0,50	0,50	0,50
Cyprus (CY)	0,50	0,50	0,50
Czech Republic (CZ)	0,00	0,00	0,00
Estonia (EE)	0,20	0,20	0,20
Finland (FI)	0,50	0,50	0,50
France (FR)	0,50	0,50	0,20 * * Bus drivers
Germany (DE)	0,50	0,00 * * Experience up to 2 years	0,00 * * Drivers working in passenger transport sector (ex. Taxi drivers)
Greece (EL)	0,50 * * 0,20 for motorcycles and mopeds drivers	0,20 * * Experience up to 2 years	0,20 * * drivers of public vehicles, lorries > 3,5 t, buses, school buses and coaches, ambulances, dangerous goods vehicles
Hungary (HU)	0,00	0,00	0,00
Ireland (IE)	0,50	0,20	0,20
Israel (IL)	0,50		
Italy (IT)	0,50	0,00 at least 21 years old or at least 3 years of driving experience	0,00 Professional drivers for driving licence C, D E
Netherlands (NL)	0,50	0,20 * * Experience up to 5 years	0,50
Poland (PL)	0,20	0,20	0,20
Serbia (SRB)*	0,30 (2009)	0,00	0,00
Slovenia (SI)	0,50	0,00 * w* persons <21 years and experience up to 2 years (even if owning a driving licence for another category)	0,00
Spain (ES)	0,50	0,30 * * Experience up to 2 years	0,30
Sweden (SE)	0,20	0,20	0,20

Source: DG MOVE: http://ec.europa.eu/transport/road_safety/observatory/doc/alcohol_rules.pdf ; International Center for Alcohol Policies (ICAP) http://www.icap.org/PolicyIssues/DrinkingandDriving; SARTRE 3 Contextual data Tables
(SRB) * - Serbian Traffic Safety Law («Offical Journal», no. 41, 2nd June 2009)

	15. BAC leading to immediate license withdrawal	16. Random breath testing allowed (since …)	17. Evidential breath testing allowed
Austria (AT)	0,8 * * or 0.5 two times	Yes (1994)	Yes (1960)
Belgium (BE)	0,5 * * Possible if BrAC ≥ 0.22 mg/l (max. of 3 times 15 days); In reality only if: BrAC ≥ 0.35 mg/l and if driving unsafely; Or BrAC ≥ 0.70 mg/l; or if driver is drunk (i.e. based on another law which does not require a breath test but only obvious signs of drunkenness); or if one refuses to provide a breath (or blood) sample and if driver is driving unsafely or is drunk.	Yes (1994)	Yes (1994)
Cyprus (CY)	0,5	Yes (1986)	Yes (1986)
Czech Republic (CZ)	n.a * * Immediate license withdrawal is not possible. the license can be with-drawn only after the administrative procedure.	Yes (1960)	No
Estonia (EE)	0,5	Yes (-)	Yes (-)
Finland (FI)	0,5 * * Withdrawal is possible, length not specified, medical assessment needed, if the driver considered to be a problem user.	Yes (1977)	Yes (1970)
France (FR)	0,50 * *if 0,5<BAC<0,8, 6 points demerit (out of a total of 12) and possibility of license withdrawal If BAC >0,8 possibility of being sentenced to two years in jail and paying a fine 4500 **€**	Yes (1995)	Yes (1995)
Germany (DE)	1,1 * * Driving ban (1 month) with BAC > 0.5 g/l; license withdrawal possible when BAC ≥ 0.3 g/l in case of ac-cident or odd driving behaviour	No	Yes (1998) * * Only valid as evidence under civil law (not under criminal law)
Greece (EL)	0,8* *licence withdrawal (90 days) with BAC>0,8 g/l , 180days with BAC>1,10g/l and 5 years with BAC>1,10g/l within 2 years from the previous alcohol limit violation.	Yes (1998)	Yes (1997)
Hungary (HU)	0,2	Yes (1960)	Yes (1995)
Ireland (IE)	1,0 * * First offence 3 months; Not ex-ceeding a BAC of 1.0 mg/ml	No	Yes (1994)
Israel (IL)			
Italy (IT)	0,8	No	Yes (1988)

Netherlands (NL)	> 1,30 (novice) > 1,50 (normal, if unfit to drive)	Yes (1985)	Yes (1987) * * Since 1974 legal limit introduced with blood analysis as evidential procedure; this was changed in 1987. From 1987 on the result of alcohol breath test may be used for evidential purposes.
Poland (PL)	0,5 * * Driving license cannot be administratively withdrawn. only by court. A court can prohibit driving any vehicle or certain types of vehicles if BAC is ≤ 0.5 g/l. The court must prohibit driving if BAC > 0.5 g/l or the driver caused an accident with serious personal injury or death. The court prohibits driving for a specified period of time. If the driver caused another casualty accident with a BAC of ≥ 0.5 g/l. the court must prohibit driving forever.	Yes (1998)	Yes (1989)
Serbia (SRB)*	No	Yes	Yes
Slovenia (SI)	1,5 * * or > 1.1 in case of an accident	Yes (-)	Yes (-)
Spain (ES)	n.a.* * Any BAC over the permitted. depending on circumstances: accident. risk etc.	Yes (1990)	Yes (1990)
Sweden (SE)	0,3	Yes (1976)	Yes (1989)

