Prevalence of alcohol and other psychoactive substances in drivers in general traffic. Part I: General results

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Driving under the Influence of Drugs, Alcohol and Medicines

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Prevalence of alcohol and other psychoactive substances in drivers in general traffic

Part I: General results

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Prevalence of alcohol and other psychoactive substances in drivers in general traffic
Part I: General results

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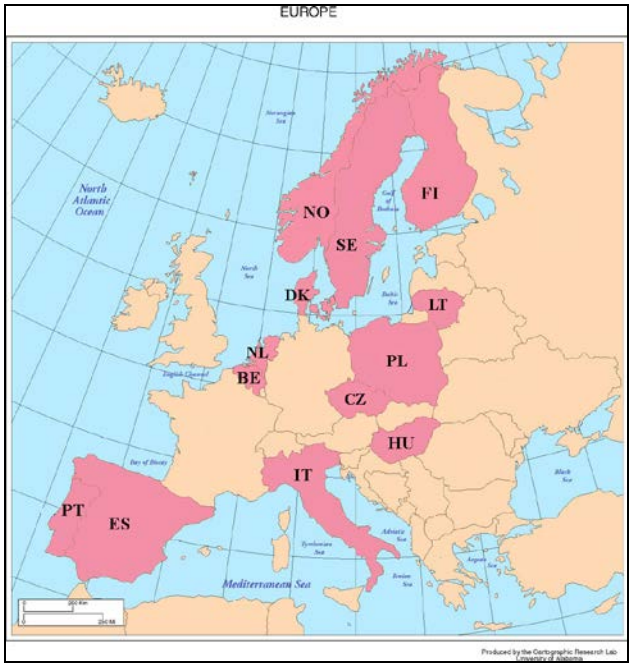
Executive summary

Introduction

DRUID (Driving under the Influence of Drugs, Alcohol and Medicines) aimed to combat the problem of driving under the influence of psychoactive substances by providing a solid scientific base for European policy makers. It brought together experienced organisations in Europe to assemble a co-ordinated set of data resources and measures. DRUID is an integrated European research project which consisted of different sub-projects (Work Packages) that were aimed at different topics such as the prevalence and risk of psychoactive substances, enforcement, classification of medicines, rehabilitation of offenders and withdrawal of driving licenses (www.druid-project.eu).

The main objective of WP2 of DRUID was to assess the situation in Europe regarding the prevalence and risk of the use of illicit drugs, alcohol and psychoactive medicinal drugs by drivers.

The main aim of this study was to obtain more insight in the use of psychoactive substances among drivers in European traffic. Thirteen countries participated in this study by conducting roadside surveys according to a general design. In total almost 50,000 randomly selected drivers participated between January 2007 and July 2009.



1. Belgium (BE)	6. Hungary (HU)	11. Poland (PL)
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All participating countries are members of the European Union (EU) except for Norway, which is associated with the European Union as a member of the European Economic Area (EEA).

Participants, i.e. drivers of passenger cars and vans, were randomly selected using a stratified multi-stage sampling design. In the first stage, one or more regions per country were selected. These regions were meant to be representative for the country with regard to substance use and traffic distribution. Within the selected regions smaller research areas were selected, and within these areas, survey locations were selected, where subjects were stopped at random, and were requested to participate in the study. With regard to days of the week and times of the day, the study population sample was stratified into eight time periods over the week, for each of the survey areas. The time periods did not overlap each other and covered all the days of the week and all times of the day.

Method

All hours of the day and all days of the week were covered by four time periods: weekdays (04.00-21.59), weeknights (22.00-03.59), weekend days (04.00-21.59), and weekend nights (22.00-03.59).

All countries have used a StatSure Saliva Sampler device for saliva collection, except for the Netherlands, where saliva was collected by means of ordinary spit cups.
Blood samples were collected in Belgium, Italy, the Netherlands and Lithuania. All four countries used glass tubes for the collection containing sodium fluoride and potassium oxalate.
Extraction of the substances was based on liquid-liquid (LLE) or solid phase (SPE), chromatographic separation was performed by gas chromatography (GC) or Liquid chromatography (LC), detection was done by mass spectrometry.
In total 23 substances have been included in the core substance list at the beginning of the project. The list of core substances was based on discussions between all partners.
For each substance an analytical cut-off has been selected based on the lowest limit of quantitation (LOQ) that could be measured by all toxicological laboratories that were involved in the analysis of the substances. LOQ's reflect the lowest concentrations for substances at which quantitative results can be reported with a high degree of confidence. For the final results presented in this report, equivalent cut-offs, and not the LOQ's, are used for analysis of the core substances to correct for differences in concentrations of substances in blood and in saliva.
The distribution of the study population sample by time periods was not proportionate to the distribution of the general driving population over these periods. This was unavoidable since in many of the thirteen countries the researchers had to take into account the preferences of the police who were needed to stop the drivers from moving traffic. Weight factors were applied to correct for this disproportion based on the ratio by time period between the distribution of traffic and the distribution of the participants.

Main results

- Alcohol is still by far the number one psychoactive substance on European roads, followed by illicit drugs and medicinal drugs.

- On a European level alcohol is estimated to be used by 3.48% of the drivers, illicit drugs by 1.90% of the drivers, medicinal drugs by 1.36% of the drivers, drug-drug combinations by 0.39% of the drivers and alcohol-drug combinations by 0.37% of the drivers.

- For illicit drugs THC is the most frequently detected drug in traffic, followed by cocaine. Amphetamines and illicit opiates were less frequently detected.

- Illicit drugs were in general mainly detected among young male drivers, during all times of the day but mainly in the weekend

- Medicinal drugs were in general mainly detected among older female drivers during daytime hours.

- Benzodiazepines were the most prevalent medicinal drug in traffic, Z-drugs were less prevalent. However, considerable differences between countries were present.

- The use of substances among drivers in the general driving population in Europe (prevalence) varies very much per country, but general patterns can be distinguished on the level of European regions:

    - The medicinal drugs Z-drugs and medicinal opiates and opioids were in general relatively frequently detected in Northern European countries.

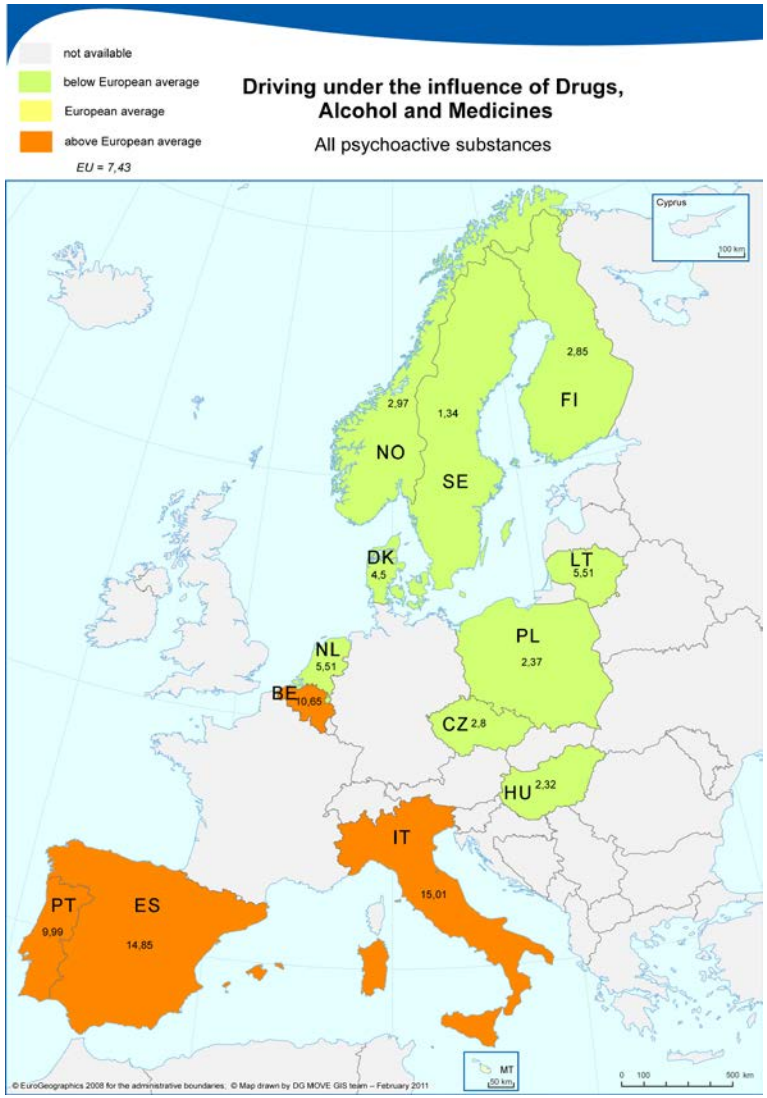
    - Illicit drugs, alcohol and benzodiazepines are relatively frequently detected in Southern European countries.

    - In Eastern Europe the prevalence of alcohol and drugs was relatively low compared to the other European regions.

- In Western Europe, drug use is more or less on the European average.

Figures 1 – 6 on the following pages provide geographical presentations as a summary of the main findings.

A more detailed overview of the findings is presented in the table on page 9. This table shows the prevalences per substance group and per country as well as the estimated European means. The European mean can be used to distinguish per substance whether a country prevalence is around, below or above this European mean. The table presents the spread of the prevalence around the estimated European mean. A yellow colour of a particular prevalence value indicates that the European mean lies within the 95% confidence interval of the prevalence. A green coloured value indicates that the confidence interval suggests that it is below the European mean, and a red coloured value indicates that the confidence interval suggests that it is above the European mean.



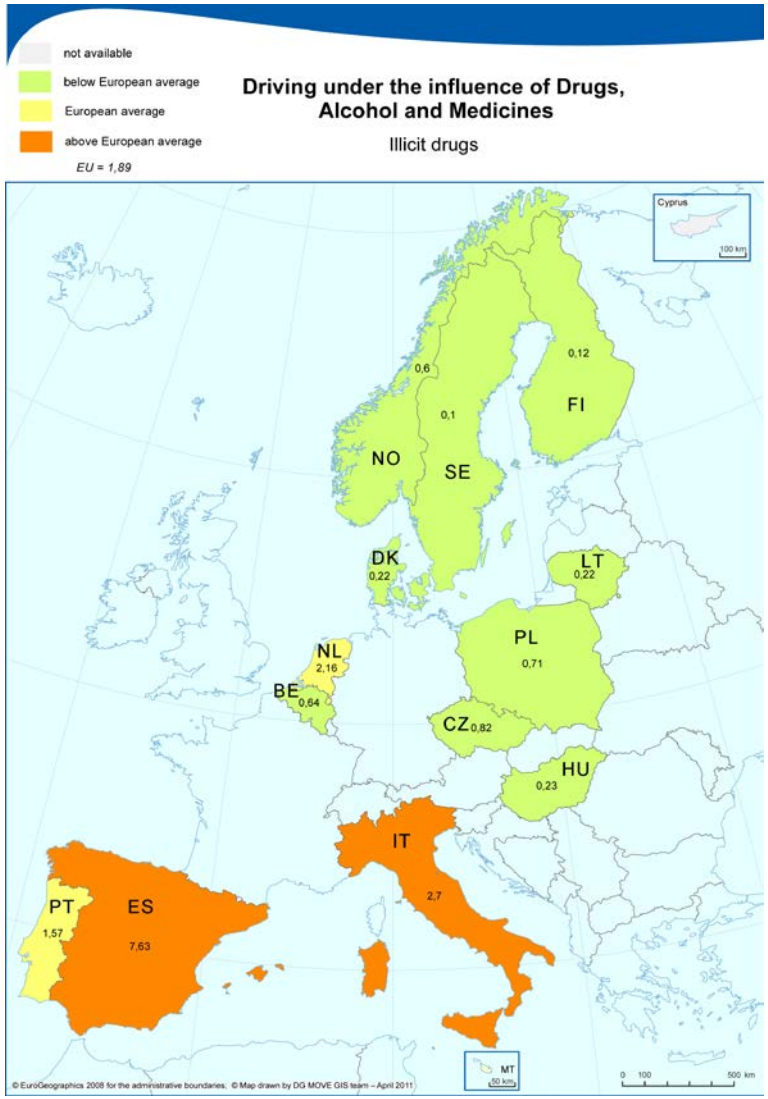
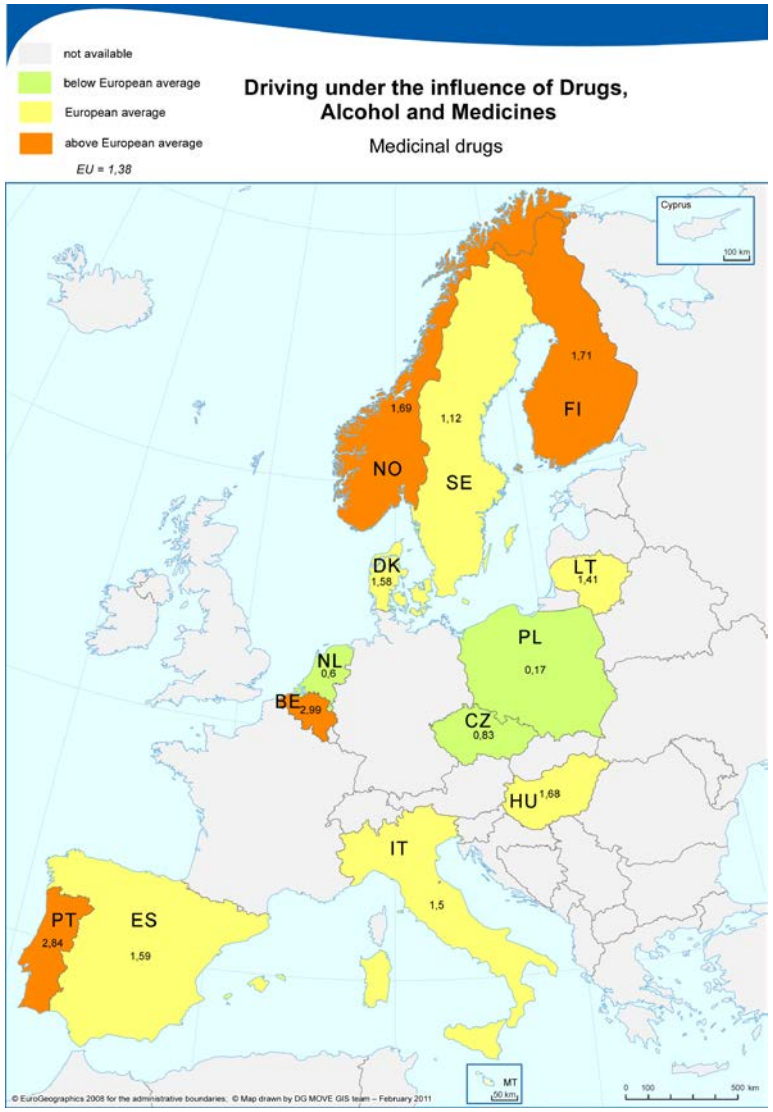


Figure 1 and 2. Geographical presentation of psychoactive substance use and illicit drug use by car drivers in the EU



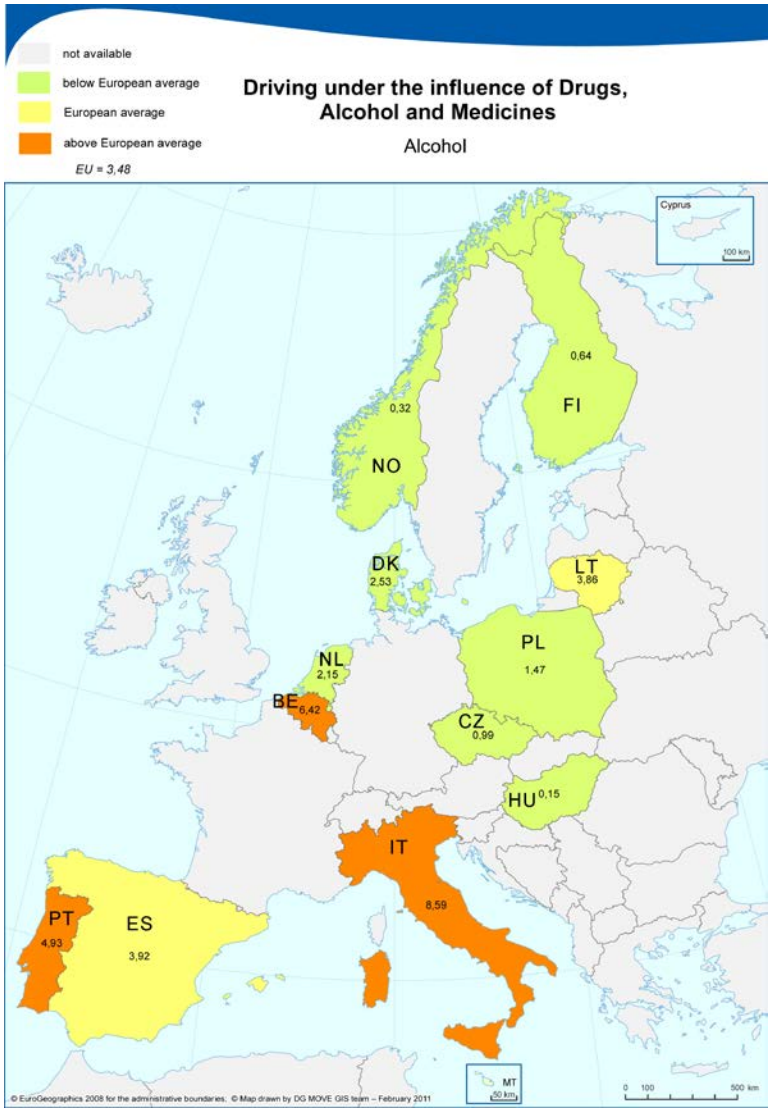
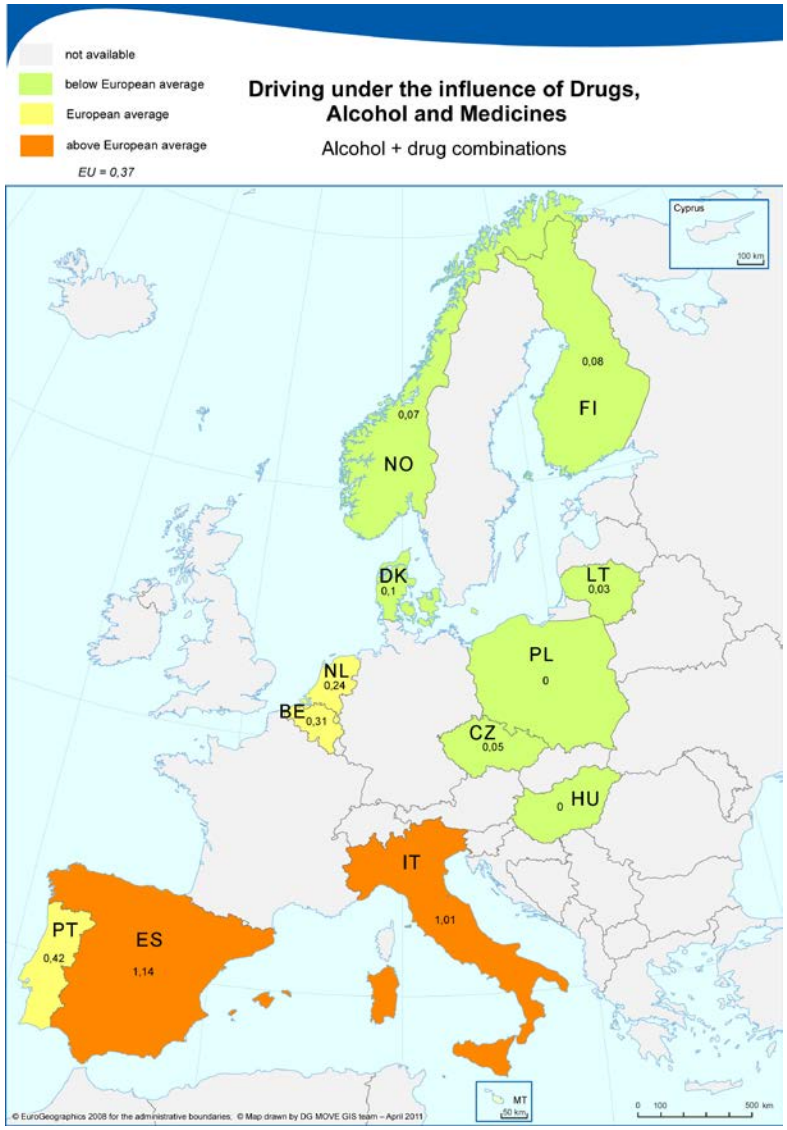