Source: SARTRE 3 Contextual data Tables
Simon Kærup and others (2010): *State-of-the-Art on Withdrawal of Driving Licence – Results of Questionnaires.* Project No. TREN-05-FP6TR-S07.61320-518404-DRUID. DRUID Driving under the Influence of Drugs, Alcohol and Medicines
(SRB) * - Serbian Traffic Safety Law («Offical Journal», no. 41, 2nd June 2009)

	18. Medical and / or psychological assessment of DUI offenders	19. Driver rehabilitation courses for DUI offenders
Austria (AT)	Yes (1956) * * Federal law basis since 1967	Yes (1978) * * Federal law basis since 1990
Belgium (BE)	Yes (1994) * * Not automatic. happens for a very limited number of persons	Yes (1996)
Cyprus (CY)	Yes (1990)	No
Czech Republic (CZ)	No	No
Estonia (EE)	No	No
Finland (FI)	No * * was included in BAIID experiment 2005-2008	No * * Verifiable drug/alcohol dependants are referred to treatment
France (FR)	Yes (2004)* * possibility of detecting the DUI offenders through a THC "saliva test" since 2008	Yes (2004) * * DUI offenders can be required to follow a 2 day educative programme
Germany (DE)	Yes (1951)	Yes (1971) * * Courses were conducted on legal basis of the single Federal States; since 1999 implemented in the Federal Law
Greece (EL)	No	No
Hungary (HU)	Yes (1960)* * Medical assessment in case of taking a blood sample	Yes (1992)
Ireland (IE)	No	No
Israel (IL)		
Italy (IT)	No	No
Netherlands (NL)	Yes (1996) * * Before 2000 violators with a BAC > 2.1 could be required to undergo a medical examination into driving competence. Since 2000 this margin is lowered to 1.81 BAC. This can also be required of drivers who have been caught 4 times in 5 years. drivers who have caused a serious accident and drivers who refuse to co-operate with evidential testing procedures, recidivist drivers who have followed an educational course and are caught again with VBAC >0,80 and drivers caught drinking and driving who have been declared alcoholist by a medical expert.	Yes (1996) * * Within administrative law a violator (BAC 1.31 – 1.8) can be required to pay for and follow a 3-day educative programme about alcohol and driving.
Poland (PL)	Yes (2002)	No
Serbia (SRB)*	Yes	It will be part of driver education in Road Traffic Safety Agency, but program is not created still
Slovenia (SI)	Yes (1982)	No
Spain (ES)	Yes (1986) * * After a license withdrawal and also in the context of periodic drivers assessment law. Not specifically for DUI offenders.	Yes (2002)
Sweden (SE)	Yes (1991)	No

Source: SARTRE 3 Contextual data Tables

	20. Drivers tested for alcohol (Unit: 10^3)			21. Drivers fined for alcohol (Unit: 10^3)		
	2006	2007	2008	2006	2007	2008
Austria (AT)	465,460	637,386	724,488	43,539	44,608	42,281
Belgium (BE)	242,107*	293,041*	375,487*	n.a.	45,680	51,247
Cyprus (CY)	68,874	116,184	143,848	4,249	7,916	8,490
Czech Republic (CZ)	n.a	n.a	n.a	8,603	7,598	8,178
Estonia (EE)	102,710	91,639	126,784	937	925	1,384
Finland (FI)	1746,505	1914,821	2040,243	25,765	27,544	25,819
France (FR)	11352,294	11230,014	11743,065	365,848	376,124	381,705
Germany (DE)	3606	5706	5001*	194,300	192,500	186,400
Greece (EL)	1424,557	1443,865	1509,092	50,174	45,668	47,257
Hungary (HU)	1451,433	1437,874	1301,127	42,463	45,682	40,721
Ireland (IE)		489,029	563,115		19,858	18,028
Israel (IL)	29,900	175,000	500,00			
Italy (IT)	250,000	700,000	1400,000	n.a.	n.a.	34,283*
Netherlands (NL)	1200 -1400	1200 -1400	1200 -1400	33,000		
Poland (PL)	n.a.	n.a.	1775,186	201,192	159,346	168,612
Serbia (SRB)*	n.a.	n.a.	n.a.	50,629	63,992	68,246
Slovenia (SI)	323,649	384,591	405,975	25,883	27,934	23,745
Spain (ES)	3835,437	4273,488	5087,873	94,683	92,449	93,979
Sweden (SE)	2390,998	2664,812	2639,588	21,812	22,095	22,216

Source: ETSC: PIN Flash n.16 Tackling the three main killers on the Road. A priority for the forthcoming EU Road Safety Action Programme http://www.etsc.eu/documents/05.05%20-%20PIN%20Flash%2016.pdf

(BE) * - This number is an underestimation as not all road side police tests were registered.

(DE) * - BAST Estimation

(IT) * - Police corps + Carabinieri corps; missing data from Local police corps (to be added).

(SRB) * - Annual Serbian Traffic Police Directorate data (2006-2008)

22. Numbers of roadside alcohol breath tests (per 1,000 inhabitants) and percentage of those tested found to be above the legal limit						
	2006		2007		2008	
	Roadside police tests per 1000 population	% above legal limit	Roadside police tests per 1000 population	% above legal limit	Roadside police tests per 1000 population	% above legal limit
Austria (AT)	56	9,4	77	7,0	87	5,8
Belgium (BE)	23*	n.a	28*	n.a.	35*	n.a.
Cyprus (CY)	90	6,2	149	6,8	182	5,9
Czech Republic (CZ)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Estonia (EE)	76	0,9	68	1,0	95	1,1
Finland (FI)	n.a.	n.a.	318	1,6	385	1,3
France (FR)	186	3,2	182	3,3	190	3,3
Germany (DE)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Greece (EL)	128	3,5	129	3,2	135	3,1
Hungary (HU)	144	2,9	143	3,2	130	3,1
Ireland (IE)			113	4,1	128	3,2
Israel (IL)	4	17	24	5	69	2,2
Italy (IT)	4		12		23	
Netherlands (NL)	In the Netherlands it is inofficially estimated that between 12, and 1,4 million drivers are annually tested for alcohol. Slightly less than 1 percent (0,90 - 0,95) are tested positive for alcohol over the limit					
Poland (PL)	n.a.	n.a.	n.a.	n.a.	47	9,5
Serbia (SRB)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Slovenia (SI)	162	8,0	191	7,3	200	5,8
Spain (ES)	88	2,5	96	2,2	112	1,8
Sweden (SE)	264	0,9	292	0,8	287	0,8

Source: ETSC: PIN Flash n.16 Tackling the three main killers on the Road. A priority for the forthcoming EU Road Safety Action Programme http://www.etsc.eu/documents/05.05%20-%20PIN%20Flash%2016.pdf
(BE) * - This number is an underestimation as not all road side police tests were registered.

Speed

	23. Speed limit on motorways	24. Speed limit on highways. main or national roads	25. Speed limit on secondary or regional roads	26. Speed limit in built-up areas
Austria (AT)	130	100	100	50
Belgium (BE)	120	120/90/70 * * 90 most common; 120 - if it is a road with 2 times 2 lanes. sepa-rated by a median strip	120/90/70 * * 90 most common; 120 - if it is a road with 2 times 2 lanes. sepa-rated by a median strip	50/30 * * 30 is systematic in the vicinity of schools
Cyprus (CY)	100	80	65	50
Czech Republic (CZ)	130	90	90	50
Estonia (EE)		110/100/90 * * 90 - general; 100 or 110: seasonal and on only certain locations (e.g. 110 only on divided two-lane highways)	90	50
Finland (FI)	120/100* * 100 in winter	100/80	100/80/60* * General speed limit is 80, but also 60 and 100 are used	50/40/30 * * 40 on more than half of the streets
France (FR)	130/110 * * 110 in rain	110/90 * * 90 - main or national roads, 110 - highways;	90	50
Germany (DE)	No general speed limit on motorways * * Recommended speed limit - 130 km/h (more half of the network has a speed limit of 120 km/h or less)	100	100	50/30
Greece (EL)	130 * * For motorbikes smaller than 125cc - 80 km/h	110 * * For motorbikes smaller than 125cc - 80 km/h	90* * For motorbikes smaller than 125cc -70 km/h	50
Hungary (HU)	130 * Introduced 1 May 2001, before 10 km/h lower	110 * Introduced 1 May 2001, before 10 km/h lower	90 * Introduced 1 May 2001, before 10 km/h lower	50
Ireland (IE)	112	96	96	48
Israel (IL)	110	100/90	90/80 * 90 km/h on non-urban roads with a built-up dividing area	50

Italy (IT)	130 * * may be raised up to 150 by the road management body, based on geometrical characteristics, traffic flow, weather conditions, local accident data, not implemented so far	110	90	50
Netherlands (NL)	120/100 * * 100 - some motorways	100/80 * * 100 - most common	80/60	70/50/30 * * From <5 (Residential areas) to 70 (interconnecting roads with high flows)
Poland (PL)	140 * * The changes took effect in November 2010. The new law allow also the drivers to speeding with impunity about 10 km / h (tolerance limit).	120/100/90 * * 120 - two carriage express roads; 100 - single carriage express roads and dual carriage roads of at least 2 lanes in each direction; 90 - rest of the roads. most common	90	60/50* * 60 - from 11pm to 5am
Serbia (SRB)	120	100/80* * 100 highways without separate lines; 80-national roads	80	50 (2009)
Slovenia (SI)	130	90	90	50/30/10* * 10 in pedestrian zones.
Spain (ES)	120	120/100/90* * 120 in highways. 100 - in main roads with a verge ≥ 1.5 m or with more than one lane on each sense. 90 - other roads.	90	50
Sweden (SE)	110/90* * Mostly 110	100/90/70* * Mostly 90	90/70* * Mostly 70	50