Figure 3 and 4. Geographical presentation of medicinal drug and single alcohol use by car drivers in the EU



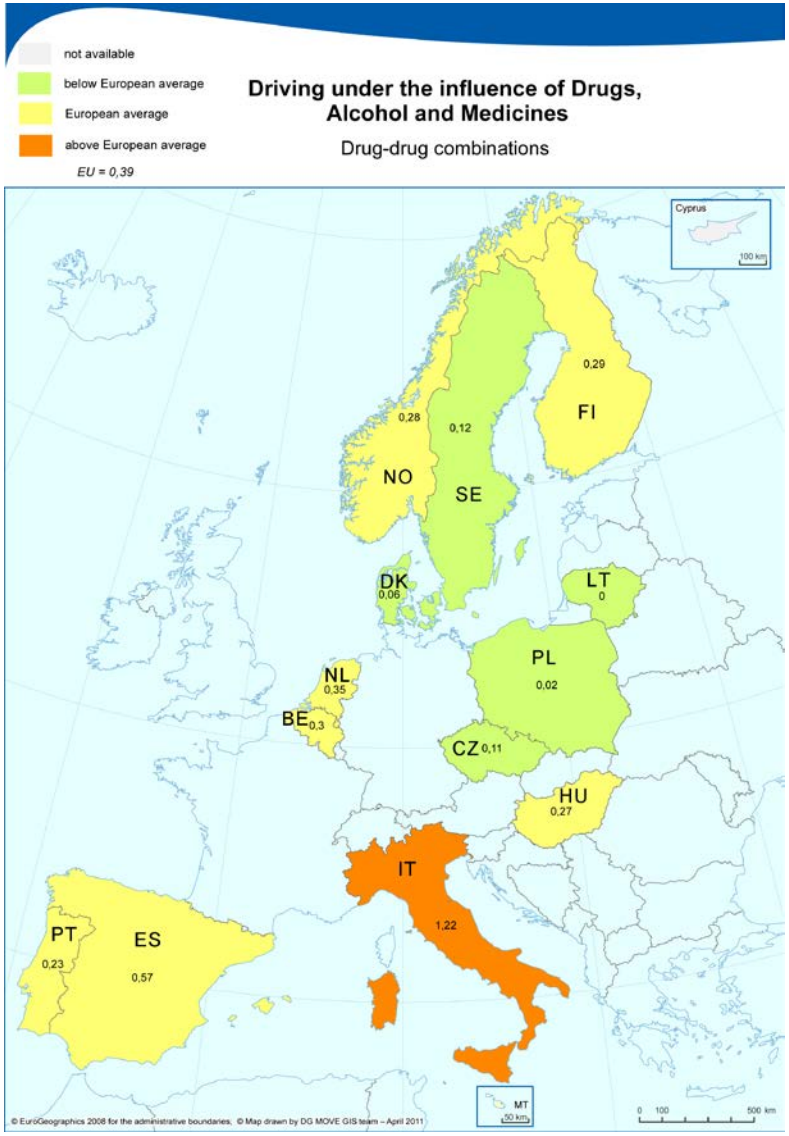


Figure 5 and 6. Geographical presentation of alcohol and drugs and drug-drug combinations by car drivers in the EU

Overview of the estimated European prevalences of psychoactive substances; prevalences in percentage; 95% confidence intervals in italics

		Inhabitants (million)	negative	amphetamines	cocaine	THC	illicit opiates	benzodiazepines	Z-drugs	medicinal opiates and opioids	alcohol	alcohol-drugs	drugs-drugs
Northern Europe	DK	5.4	95.52 *94.72 - 96.2*	0.02 *0 - 0.16*	- -	0.2 *0.09 - 0.43*	- -	0.47 *0.28 - 0.79*	0.32 *0.17 - 0.59*	0.79 *0.53 - 1.18*	2.53 *2.02 - 3.15*	0.1 *0.03 - 0.3*	0.06 *0.02 - 0.24*
	FI	5.3	97.15 *96.58 - 97.63*	0.05 *0.02 - 0.19*	0.03 *0.01 - 0.16*	0.04 *0.01 - 0.17*	- -	0.79 *0.56 - 1.13*	0.36 *0.21 - 0.6*	0.56 *0.37 - 0.85*	0.64 *0.43 - 0.94*	0.08 *0.03 - 0.23*	0.29 *0.16 - 0.52*
	NO	4.7	97.03 *96.67 - 97.36*	0.06 *0.02 - 0.13*	0.06 *0.03 - 0.14*	0.48 *0.36 - 0.64*	- -	0.84 *0.67 - 1.05*	0.69 *0.54 - 0.88*	0.16 *0.1 - 0.27*	0.32 *0.23 - 0.46*	0.07 *0.03 - 0.15*	0.28 *0.19 - 0.42*
	SE	9.1	98.66 *98.34 - 98.92*	0.07 *0.03 - 0.17*	- -	0.03 *0.01 - 0.12*	- -	0.19 *0.11 - 0.33*	0.31 *0.2 - 0.48*	0.63 *0.46 - 0.86*	NA	NA	0.12 *0.06 - 0.25*
	Total N-EU	*93.3*	*97.32*	*0.05*	*0.02*	*0.16*	*0.00*	*0.51*	*0.40*	*0.56*	*1.20*	*0.05*	*0.17*
Eastern Europe	CZ	10.3	97.2 *96.39 - 97.83*	0.36 *0.17 - 0.72*	- -	0.46 *0.25 - 0.86*	- -	0.62 *0.36 - 1.07*	- -	0.21 *0.08 - 0.52*	0.99 *0.65 - 1.53*	0.05 *0.01 - 0.28*	0.11 *0.03 - 0.38*
	HU	10.1	97.68 *97.04 - 98.18*	- -	0.04 *0.01 - 0.21*	0.19 *0.08 - 0.44*	- -	1.5 *1.11 - 2.03*	0.07 *0.02 - 0.26*	0.11 *0.04 - 0.32*	0.15 *0.06 - 0.38*	- -	0.27 *0.13 - 0.54*
	LT	3.4	94.49 93.09 - 95.61	0.22 0.07 - 0.66	- -	- -	- -	1.41 0.9 - 2.23	- -	- -	3.86 2.93 - 5.06	0.03 0 - 0.36	- -
	PL	38.2	97.63 *97.11 - 98.05*	0.05 *0.01 - 0.18*	- -	0.57 *0.38 - 0.85*	0.09 *0.04 - 0.25*	0.14 *0.06 - 0.31*	- -	0.03 *0.01 - 0.15*	1.47 *1.14 - 1.9*	- -	0.02 *0 - 0.14*
	Total E-EU	*96.7*	*97.57*	*0.09*	*0.01*	*0.47*	*0.06*	*0.52*	*0.02*	*0.08*	*1.10*	*0.01*	*0.07*
Southern Europe	ES	44.5	85.15 *83.87 - 86.34*	0.11 *0.04 - 0.3*	1.49 *1.12 - 1.97*	5.99 *5.22 - 6.87*	0.05 *0.01 - 0.2*	1.4 *1.05 - 1.87*	- -	0.19 *0.09 - 0.41*	3.92 *3.3 - 4.66*	1.14 *0.83 - 1.58*	0.57 *0.36 - 0.89*
	IT	59.1	84.99 *82.95 - 86.82*	- -	1.25 *0.78 - 2.01*	1.15 *0.7 - 1.89*	0.3 *0.12 - 0.78*	0.97 *0.57 - 1.67*	- -	0.53 *0.25 - 1.09*	8.59 *7.19 - 10.23*	1.01 *0.59 - 1.71*	1.22 *0.75 - 1.97*
	PT	10.6	90.01 *89.04 - 90.91*	- -	0.03 *0.01 - 0.16*	1.38 *1.07 - 1.8*	0.15 *0.07 - 0.33*	2.73 *2.27 - 3.29*	- -	0.11 *0.04 - 0.27*	4.93 *4.29 - 5.64*	0.42 *0.26 - 0.67*	0.23 *0.12 - 0.44*
	Total S-EU	*128.6*	*85.52*	*0.04*	*1.23*	*3.06*	*0.19*	*1.30*	*0.00*	*0.36*	*6.43*	*1.01*	*0.87*
Western Europe	BE	10.6	89.35 *88.18 - 90.41*	- -	0.2 *0.09 - 0.43*	0.35 *0.19 - 0.64*	0.09 *0.03 - 0.28*	2.01 *1.57 - 2.59*	0.22 *0.1 - 0.47*	0.75 *0.5 - 1.13*	6.42 *5.59 - 7.36*	0.31 *0.16 - 0.58*	0.3 *0.16 - 0.58*
	NL	16.4	94.49 *93.81 - 95.1*	0.19 *0.1 - 0.36*	0.3 *0.18 - 0.5*	1.67 *1.34 - 2.07*	0.01 *0 - 0.09*	0.4 *0.25 - 0.62*	0.04 *0.01 - 0.15*	0.16 *0.08 - 0.32*	2.15 *1.78 - 2.6*	0.24 *0.13 - 0.42*	0.35 *0.22 - 0.56*
	Total W-EU	*181.4*	*92.46*	*0.12*	*0.26*	*1.15*	*0.04*	*1.03*	*0.11*	*0.39*	*3.83*	*0.27*	*0.33*
Weighted European mean		***500.0***	***92.57***	***0.08***	***0.42***	***1.32***	***0.07***	***0.90***	***0.12***	***0.35***	***3.48***	***0.37***	***0.39***