Source: DG MOVE: http://ec.europa.eu/transport/road_safety/observatory/doc/speed_rules.pdf

	27. Number of speed tickets				28. Yearly checks per population			
	2006	2007	2008	2009	2006	2007	2008	2009
Austria (AT)	2700000	3800000	3800000	na	327	458	456	na
Belgium (BE)	n.a.	2017342	2273795		-	-	-	-* *impossible to count due to automatic speed cameras alongside the roads
Cyprus (CY)	66642	128237	108232	71852	87	165	137	
Czech Republic (CZ)	309392	215745	180421	200079	30	21	17	19
Estonia (EE)					n.a.	n.a.	n.a.	n.a.
Finland (FI)	198643	219738	263012	322997	38	42	50	
France (FR)	7238901	8097871	8863741	10 603 640	114	127	138	164
Germany (DE)	3035000*	2772000*	2797000*	2886000* * only offenses > 20 km/h above speed limit are included	na	na	na	na
Greece (EL)	307763	353133	349417	330186	na	na	na	na
Hungary (HU)	174890	157244	289255	433565 *	17	16	29	n.a.
Ireland (IE)		194620	177549	103861		45	40	
Israel (IL)	155596	155578	217206		22	22	30	
Italy (IT)	1326324	1499721	1405359	n.a.	23	25	24	n.a.
Netherlands (NL)	8874080	9740861	9159301	9102868	543	595	558	
Poland (PL)	1079493	1209109	1300514	1446921	28	32	34	38
Serbia (SRB)*	255279	228745	261631	218314				
Slovenia (SI)			144922				72	
Spain (ES)	733952	1196031	2002225	n.a.	17	27	44	n.a.
Sweden (SE)	185823	218939	232274	242126	21	24	25	

Source: ETSC: PIN Flash n.16 Tackling the three main killers on the Road. A priority for the forthcoming EU Road Safety Action Programme http://www.etsc.eu/documents/05.05%20-%20PIN%20Flash%2016.pdf
(HU) * - The number of speed tickets in classical sense is 80458; but the number of automatically issued administrative fine for speeding detected by speed cameras is 353107, in total: 433565 in Hungary
(SRB) * - Annual Serbian Traffic Police Directorate data (2006-2009)

Seat-belts

	29. Obligation to use seat-belt in front seat	30. Obligation to use seat-belt in back seat	31. Obligation to use child restraint systems for transport of children
Austria (AT)	Yes (1976)	Yes (1984)	Yes (1994)
Belgium (BE)	Yes 1973 (outside cities), 1975 (post-1967 cars), 1979 (all)	Yes (1991)	Yes (1996)
Cyprus (CY)	Yes (1987)	Yes (2002)	Yes (1987)
Czech Republic (CZ)	Yes (1989)	Yes (1989) * * When the car is fitted with belts in back seats	Yes (2001)
Estonia (EE)	Yes (1973)	Yes (1973) * * Soviet traffic law; Estonian law: since 1992	Yes (1996)
Finland (FI)	Yes (1975)	Yes (1987)	Yes (1975) * * Not obligatory in back seat, if there are no seat-belts in back seat or if there is no room for additional child restraint systems (between two or more child restraint systems)
France (FR)	Yes 1973 (outside cities), 1975 (cities at night), 1979 (all)	Yes (1990)	Yes (1995)
Germany (DE)	Yes (1976)	Yes (1984)	Yes (1993)
Greece (EL)	Yes (1987)	Yes (2003)	Yes (1999)
Hungary (HU)	Yes (1976) * * 2001 inside built€up areas	Yes (1993) * * 2001 inside built€up areas	Yes (2002)
Ireland (IE)	Yes (1979)	Yes (1992)	Yes (1992)
Israel (IL)	Yes (1975)	Yes (1995)	?
Italy (IT)	Yes (1988)	Yes (1990)	Yes (1988)
Netherlands (NL)	Yes (1975)	Yes (1992)	Yes (1990)
Poland (PL)	Yes (1984) * * Jan. 1st 1984: on hardened roads outside built-up areas. In July 1991 (whole territory of Poland).	Yes (1991) * * July 1991: Obligation to use seat-belts in all seats in the whole territory of Poland. As for back seats. the regulation only refers to those fitted with seat belts. Since June 1993. all new cars must have seat-belts both in front and back seats.	Yes (1991) * *1991: Obligation to use a child safety seat for children up to 10 years. 1997: Regulation to use restraint systems if the child's weight or height do not allow to use a standard seat-belt. May 2002: each child up to 12 years whose height does not exceed 150 cm must use a child restraint system. This does not refer to cars with no seat-belt in back seat
Serbia (SRB)	Yes	Yes (2009)	Yes (2009)

Slovenia (SI)	Yes (1977 or 1982)	Yes (1998) * * Obligation mentioned in the law in 1982 but not clear	Yes (1998)
Spain (ES)	Yes (1975, 1992) * * 1975 (outside cities) 1992 (all roads) .	Yes (1992)	Yes (1992)
Sweden (SE)	Yes (1975)	Yes (1986)	Yes (1988)

Source: SARTRE 3 Contextual data Tables

32. Daytime seat belt wearing rate on front seats aggregated of cars < 3,5 tons from road side independent survey								
	2002	2003	2004	2005	2006	2007	2008	2009
Austria (AT)	75	77	77	83	89	89	87	89
Belgium (BE)	n.a.	n.a.	n.a.	67	75	79	80	82
Cyprus (CY)	81	81	n.a.	80	n.a.	80	n.a.	80
Czech Republic (CZ)	59	59	63	66	71	90	88	89
Estonia (EE)	64	72	70	74	72	90	96	87
Finland (FI)	86	86	88	88	90	89	88	92
France (FR)	92	95	97	97	97	98	98	97,6
Germany (DE)	93	94	94	96	97	95	97	98* * Rates for drivers. Source: BASt
Greece (EL)							77	75
Hungary (HU)	52	59	59	65	n.a.	71	71	79
Ireland (IE)	72	84		86	86	88	90	
Israel (IL)		87		87	87	91	90	94
Italy (IT)	30	83	n.a.	71	71	65	n.a.	n.a.
Netherlands (NL)	89	87	91	92	94	92	95	n.a.
Poland (PL)	71	72	69	76	77	77	80	n.a.
Serbia (SRB)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Slovenia (SI)					86	82	88	
Spain (ES)	63	71	n.a.	74	85	89	85	n.a.
Sweden (SE)	91	92	92	92	94	96	95	96

Source: ETSC: PIN Flash n.16 Tackling the three main killers on the Road. A priority for the forthcoming EU Road Safety Action Programme http://www.etsc.eu/documents/05.05%20-%20PIN%20Flash%2016.pdf

33. Daytime seat belt wearing rate on rear seats aggregated of cars < 3,5 tons from road side independent survey								
	2002	2003	2004	2005	2006	2007	2008	2009
Austria (AT)	62	58	56	52	58	49	65	65
Belgium (BE)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Cyprus (CY)						9		21
Czech Republic (CZ)	n.a.	n.a.	n.a.	34	58	54	56	51
Estonia (EE)	22	22	20	28	30	68	67	63
Finland (FI)	74	76	77	78	82	80	82	87
France (FR)	n.a.	n.a.	n.a.	77	82	84	85	85
Germany (DE)	86	86	90	89	92	88	94	96
Greece (EL)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	21	23
Hungary (HU)	17	20	n.a.	30	n.a.	40	42	49
Ireland (IE)		46		46	63	84	78	
Israel (IL)		23		25	26	45	56	63
Italy (IT)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands (NL)	52	63	69	64	73	65	81	n.a.
Poland (PL)	56	45	44	43	47	48	50	n.a.
Serbia (SRB)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Slovenia (SI)					30		57	
Spain (ES)	36	38	n.a.	51	64	69	81	n.a.
Sweden (SE)	75	74	79	73	74	80	74	80

Source: ETSC: PIN Flash n.16 Tackling the three main killers on the Road. A priority for the forthcoming EU Road Safety Action Programme http://www.etsc.eu/documents/05.05%20-%20PIN%20Flash%2016.pdf

Other road traffic safety relevant aspects

	34. Penalty (or demerit) point system for traffic offences	35. Probationary driving license for novice drivers	36. Prohibition to use mobile phone while driving
Austria (AT)	Yes (?)	Yes (1992)	Yes (1999)
Belgium (BE)	No	No	Yes (2000) * * Phones can be used without a hands-free unit when the car is stationary - but not while in traffic (such as at traffic lights)
Cyprus (CY)	Yes (2001)	No	Yes (1999)
Czech Republic (CZ)	Yes (2006)	No	Yes (2001)
Estonia (EE)	No	Yes (1994)	Yes (2001) * * Allowed on rural roads
Finland (FI)	Yes (1996) [1]	Yes (1989)	Yes (2003) * * use of mobile phone allowed while driving only with a handsfree device
France (FR)	Yes (1992)	Yes (2004)	Yes (2002)
Germany (DE)	Yes (1974)	Yes (1986)* * 1986: only Western part of Germany; New Federal States: since 1990	Yes (2001) * * usage allowed without a hands-free unit only when the engine is switched off.
Greece (EL)	Yes (1999)	No	Yes (1999)
Hungary (HU)	Yes (2001)	Yes (1997)	Yes (1998)
Ireland (IE)	Yes (2002)* * As and from 31.10.2002 for speeding offence only.	Yes (1964)	Yes (2002) * * Handsfree kits allowed, although that is subject to review. Regulations were introduced but are not being enforced because of legal difficulties
Israel (IL)			Yes (?)
Italy (IT)	Yes (2003)	Yes * * a special (doubled) loss of points is foreseen for novice drivers since 2003	Yes (1993) * *handsfree kits allowed