Recommendations

The results of this study can generally be used in selecting overall activities and target groups in the policy field of psychoactive substance use in traffic across Europe. The results indicate, however, that the prevalence of psychoactive substances by gender, age and time period varies largely per country. Therefore, recommendations for national activities regarding, e.g., policy issues, enforcement, education or campaigns, should primarily be based on the results of the country reports, rather than on the general report.

Alcohol is still the most prevalent substance in traffic, as well as it is among injured and killed drivers (Isalberti et al., 2011). Therefore, with regard to enforcement on psychoactive substances it is recommended that this would remain to be mainly focused on alcohol use among drivers. Since enforcement of drug driving legislation is costly in terms of time and money, selective drug testing is recommended above random drug testing. However, drug enforcement should not go at cost of alcohol enforcement (Veisten et al., 2010).

The thirteen roadside surveys that were conducted within the DRUID-project provided a very valuable insight in the prevalence of psychoactive substances among car drivers in Europe. In the near future new legislations on drug driving will be applied in several European countries (e.g. the Netherlands) and the results from the DRUID project may affect future policies towards drink and drug driving. Therefore, it would be very valuable to monitor if these changes will indeed have a positive effect on the use of psychoactive substances in traffic. National roadside surveys on the prevalence of substance use in traffic on a regular, say, annual or bi-annual base would be a helpful tool to monitor the trend of drink and drug driving. It is recommended that these monitoring surveys would be carried out in more countries than the thirteen European countries that participated in the DRUID roadside surveys, in order to get a more representative European overview.
Since the main purpose of this roadside survey would be to monitor the trend of drug driving, the number of samples per country might be smaller than in the present study. A power study should be conducted to estimate the required number of samples from randomly selected car drivers.

In order to compare the results from new roadside surveys in Europe with the data collected in DRUID it is recommended to follow the study design guidelines from the DRUID roadside surveys (See annex 1) as much as possible.

It is recommended to collect saliva samples when the roadside surveys are solely used for monitoring the prevalence of drug use in traffic, since higher non-response rates are to be expected when collecting blood samples.

If the roadside survey is part of a case-control study, it is recommended to use the same sample collection method at the roadside as is used in the hospital, in order to be able to make good comparisons between cases and controls.

Furthermore, in order to reduce non-response researchers should invite the participants of the survey before the police tests the driver for alcohol.

It is mandatory to have permission of the various national Medical Ethics Commission to conduct a roadside survey like this. The process of getting this permission can take a lot of time in some countries, this should be taken into account when planning future prevalence studies on psychoactive substances.

List of abbreviations

BAC: Blood Alcohol Concentration
BE: Belgium
CV: coefficient of variation
CZ: Czech Republic
DK: Denmark
DRUID: Driving Under the Influence of Drugs, alcohol and medicines
ES: Spain
FIN: Finland
GC: Gas Chromatography
HPLC: High Performance Liquid Chromatography
HU: Hungary
IT: Italy
LC: Liquid Chromatography
LLE: Liquid Liquid Extraction
LT: Lithuania
MS: Mass Spectrometry
N: Norway
NA: Not Applicable
NL: The Netherlands
OF: Oral Fluid
PL: Poland
PT: Portugal
PrT: proficiency testing
SE: Sweden
SD_{HOR}: standard deviation according to Horwitz
SPE: Solid Phase Extraction
THC: delta-9-tetrahydrocannabinol
THCCOOH: 11-nor-9-carboxy-Δ9-tetrahydrocannabinol
UPLC: Ultra Performance Liquid Chromatography
WB: Whole Blood
WP2: DRUID - Work Package 2

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Acknowledgements

This report has been produced under the project Driving Under Influence of Drugs, Alcohol and Medicines (DRUID) financed by the European Commission within the framework of the EU 6th Framework Program.
The authors are grateful for the input of all partners in the national roadside surveys. Furthermore, we would like to express our thanks to Professor Ralf-Dieter Hilgers of the Institute for Medical Statistic in Aachen and Professor Markus Vollrath of the Technical University of Braunschweig for their suggestions and advice on the methods for statistical analysis. The DG MOVE GIS team is thanked for the preparation of the result maps.
This report has benefitted very much by the comments and remarks of the internal reviewers Hallvard Gjerde (FHI), Javier Alvarez (UVa), and Mario Dias (CPS-NILM).
Our appreciation goes as well to our colleagues of BAST and TÜV who were responsible for the management of the project.

1. Introduction

1.1 General background

DRUID (Driving under the Influence of Drugs, Alcohol and Medicines) aimed to combat the problem of driving under the influence of psychoactive substances by providing a solid scientific base for European policy makers. It brought together experienced organisations in Europe to assemble a co-ordinated set of data resources and measures. DRUID is an integrated European research project which consisted of different sub-projects (Work Packages) that were aimed at different topics such as the prevalence and risk of psychoactive substances, enforcement, classification of medicines, rehabilitation of offenders and withdrawal of driving licenses (www.druid-project.eu).

The main objective of WP2 of DRUID was to assess the situation in Europe regarding the prevalence and risk of the use of illicit drugs, alcohol and psychoactive medicinal drugs by drivers.

The prevalence of drug driving was estimated by means of roadside surveys and the prevalence of drugs in injury accidents was estimated by means of hospital surveys of seriously injured and/or killed drivers. Accident risk estimates for drug driving were assessed by relating the prevalence of drugs among the general driving population to the prevalence among seriously injured and/or killed drivers, by relating medication records to accident data and by relating substance use among accident-involved drivers to accident culpability.

1.2 Study design

A cross-sectional roadside survey was conducted to determine the prevalence of psychoactive substances among the general driving population in thirteen European countries. In order to be able to compare the thirteen different studies, guidelines for a uniform design were developed for all participating countries (see Annex 1).

1.3 Part 1 and 2 of the report

PART 1 of this report presents the general results of the roadside surveys. The representativeness of the driving population is discussed in chapter 2, which also includes an assessment of the non response issues in the various countries. Chapter 3 describes method, substances as well as weighting and analyses used. Chapter 4 provides an overview of the most important general results based on the weighted prevalence estimates for a range of substance groups. Chapter 5 presents an analysis of factors that influence the prevalence. In chapter 6 the obtained results are discussed and conclusions and recommendations are formulated.

The general results in this report are based on the thirteen country reports that were written by all partners and are combined in PART 2 of the report. This second part includes a report from each of the participating countries with more specific details on method, results and representativeness of the study.

1.4 Sampling design and data collection

Participants, i.e. drivers of passenger cars and vans, were randomly selected using a stratified multi-stage sampling design. In the first stage, one or more regions per country were selected. These regions were meant to be representative for the country with regard to substance use and traffic distribution. The representativeness of the regions is discussed in chapter 2 and the results of the substance use are presented in chapter 4. Within the selected regions smaller research areas were selected, and within these areas, survey locations were selected, where subjects were stopped at random, and were requested to participate in the study. With regard to days of the week and times of the day, the study population sample was stratified into eight time periods over the week, for each of the survey areas. The time periods did not overlap each other and covered all the days of the week and all times of the day.

The distribution of the study population sample by time periods was not proportionate to the distribution of the general driving population over these periods. This was unavoidable since in many of the thirteen countries the researchers had to take into account the preferences of the police who were needed to stop the drivers from moving traffic. Weight factors were applied to correct for this disproportion based on the ratio by time period between the distribution of traffic and the distribution of the participants.

Information like gender and age was collected for each subject, as well as a saliva and/or a blood sample. For more information on the items of the data collection see Annex 1.

1.5 Participating countries in the roadside survey

Roadside surveys were carried out in thirteen European countries. These countries are presented in table 1.1 and figure 1.1.

Table 1.1. Participating countries

1. Belgium (BE)	6. Hungary (HU)	11. Poland (PL)
2. Czech Republic (CZ)	7. Italy (IT)	12. Portugal (PT)
3. Denmark (DK)	8. Lithuania (LT)	13. Sweden (SE)
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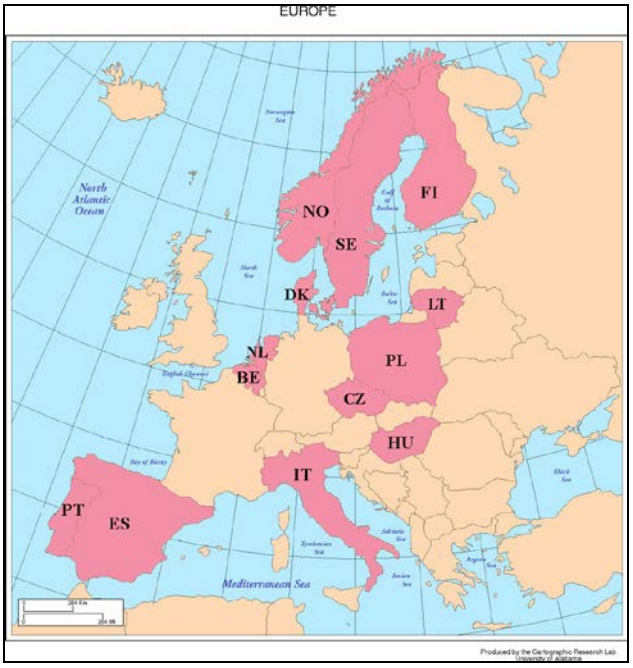

Figure 1.1. Participating countries

All participating countries are members of the European Union (EU) except for Norway, which is associated with the European Union as a member of the European Economic Area (EEA).

2. Method

2.1 Operation of the survey

The operation of the roadside survey was based on a uniform design. Allthough differences between countries were present, some general steps in the survey protocol can be described.
Drivers were stopped by the police at the request of the acting research coordinator. The subjects were breath tested for alcohol by a police officer, using a screening breath test analyzer.
As soon as a member of the research team was ready for interviewing and/or blood or saliva sampling a driver, the next car approaching the research site was stopped. The stopped drivers were asked to cooperate with the research team on a voluntary basis. In some countries informed consent was mandatory. In these countries the drivers who agreed to cooperate signed a written consensus form before they were interviewed. Besides the interview, in some countries a physical examination was performed with particular attention paid to clinical signs of drug use or abuse.
The interviews and the medical examinations were conducted in most countries in a specially equipped mobile research unit with enough space to accommodate the research team and two subjects. The results for each driver, including breath test data, were entered on a uniquely numbered anonymous research form. More detailed information on the research protocol is presented in the country reports that can be found in part 2 of this report.

2.2 Time periods

All hours of the day and all days of the week were covered by the eight time periods that were selected in the DRUID project. All hours of the day were distributed over four six-hour time periods (04.00-09.59, 10.00-15.59, 16.00-21.59, and 22.00-03.59). The days of the week were distributed over weekdays and weekend days.
Figure 2.1 presents the eight different DRUID time periods.

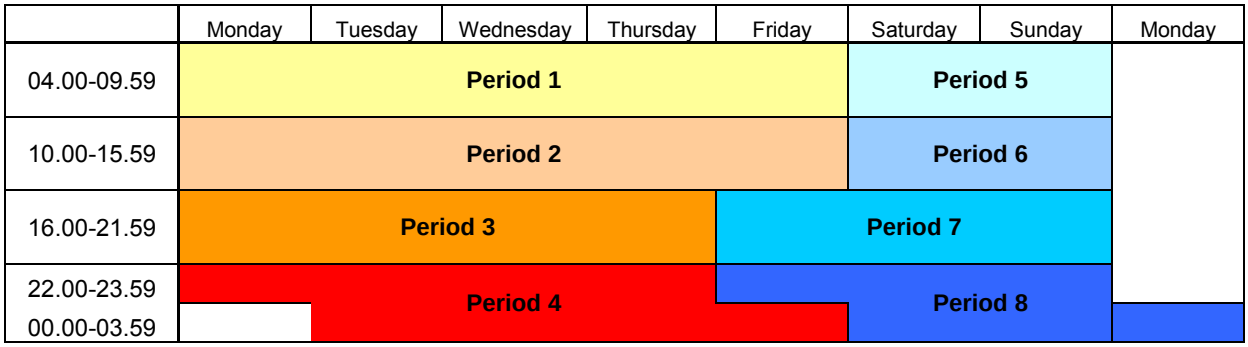

Figure 2.1. DRUID time periods

The eight time periods have been clustered into four time periods in the analysis in order to increase the statistical power of the study. The four new time periods in the analysis are the following: weekdays (04.00-21.59), weeknights (22.00-03.59), weekend days (04.00-21.59), and weekend nights (22.00-03.59). The Lithuanian roadside survey did not collect data in time period 5. After clustering of the data however, all four new time periods were covered by the results of the roadside survey.
Clustering was not needed for all countries, but in order to have comparable data, results are presented for the distribution over four time periods for all countries.

2.3 Substances

All countries have used a StatSure Saliva Sampler device for saliva collection, except for the Netherlands, where saliva was collected by means of ordinary spit cups. The Statsure Saliva Sampler is a saliva collection device, which the partners agreed upon to use at the beginning of the project. By the time this decision was made, the roadside survey in the Netherlands already had been started. After consultation with the partners, the Dutch researchers decided not to restart their collection of samples, but to continue the roadside survey with the ordinary spit cups. Blood samples were

collected in Belgium, Italy, the Netherlands and Lithuania. All four countries used glass tubes for the collection containing sodium fluoride and potassium oxalate.
Extraction of the substances was based on liquid-liquid (LLE) or solid phase (SPE), chromatographic separation was performed by gas chromatography (GC) or Liquid chromatography (LC), detection was done by mass spectrometry.
Annex 2 provides a detailed overview of the toxicological methods that were used by the partners as well as information on the proficiency tests.

In total 23 substances have been included in the core substance list at the beginning of the project. The list of core substances was based on discussions between all partners. These core substances should at least be included in the sample analysis. Furthermore, the analysis for additional substances was permitted as well. Some countries have included the results from their additional substances in their country reports (see part 2 of this report). In this general part of the report only the results of the analysis of the core substances will be discussed.
For each substance an analytical cut-off has been selected based on the lowest limit of quantitation (LOQ) that could be measured by all toxicological laboratories that were involved in the analysis of the substances. LOQ's reflect the lowest concentrations for substances at which quantitative results can be reported with a high degree of 95% confidence. For the final results presented in this report, equivalent cut-offs, and not the LOQ's, are used for analysis of the core substances to correct for differences in concentrations of substances in blood and in saliva. The reason for this is that for many substances the concentrations in oral fluid are much higher than in blood, while for some compounds the concentrations are lower (Gjerde et al., 2010; Wille et al., 2009). This means that if LOQ's for oral fluid samples were used to collect information on recent drug use, the prevalence for most substances would probably have been higher than that it would have been the case if blood was used as a sampling matrix. For the core substances diazepam, flunitrazepam and zolpidem, as well as for 7-amino-flunitrazepam, which is a metabolite of flunitrazepam, the equivalent cut-offs for oral fluid were below the LOQ. So, in order to get comparable results between the thirteen, the equivalent cut-offs were used. Table 2.2 provides an overview of the initial and the equivalent cut-offs for all core substances.

Table 2.2. Recommended equivalent cut-offs for DRUID core substances

Substance	Cut-off in whole blood (ng/mL)	Cut-off in oral fluid (ng/mL)	**Recommended equivalent cut-off in oral fluid (ng/mL)**	**Recommended equivalent cut-off in whole blood (ng/mL)**
6-AM	10	5	**16**[1]	10
Alprazolam	10	1	**3.5**	10
Amphetamine	20	25	**360**	20
Benzoylecgonine	50	10	**95**	50
Clonazepam	10	1	**1.7**	10
Cocaine	10	10	**170**	10
Codeine	10	20	**94**	10
Diazepam	20	5	5.0[2]	**140**
Flunitrazepam	2	1	1.0[2]	**5.3**[1]
Lorazepam	10	1	**1.1**	10
MDA	20	25	**220**[1]	20
MDEA	20	25	**270**[3]	20
MDMA	20	25	**270**[1]	20
Methadone	10	20	**22**	10
Methamphetamine	20	25	**410**	20
Morphine	10	20	**95**	10
Nordiazepam	20	1	**1.1**	20
Oxazepam	50	5	**13**	50
THC	1	1	**27**	1.0
Zolpidem	20	10	10[2]	**37**
Zopiclone	10	10	**25**[1]	10
Tramadol	50	50	**480**	50
7-amino-clonazepam	10	1	**3.1**[1]	10

7-amino-flunitrazepam	2	1	1.0[2]	**8.5**[1]

[1] *data based on less than 10 individual cases*
[2] *recommended cut-off in oral fluid lower than the original DRUID cut-off in oral fluid, therefore the cut-off in blood has been raised*
[3] *no positive cases, cut-off MDEA used for MDMA*

Substances of the same type are combined into substance groups in the analysis. Table 2.3 presents the substance groups and the core substances that were included in each of the groups. The substance groups (including those who tested negative on all substances) are mutually exclusive, so each record in a database is either negative or linked to one of the substance groups.
For calculating prevalence, substances of the same type were combined into following substance groups: alcohol, amphetamines, cocaine, THC, illicit opiates, benzodiazepines, Z-drugs, and medicinal opioids. The presence of THCCOOH alone (a metabolite of THC which is only detectable in blood samples), is regarded as negative.