Netherlands (NL)	No * * a special point system for novice drivers is operating since 2002	Yes (2002)* * With a probationary license drivers can loose their license if they are caught for 3 severe traffic violations within a period of 5 years. After 3 severe violations license is suspended and drivers are required to undergo practical and theoretical driving test. Failure on either of these tests will result in loss of license. If beginning drivers are caught drinking-and-driving with a BAC > 0.81 they are required to follow a 3-day educative programme on traffic and alcohol.	Yes (2002) * * Use of mobile phone with special headset allowed
Poland (PL)	Yes (1993)	No	Yes (1997) * * Use of mobile phone with special headset allowed
Serbia (SRB)	Yes (2009)	Yes (2009)	Yes (2009) * * Use of mobile phone with special headset allowed
Slovenia (SI)	Yes (1998)	No	Yes (1998)
Spain (ES)	Yes (2006)	No	Yes (2002) only hand free are permitted
Sweden (SE)	No	Yes (1990)	No

Source: SARTRE 3 Contextual data Tables and **http://www.ecllulat-news.com/car_bans**
(FI) * - In 1996, the Road Traffic Law in Finland was changed so that traffic offences and violations will be interfered more efficiently, especially those done by novice drivers. The follow-up time for the monitoring of offences was changed from one to two years, and the measures become stricter and more effective after each offence. The driving ban would be given after 4 offences done in 2 years time or 3 offences done in one year. However, there are no points associated with the offences, although basically the system is quite similar than the penalty point system used in many countries.

	37. Sanctions for using hand-held mobile phone while driving	38. Mandatory check-up for elderly drivers	39. Obligation to use daytime running lights for passenger cars
Austria (AT)	Yes (1999) Fine up to 25 EUR per incident	No Mandatory for lorry drivers starting at 45 each 5 year	No Applied from 15.11.2005 r. to 1.01.2008 r.
Belgium (BE)	Yes (2000)	No	No
Cyprus (CY)	Yes (1999)	Yes (1996)	No
Czech Republic (CZ)	Yes (2001) Mostly only policeman's reproof or small fine	Yes (1971) All drivers in age 60, 65, 68, then every 2 years.	Yes (2001) Only during the winter season.
Estonia (EE)	Yes (2001)	Yes	Yes (1995)
Finland (FI)	Yes (2003) 40 EUR fine for infringements	Yes (2004) professional drivers (of passenger and heavy vehicles): medical certificate at ages of 50, 55, 60 and 65.	Yes (1982) First applied in rural areas. Since 1997 - obligatory also in built-up areas
France (FR)	Yes (2002) 30 EUR fine per infraction	No	No
Germany (DE)	Yes (2001) 40 EUR fine plus one penalty point	No	No
Greece (EL)	Yes (1999) 100EUR fine per infraction and 30 days withdrawal for passenger cars and 150EUR fine and 30 days withdrawal for bicycles, mopeds and motorcycles.	Yes (1999) Every 3 years after the age of 65	No
Hungary (HU)	Yes (1998) Fines up to 15 EUR per infraction	Yes (1992) For 60-70 year old elderly drivers every 3 years. > 70 year old elderly drivers every 2 years	Yes (1993) Outside built-up areas
Ireland (IE)	Yes (2002) 270 EUR fine and/or up to 3 months imprisonment on a third offence	Yes (1964)	No
Israel (IL)			
Italy (IT)	Yes (1993) Fines of up to 90 EUR per infraction	Yes The period of license validity shortens with the age, up to every year renewals and related checks	Yes (2002)

Netherlands (NL)	Yes (2002) Sanction: 160 Euro	Yes (?) Medical check-up for drivers over 70 years old.	Yes (2009)
Poland (PL)	Yes (1997) Fine 50 Euro, but the police are very liberal about this offence.	No Only for professional drivers.	Yes (1991) 1991 - from November 1 to March 1. 1997 –from October 1 to the end of February, 2007 – all year
Serbia (SRB)	Yes Fine 50 Euro	No	Yes (2009)
Slovenia (SI)	Yes (1998)	No	Yes (1998)
Spain (ES)	Yes (2002)	Yes (1986) Not only for elderly. but for all drivers. periodical preventive psycho-medical assessment. Before 1986. only for professional drivers.	No
Sweden (SE)	No	No	Yes (1977)