Substance groups are aggregated into the following substance classes: alcohol, illicit drugs, medicinal drugs and the following combinations: drug-alcohol and drug-drug. This last class is specified as a combination of different substance groups. For example: zolpidem + cocaine will be considered a drug-drug combination but zolpidem + zopiclone will be considered a single use of Z-drugs.

Table 2.3. DRUID substance groups for the prevalence among drivers in general traffic

Type	Group	Analytical findings
Alcohol	alcohol	ethanol
Illicit drugs	amphetamines	amphetamine methamphetamine or methamphetamine + amphetamine MDMA or MDMA + MDA MDEA or MDEA + MDA MDA
	cocaine	benzoylecgonine or cocaine + benzoylecgonine or cocaine
	THC	THC or THC+THCCOOH
	illicit opiates	6-acetylmorphine or 6-AM + codeine or 6-AM + morphine or 6-AM + codeine + morphine or (morphine + codeine and morphine>= codeine)
Medicinal drugs	benzodiazepines	diazepam or diazepam + nordiazepam or diazepam + oxazepam or diazepam + nordiazepam + oxazepam nordiazepam or nordiazepam + oxazepam oxazepam lorazepam alprazolam flunitrazepam or flunitrazepam + 7-aminoflunitrazepam clonazepam or clonazepam + 7-aminoclonazepam
	Z-drugs	zolpidem zopiclone
	medicinal opioids	morphine codeine or (codeine + morphine and codeine> morphine) methadone tramadol
Various combinations	alcohol-drugs	all combinations (except ethanol+THCCOOH)
	multiple drugs	all combinations (except drug+THCCOOH)

2.4 Evaluation method

Prevalence of alcohol and drugs was calculated on the basis of the available body fluids in the different roadside surveys. In case of two samples – both blood and saliva, the value of blood was leading. This leads to the following conclusions for the observations:

Table 2.4. Decision rules for results from different body fluid combinations

	Blood sample	Saliva sample	Observation
Scenario 1	Positive	Not Available	Positive
Scenario 2	Positive	Negative	Positive
Scenario 3	Positive	Positive	Positive
Scenario 4	Negative	Not Available	Negative
Scenario 5	Negative	Negative	Negative
Scenario 6	Negative	Positive	Negative
Scenario 7	Not Available	Negative	Negative
Scenario 8	Not Available	Positive	Positive
Scenario 9	Not Available	Not Available	Not Available

Three out of thirteen countries have collected both blood and saliva samples: Belgium, Italy and the Netherlands. In Lithuania only blood was collected and in all other participating countries only saliva samples were collected.

2.5 Weighting

The roadside sample should be representative for all drivers who participated in road traffic. Since random sampling was applied, drivers are expected to be representative for gender and age during the sampling sessions. However for practical reasons, in many of the national roadside surveys, the selection of the samples could not be distributed equally with traffic volumes over the different time periods.

In order to correct for the difference between the distribution of the roadside samples and the distribution of traffic over the eight different time periods, weight factors were calculated by dividing the general distribution of traffic by time period by the distribution of sampled drivers in the same time period. For most countries traffic data by time period was derived from national traffic surveys.

Table 2.5 provides an overview of the distribution of traffic by country rounded off on two decimals. For some countries no data was available on the distribution of traffic by time period. For these countries average distributions were applied based on information of a selection of OECD member states which representatives provided data after a request for information by the DRUID WP2 partners. If countries with missing traffic data had reasons to believe that the distribution of traffic was deviating in some direction from the average distribution, they were allowed to make small adjustments in the average distribution to fit it more into the expected distribution in their country. In the end, adjustments have only been made for Sweden. Annex 4 provides more detailed information on the method of estimating the average distribution.

Table 2.5. Distribution of proportion general traffic by time period; rounded off on 2 decimals

Time period	Weekday morning	Weekday afternoon	Weekday evening	Weekday night	Weekend morning	Weekend afternoon	Weekend evening	Weekend night
BE	0.19	0.25	0.25	0.06	0.06	0.08	0.08	0.03
CZ	0.20	0.29	0.16	0.02	0.08	0.11	0.13	0.01
DK	0.22	0.31	0.17	0.02	0.03	0.11	0.11	0.03
ES	0.17	0.27	0.22	0.04	0.03	0.08	0.14	0.05
FI	0.19	0.29	0.20	0.03	0.06	0.09	0.13	0.02
HU*	0.21	0.26	0.25	0.02	0.04	0.12	0.08	0.02
IT*	0.21	0.26	0.25	0.02	0.04	0.12	0.08	0.02
LT*	0.21	0.26	0.24	0.03	0.04	0.11	0.09	0.02
NO	0.15	0.27	0.23	0.06	0.01	0.08	0.15	0.05
NL	0.22	0.24	0.27	0.04	0.03	0.11	0.08	0.02
PL*	0.21	0.26	0.25	0.02	0.04	0.12	0.08	0.02
PT*	0.21	0.26	0.25	0.02	0.04	0.12	0.08	0.02
SE*	0.21	0.26	0.25	0.02	0.04	0.12	0.08	0.02

* Based on average distribution of a selection of OECD member states

In the Portuguese data a second weight factor was included, which was based on the skewness between the distribution of traffic over each of the three survey regions and the distribution of the samples over these regions. For all other countries, no such weight factor was applied because the sample distribution was in accordance with the distribution of traffic in these regions or information on the distribution of traffic over the regions was not available.

The Lithuanian data did not include samples from time period 5. Therefore, the weight factors for the seven remaining time periods were adjusted for the absence of time period 5, in order to be able to calculate valid weighting factors.

2.6 Preparation of the data

In each database a number of columns were included with if-then statements to determine to which substance group a record belonged. The if-then statements were based on the distribution of substances (see table 2.3) and the equivalent cut-offs for substance concentrations (see table 2.2).

Records were removed from the databases of the thirteen countries in case toxicological analyses were missing for one or more total substance groups or if samples were not analysed at all. Finally, underage drivers (aged 17 years and younger) were removed as well from the databases. Table 2.6 presents the total number of included samples per country. The 'cleaned' databases from the 13 countries contained between 1264 and 9236 records. In total almost 50.000 records were included. The number of excluded drivers is presented in Annex 3. The main reason for exclusion was that no body fluid sample analysis was available. Furthermore, around 250 records were deleted since one or

more substance groups were missing. Finally, some records were removed from the database since they belonged to underage drivers.
The exact number of removed records is hard to give since some partners already removed records with no sample analysis or from underage drivers before sending the database to SWOV and DTU for analysis. Therefore, in table 2.6 only the number of included records are presented.

Table 2.6. Participating countries and the number of samples included per country

Participating countries	Number of included samples
1. Belgium (BE)	2949
2. Czech Republic (CZ)	2037
3. Denmark (DK)	3002
4. Spain (ES)	3174
5. Finland (FI)	3841
6. Hungary (HU)	2738
7. Italy (IT)	1310
8. Lithuania (LT)	1264
9. Netherlands (NL)	4822
10. Norway (NO)	9236
11. Poland (PL)	4005
12. Portugal (PT)	3965
13. Sweden (SE)	6199
Total	**48542**

The weight factors in the final analysis are based on the 'clean' version of the national databases.

2.7 Analysis

2.7.1 Prevalence

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS version 9.2. Tables have been created by using the "proc freq statement", including a statement on the weight factors to be used. The weighted prevalence of the substance under scrutiny is calculated by dividing the weighted number of positives for this substance by the weighted total of samples. Because lower and upper 95% confidence limits calculated using traditional approximations may result in limits outside the (0,1) interval, a more elaborate approximation is used. To that end, the Wilson 95% confidence interval formula is used as it is supplied by SAS as one of the available options. The prevalence results are reported in chapter 4.

2.7.2 Underlying factors

Logistic regression models were constructed to describe differences in independent variables explaining prevalence. Logistic regression is a method that reveals (significant) relations between given explanatory variables (quantitative or qualitative) such as time period, age, gender and a binary response variable. Here, the response variable consisted of a collection of samples that were either positive or negative for alcohol/psychoactive substances. The models were to include all countries where samples had been taken so that prevalence patterns across countries could be revealed. Prevalence of the various substance groups was related to time period, age of the driver, driver gender, country and interactions of these variables. The results of the logistic regression analysis are reported in chapter 5. Annex 5 provides more detailed information on the modelling procedure.

2.8 Ethical approval

Ethical approval was needed in all countries except for Italy where the participation in the study was mandatory. Written informed consent was needed in six countries: Belgium, Spain, Finland, Hungary, Norway and Poland. In the six other countries (Czech Republic, Denmark, Lithuania, The Netherlands, Portugal and Sweden) the national Medical Ethics Committees decided that written informed consent was not needed.

3. Representativeness of the study population in the EU Member States

3.1 Introduction

In January 2007, when the first roadside surveys started, the European Union consisted of 27 Member States with a total of 495 million inhabitants (Lanzieri, 2008). This represents 60% of all European inhabitants.
According to the United Nations geoscheme (United Nations Statistics Division, 2007), which is created for statistical purposes, the region Europe can be divided in four geographical sub-regions. This division does not imply any assumption regarding political or other affiliations of countries or territories.
Table 3.1 presents an overview of the participating countries arranged by European sub-region. All participating countries are marked by the grey colour. Based on the population numbers it can be calculated that the population of Southern EU countries are represented for 89%, and the population from Eastern EU countries is represented for almost two-thirds (63%). The population of the Northern EU countries together with Norway are represented for only 29% due to the absence of a roadside survey in the United Kingdom which accounts for 63% of the total Northern EU population. Finally, the population of the Western Member States are only represented for 11%, since large Member States such as Germany and France, together accounting for 80% of the total Western EU population, did not participate in the DRUID roadside surveys.

A small coverage of the countries that are part of a European region does not necessarily mean that the survey results are not representative for the whole region. However, in general the representativeness will increase if the geographical coverage is larger. On the other hand, a good coverage of countries may result in poor representativeness too if the survey samples are not representative for the general driving populations.
Therefore, a conclusion on the European representativeness of the roadside survey results can only be given after an assessment of the representativeness at a national level. This assessment will focus on two aspects. The first aspect is the survey sample's representativeness of the national driving population, and the second considers the non-response bias. Both aspects will be discussed in the next two sections.

Table 3.1. DRUID coverage of EU countries, by subregion (source: Eurostat, 2008)

Coverage by subregion		Number of inhabitants (million)
Northern Europe (29%)	United Kingdom (UK)	60.9
	Sweden (SE)	9.1
	Denmark (DK)	5.4
	Finland (FI)	5.3
	Norway* (NO)	4.7
	Ireland (IE)	4.3
	Lithuania (LT)	3.4
	Latvia (LV)	2.3
	Estonia (EE)	1.3
Eastern Europe (63%)	Poland (PL)	38.2
	Romania (RO)	21.6
	Czech Republic (CZ)	10.3
	Hungary (HU)	10.1
	Bulgaria (BG)	7.7
	Slovakia (SK)	5.4
Southern Europe (89%)	Italy (IT)	59.1
	Spain (ES)	44.5
	Greece (EL)	11.2
	Portugal (PT)	10.6
	Slovenia (SI)	2.0
	Cyprus (CY)	0.8
	Malta (MT)	0.4
Western Europe (15%)	Germany (DE)	82.3
	France (FR)	63.4
	The Netherlands (NL)	16.4
	Belgium (BE)	10.6
	Austria (AT)	8.3
	Luxembourg (LU)	0.5
Total EU (46%)	European Union	499.8

* Norway is not a member of the EU

3.2 Representativeness of the national driving population

A previous prevalence study regarding drugs in road traffic (Mathijssen and Houwing, 2005) showed that the presence of illicit drugs in the Netherlands was mainly concentrated in night-time hours, whereas the presence of medicinal drugs was more concentrated in daytime hours. To make sure that in the present study all periods of the week were sufficiently covered, the study population in the participating countries was stratified into eight different time periods, which were expected to be more or less homogeneous with regard to the prevalence of drugs and alcohol.
An advantage of a practical kind was that stratification allowed a flexible approach in each of the periods. In principle, a proportionate stratification in all roadside surveys would seem to be ideal. This means that the sample distribution by day and time would be proportionate to the distribution of the general driving population.
However, in many countries normal police enforcement activities on driving under the influence of drugs and alcohol are mostly concentrated in night-time hours, when the prevalence of alcohol and illicit drugs is the highest. The use of strata allowed researchers to have a disproportionate stratification that was in line with the preferences of the cooperating police forces. After collecting the data, adjustment factors could be applied to correct the disproportionate sample distribution into a proportionate one.
Each stratum needed to have a sufficient number of observations in order to allow statistically significant outcomes. The required sample size was depending on the expected prevalence, the sampling error and the 95% confidence intervals. An insufficient sample size would result in outcomes with large 95% confidence intervals.

Table 3.2 presents an overview of the representativeness of the various roadside surveys based on a comparison between the distribution of the survey sample and the distribution of the driving population according to the eight DRUID time periods. Information on the distribution of the national driving population was collected by each partners. Most partners used data from national traffic surveys and for countries which did not have any information on traffic distribution by time period available, an estimation was used based on the mean of a group of OECD (Organisation of Economic Cooperation and Development) member states that were able to provide this information. As explained above, differences between the sample distribution and the distribution of the general driving population are solved by applying adjustment factors. For instance, if the share of the study population in a given period was 10% and the share of the general driving population in that same time period was 20%, an adjustment factor of 20/10=2.0 is needed to correct for the skewness caused by the sampling design. However, if the adjustment factor becomes very high, the quality of the survey results may be endangered, since a serious under-representation of a time period in combination with a small sample size may cause a representativeness issue. Therefore, in this assessment the upper limit for an adjustment factor was set at 3, although there are no specific guidelines for the maximum size of an adjustment factor. The results of this assessment should therefore be sheen as purely indicative, and not to be used for any statistical purposes.

Table 3.2. Representativeness of roadside surveys by day and time

Country	Adjustment factor > 3 (for any 6 hour time period)
Belgium	No
Czech Republic	No
Denmark	No
Spain	No
Finland	No
Hungary	Yes
Italy	Yes
Lithuania	Yes
Netherlands	No
Norway	No
Poland	Yes
Portugal	No
Sweden	Yes

Five countries had a large under-representation in one or more time periods: Hungary, Italy, Lithuania, Poland and Sweden. For these five countries the potential bias and the need for clustering of day-and-time periods was assessed. The assessment included two indicating factors:

1. The number of time periods with a sample size < 100 subjects.
2. The share of underrepresented time periods.

A high adjustment factor can be an indicator for clustering of time periods for one or more substances. Furthermore, it indicates the likelihood of bias. The results of the additional assessment for the five countries are presented in table 3.3. The share of underrepresented time periods is calculated by summing up the share of traffic in those time periods where the sample size was less than 100 and the adjustment factor was more than three. If the share of underrepresented time periods was smaller than 25% the likelihood of bias was estimated as low. Otherwise it was estimated as high.

Table 3.3. Assessment of representativeness for countries with adjustment factor > 3

Country	Number of time periods with sample size < 100 and an adjustment factor > 3	Share of underrepresented time periods	Likelihood of bias
Hungary	1	11%	Low
Italy	3	56%	High
Lithuania	2	30%	High
Poland	1	21%	Low
Sweden	0	0%	Low

The Hungarian roadside survey contained one DRUID time period (time period 6: weekend days 10:00-15:59) with a significant underrepresentation. This time period accounted for 11% of the person kilometres driven. The sample size of time period 5 (N=91), which included weekend mornings 04:00 - 09:59, is not reported in table 3.3, since the share of the roadside sample and the general driving population were almost equal (and both very small). Therefore, a possible bias for this day-and-time period would have only a small effect on the final results.

The Italian roadside survey contained three time periods with a small sample size, in combination with a significant underrepresentation. Most roadside survey sessions took place during weekend and weekday nights. As a result, the daytime sample size accounted for only 35% of the total sample size, while the traffic share for that period added up to 94% of the total traffic volume.

In Lithuania sampling took place mostly during daytime periods between 10:00 and 21:59, covering 73% of the general driving population. Only 99 samples were collected during early morning and night-time sessions, comprising barely 6% of all cases. Even when clustering would be applied, the likelihood of bias was high since time periods, which were assumed to have higher prevalence percentages, such as weekday and weekend nights and weekend mornings, were represented by small numbers of samples (35, 16, and 0, respectively).

The Polish roadside survey comprised only one time period with a serious underrepresentation in combination with a low number of samples. This time period covered the weekday mornings 04:00 - 09:59, which included a large share of the general driving population. The number of samples in this time period was only slightly lower than 100, so the potential bias was estimated as limited.

In Sweden the adjustment factor for weekday mornings 04:00 - 09:59 was higher than 3. However, almost 400 samples were collected in this time period meaning that the 95% confidence interval of the calculated prevalence was probably relatively small.

The geographical coverage of a country was another important factor with regard to representativeness. If traffic distribution and/or psychoactive substance use varies substantial between regions, selecting only one survey region may not give a good representation of the national situation. The number of survey regions per country is presented in table 3.4.

Table 3.4. National geographical coverage of the roadside surveys

Country	Number of regions (or clusters of regions)
Belgium	3
Czech Republic	6
Denmark	3
Spain	4
Finland	2
Hungary	1
Italy	1
Lithuania	5
Netherlands	6
Norway	3
Poland	6
Portugal	3
Sweden	1

Three countries selected only one survey region (or cluster of regions). These three countries were Hungary, Italy, and Sweden. The selected region in each of these countries might have been representative of the whole country, but this has to be made plausible.