Source: Ad. 39 – http://www.ecllulat-news.com/car_bans, SARTRE 3 Contextual data Tables; Ad. 40 - SARTRE 3 Contextual data Tables; Ad. 41 - DG MOVE: http://ec.europa.eu/transport/road_safety/observatory/doc/drl_rules.pdf; SARTRE 3 Contextual data Tables

Accident Data

	40. People killed in road traffic (total)									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria (AT)	976	958	956	931	878	768	730	691	679	633
Belgium (BE)	1470	1486	1306	1214	1162	1089	1069	1071	944	955
Cyprus (CY)	111	98	94	97	117	102	86	89	82	71
Czech Republic (CZ)	1486	1333	1430	1447	1382	1286	1063	1221	1076	901
Estonia (EE)	204	199	223	164	170	170	204	196	132	100
Finland (FI)	396	433	415	379	375	379	336	380	344	279
France (FR)	8079	8162	7655	6058	5530	5318	4709	4620	4275	4273
Germany (DE)	7503	6977	6842	6613	5842	5361	5091	4949	4477	4152
Greece (EL)	2037	1880	1634	1605	1670	1658	1657	1612	1553	1456
Hungary (HU)	1200	1239	1429	1326	1296	1278	1303	1232	996	822
Ireland (IE)	418	412	376	337	377	400	365	338	279	240
Israel (IL)	452	542	525	445	467	437	405	382	412	314
Italy (IT)	7061	7096	6980	6563	6122	5818	5669	5131	4731	4050
Netherlands (NL) *	1082	993	987	1028	804	750	730	709	677	644
Poland (PL)	6294	5534	5826	5642	5712	5444	5243	5583	5437	4572
Serbia (SRB)*	n.a.	1275	854	868	954	841	900	962	897	808
Slovenia (SI)	314	278	269	242	274	258	262	293	214	171
Spain (ES)	5777	5517	5347	5400	4749	4442	4104	3823	3100	2605
Sweden (SE)	591	583	560	529	480	440	445	471	397	355

Source: CARE Database, 2010-OECD: *A record decade for road safety*. Press release, 15 September 2010. (NL) * - Dutch data are official registered traffic fatalities, there are also official higher estimates of real number of fatalities. (SRB) * - Annual Serbian Traffic Police Directorate data (2001-2009)

	41. Occupants of passenger cars killed									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria (AT)	549	570	524	524	480	432	384	378	367	328
Belgium (BE)	922	899	779	688	623	624	589	548	479	n.a.
Cyprus (CY)		52	52	56	62	54	40	44	36	37
Czech Republic (CZ)	784	716	759	798	779	679	567	661	573	497
Estonia (EE)	38	56	64	47	35	38	43	52	29	25
Finland (FI)	224	262	267	217	221	231	203	241	202	165
France (FR)	5290	5283	4864	3689	3369	3065	2627	2466	2205	2160
Germany (DE)	4396	4023	4005	3774	3238	2833	2683	2625	2368	2110
Greece (EL)	922	803	793	761	775	816	722	771	708	805
Hungary (HU)	500	502	618	640	606	620	630	555	448	386
Ireland (IE)	262	231	202	174	262			170	160	
Israel (IL)				223				224	218	
Italy (IT)	3850	3847	3653	3377	3032	2830	2781	2320	2116	n.a.
Netherlands (NL)	513	477	479	483	398	337	323	299	299	288
Poland (PL)	2709	2 438	2 548	2 543	2 459	2 526	2 397	2 582	2 540	2 179
Serbia (SRB)	n.a.	305	208	197	227	n.a.	213	220	198	181
Slovenia (SI)	179							181	107	
Spain (ES)	3288	3144	3104	3211	2691	2389	2096	1824	1495	n.a.
Sweden (SE)	393	373	379	349	288	273	261	279	230	

Source: CARE Database
(SRB) * - Annual Serbian Traffic Police Directorate data (2001-2009)

	42. Motorcyclists killed									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria (AT)	112	107	89	109	98	98	95	96	91	87
Belgium (BE)	118	147	158	124	120	123	130	136	108	n.a.
Cyprus (CY)		24	22	21	35	24	25	25	24	25
Czech Republic (CZ)	116	95	134	112	102	124	116	139	123	94
Estonia (EE)	5	6	3	3	2	5	5	10	1	3
Finland (FI)	10	16	22	23	22	32	26	32	36	27
France (FR)	964	1092	1063	883	866	892	789	853	817	888
Germany (DE)	1102	1102	1044	1080	980	982	900	907	766	749
Greece (EL)	406	426	341	310	379	399	440	420	394	461
Hungary (HU)	52	54	52	66	72	100	89	112	91	73
Ireland (IE)	40	50	44	55	40			33	29	27
Israel (IL)				40				37	44	33
Italy (IT)	770	848	907	1035	1139	1120	1127	1182	1086	n.a.
Netherlands (NL)	89	76	93	95	84	77	57	64	67	68
Poland (PL)	178	159	167	145	181	157	164	215	262	290
Serbia (SRB)*	n.a.	n.a.	n.a.	n.a.	33	39	51	68	85	80
Slovenia (SI)	19							40	39	
Spain (ES)	392	370	401	367	399	472	488	640	495	436
Sweden (SE)	39	38	37	47	56	46	55	60	51	47

Source: CARE Database; 2010-OECD: *A record decade for road safety.* Press release. 15 September 2010.
(SRB) * - Annual Serbian Traffic Police Directorate data (2001-2009)

	43. Bicyclists killed									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria (AT)	62	55	80	56	58	47	48	37	62	39
Belgium (BE)	134	130	105	110	79	71	92	88	86	n.a,
Cyprus (CY)	n.a.	n.a.	n.a.	n.a.	n.a.	1	2	3	6	0
Czech Republic (CZ)	151	141	160	159	131	115	110	116	93	84
Estonia (EE)	21	18	19	15	9	12	18	14	10	7
Finland (FI)	53	59	53	39	26	43	29	22	18	20
France (FR)	270	256	223	201	177	180	181	142	148	162
Germany (DE)	659	635	583	616	475	575	486	425	456	462
Greece (EL)	22	29	14	21	24	18	21	16	22	15
Hungary (HU)	182	196	182	178	183	152	153	158	109	103
Ireland (IE)	10	12	18	10	10			15	13	
Israel (IL)				23				6	13	
Italy (IT)	401	366	326	355	322	335	311	352	288	n.a.
Netherlands (NL)	198	195	169	188	157	151	179	147	145	138
Poland (PL)	692	610	681	647	691	603	509	498	433	371
Serbia (SRB)*	n.a.	134	92	82	101	99	85	100	88	84
Slovenia (SI)	26							17	16	
Spain (ES)	84	100	96	78	88	82	72	90	59	n.a.
Sweden (SE)	47	43	42	35	27	38	26	33	30	

Source: CARE Database
(SRB) * - Annual Serbian Traffic Police Directorate data (2001-2009)

	44. Pedestrians killed									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria (AT)	140	117	160	132	132	97	110	108	102	101
Belgium (BE)	142	158	127	113	101	108	122	103	99	n.a.
Cyprus (CY)		21	17	18	18	23	19	17	16	9
Czech Republic (CZ)	362	322	309	290	281	298	202	235	238	176
Estonia (EE)	79	61	59	43	60	47	61	37	40	24
Finland (FI)	62	62	40	59	49	45	49	48	53	30
France (FR)	838	822	866	626	581	635	535	561	548	496
Germany (DE)	993	900	873	812	838	686	711	695	653	591
Greece (EL)	375	338	279	257	293	234	267	255	248	202
Hungary (HU)	346	355	378	299	326	289	296	288	251	186
Ireland (IE)	85	89	86	64	85			81	49	
Israel (IL)				159				114	134	
Italy (IT)	982	1032	1226	871	810	786	758	627	648	n.a.
Netherlands (NL)	106	106	97	97	68	83	66	86	56	63
Poland (PL)	2256	1866	1987	1878	1986	1756	1802	1951	1882	1467
Serbia (SRB)*	n.a.	365	251	268	283	n.a.	233	251	223	175
Slovenia (SI)	60							32	39	
Spain (ES)	899	846	776	786	683	680	614	591	502	n.a.
Sweden (SE)	73	87	58	55	67	50	55	58	45	

Source: CARE Database
(SRB) * - Annual Serbian Traffic Police Directorate data (2001-2009)

	45. Fatalities by population									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria (AT)	122	119	119	115	108	94	88	83	81	76
Belgium (BE)	144	145	127	117	112	104	102	101	88	89
Cyprus (CY)	161	140	133	136	160	136	112	114	103	89
Czech Republic (CZ)	145	130	140	142	135	126	104	119	104	86
Estonia (EE)	149	146	164	121	126	126	152	146	98	75
Finland (FI)	77	84	80	73	72	72	64	72	65	53
France (FR)	137	138	129	101	92	85	75	73	67	66
Germany (DE)	91	85	83	80	71	65	62	60	54	51
Greece (EL)	187	172	149	146	151	150	149	144	139	132
Hungary (HU)	117	121	140	131	128	127	129	122	99	82
Ireland (IE)	111	107	96	85	94	97	87	78	63	54
Israel (IL)	71								55	
Italy (IT)	124	125	122	114	106	100	96	87	79	67
Netherlands (NL)	68	62	61	63	49	46	45	43	41	44
Poland (PL)	163	145	152	148	150	143	137	146	143	120
Serbia (SRB)*		170	114	116	127	112	120	128	120	108
Slovenia (SI)	158	140	135	121	137	129	131	146	106	84
Spain (ES)	144	136	131	130	112	103	94	86	68	44
Sweden (SE)	67	66	63	59	53	49	49	52	43	39

Source: CARE Database

(SRB) * - Annual Serbian Traffic Police Directorate data (2001-2009)