According to the Hungarian country report (see Part 2) their survey region was representative of the South Eastern part of Hungary. However, information on differences or similarities between the South Eastern part and the rest of Hungary was lacking. Therefore, the representativeness of the results of the Hungarian roadside survey is not known.

In the Italian country report it is stated that the police may have applied a pre-selection of people that were sent to the researchers for the DRUID protocol, based either on the use of presumptive tests for alcohol or physical signs of impairment, according to their standard protocols. However, the results obtained are in agreement with epidemiological studies on the use of alcohol and drugs, evidencing that the sampled population can be considered a representative sample of Italy.

The Swedish country report indicates that the study was conducted in a relatively small part of Sweden, which comprises several medium-sized cities. Since this is the first study of its kind in Sweden, it is difficult to know if the results are representative for other parts of the country. However, the authors found two studies of drug prevalence in general; one is a survey of drug use among young adults (mostly men) signing in for the Swedish army (CAN, 2009; table 19) and one is about cannabis use among the general population (age 16-84; FHI, 2011). Both studies showed that drug use varied between counties but there were no evidence that the DRUID study region differed substantially from other counties, at least not if the counties including the big cities Stockholm, Göteborg and Malmö were excluded.

3.3 Non-response bias

Non-response and non-response bias are common problems in epidemiological studies (Berghaus et al., 2007). Non-response bias occurs when people who do not respond to the survey, differ with regard to drug use from those who do respond. The presence of non-response bias is difficult to indicate, but differences in the distribution by age and gender, and differences in alcohol prevalence if available provide some information on the likelihood of non-response bias. The higher the non-response rate, the higher the possibility for a non-response bias.
The non-response rate of the thirteen prevalence studies varied between 0% and 52%. In general the size and nature of the non-response depends on two factors: study design and external factors, the latter rather affects variation in the size of non-response than the total size of the non-response.

3.3.1 Non response due to study design factors

Study design factors could affect the size and nature of the non-response in various ways. The first issue is the choice of body fluids to be collected and analysed for recent drug use: in the case of the DRUID roadside survey either blood or saliva (see Annex 2). Since blood sampling is more invasive than saliva sampling, drivers would probably have been less eager to give blood than saliva.

Furthermore, several subjects who refused to give blood informed the researcher that they were afraid of needles or blood.
A second design factor which might affect the non-response was the sequence of police enforcement and research activities. For example, it is likely that the willingness of drivers in cooperating with the research decreased strongly if they had been arrested by the police before being requested to cooperate with the research (if the police allowed suspects to cooperate at all).
A third factor relates to the voluntary character of the survey. Only in Italy participation was mandatory and people who refused cooperation were fined. It is obvious that mandatory cooperation resulted in very low non-response rates. And in Spain, the voluntary participation was requested while drivers were waiting for the result of the mandatory saliva test performed by the police. This also resulted in very low non-response rates.
Finally, the need for a written informed consent from each driver, as was required in some countries, might have negatively influenced the response rate. Written informed consent, confirmed by an autograph might raise questions on the level of anonymity. Furthermore, during the time spent reading the document, participants had time to reconsider their participation.
Table 3.5 presents an overview of the four study design factors that may have influenced the size and nature of non-response.

Table 3.5. Study design and non-response

Country	Body fluid	Precedence	Mandatory	Informed consent	Non-response
Belgium	Saliva/blood	Police first	No	Yes	52%
Czech Republic	Saliva	Police first	No	No	23%
Denmark	Saliva	Police first	No	No	5%
Spain	Saliva	Police first	No	Yes	2%
Finland	Saliva	Police first	No	Yes	48%
Hungary	Saliva	Police first	No	Yes	10%
Italy	Saliva/blood	Police first	Yes	NA	0%
Lithuania	Blood	Researcher first	No	No	24%
Netherlands	Saliva/blood	Researcher first	No	No	5%
Norway	Saliva	Police first	No	Yes	6%
Poland	Saliva	Researcher first	No	Yes	1%
Portugal	Saliva	Researcher first	No	No	3%
Sweden	Saliva	Police first	No	No	38%

Nine countries collected only saliva and three countries both saliva and blood. In Lithuania, only blood was collected. In the Netherlands a blood sample was asked and in case of refusal a saliva sample. 25% of the drivers refused to give blood. However, most of these refusers were willing to give a saliva sample. In total 5% of the drivers refused both blood and saliva sampling. In Lithuania, no saliva samples were asked. The refusal of blood sampling in Lithuania was of a comparable size as that for the Netherlands, namely 24%. In Poland and Portugal, where the study design was in terms of precedence quite similar to the Dutch and Lithuanian surveys, saliva-only was requested, resulting in 1% and 3% non-response, respectively.
In all countries where the police performed a mandatory drug test or where drug testing by researchers preceded the mandatory breath test for alcohol, non-response was very low (0-5%). In countries where the police performed the mandatory breath test for alcohol before the voluntary drug test was performed by a researcher, the non-response range was quite broad: 5-52%. Only in two of these countries (Denmark and Norway) a non-response below 10% was achieved. Therefore, the precedence seems to be a noteworthy factor for the rate of non response.
In Spain, saliva sampling took place while drivers were waiting for police test results and, in Italy, saliva sampling was mandatory. As a result, these two countries had a very low non-response of 2% and 0%, respectively. In countries where drug testing was not mandatory, non-response varied from 1-52%. Summarising: mandatory drug testing resulted in very low refusal rates, but voluntary drug testing not always resulted in high refusal rates.
Similarly, written informed consent was not always associated with increased non-response.

3.3.2 Non-response due to external factors

Within each of the thirteen prevalence studies, several external factors can be indicated. These factors may have had an effect on the size of the non-response, but they could hardly have been influenced by the design of the study.
One of those factors were weather conditions. Some countries reported that people were less willing to cooperate under adverse conditions like storm and rain. The Hungarian study reported a 17.6-42.9% non-response during winter months, while in spring and summer non-response varied from 6.1-14.7%.
A second external factor was negative publicity. In Hungary, the collection of saliva was associated with the collection of DNA, on national television. Although the programme was not specifically aimed at saliva collection within the DRUID project, it was decided to interrupt the roadside survey for a couple of months, in order to prevent high non-response rates.
A third factor was the experience of the survey team in convincing drivers to participate in the study. A trend line of the Dutch survey showed a continuously increasing response rate from the start to the end of the project.
A fourth factor was the day of the week and the time of the day. Early in the morning people were hasty to get to work in time. They were probably less willing to lose time than people who travel later in the morning or in the early afternoon. During early morning sessions, some people travel back home after a night shift. When confronted with a request for voluntary study participation, they were not always very eager to participate. This was reflected in the non-response rates at the various time periods.
All the factors mentioned above may have affected the overall non-response rates. However, it is not likely that one of these external factors in itself would really be able to cause a high non-response.

3.3.3 Selectivity of the non-response group

Another important aspect is the selectivity of the non-response group. Results of the roadside surveys would underestimate the prevalence of psychoactive substances, if drivers under the influence would be more likely to refuse participation. This might for instance be the case if they believed that participation could result in a judicial sanction.
Underestimation of the prevalence of psychoactive substances among the general driving population is especially problematic if the roadside survey sample is used as a control sample in a case-control study. Underestimation of the prevalence among controls will then result in overestimation of the risk associated with psychoactive substance use.
We assume that the effect of non-response bias is small in this roadside survey study when the size of non-response is not exceeding the size of prevalence. This assumption should be regarded as a practical rule-of-thumb. The non-response bias will only be discussed for countries with higher non-response than prevalence figures. Table 3.6 presents those countries included and shows both their prevalence and their non-response percentage.

Table 3.6. High non-response countries

Country	Prevalence	Non-response
Belgium	10.65%	52%
Czech Republic	2.8%	23%
Finland	2.9%	48%
Hungary	2.3%	12%
Lithuania	5.5%	24%
Sweden	1.3%*	38%

*No information available on alcohol in Sweden

The Belgian roadside survey suffered from a high non-response rate, which could lead to a large bias if the non-response group was selective. For the non-responders, data was available on age, gender, transport mode and alcohol use. Comparison between the response and non-response groups on these four characteristics gave no indication of non-response bias (see Part 2).

The Czech roadside survey had a non-response of 23%. 84% of these non-respondents were male and 16% were female. This distribution is similar to the distribution of the driving population. There is no information available on other aspects. Nevertheless, the authors of the national roadside survey report stated that there may be some bias in the results. In their opinion, non-cooperating drivers were

most likely afraid that the police would be informed about the alcohol or drug presence in their saliva, because they knew they violated the road traffic act (see Part 2).

The non-response rate of the Finnish study was almost as high as the Belgian one. Due to judicial limitations, no comparison was possible between the response and non-response groups. The majority of the refusals were on the initial request to participate by the police, before the drivers learned about the nature of the study. It was an obligation of the ethical advisory board that the drivers were informed of the time required to participate in the study. Hence the researchers state that it is reasonable to assume that one of the main reasons for refusal was the lack of time. Comparison of the DRUID study population with a recently conducted study on the Finnish traffic distribution show that the demographic profile of the respondents was representative of the Finnish general driving population and had not been influenced by the variance in response between sessions (see Part 2).
Due to agreements with the Finnish police, no roadside sampling took place between 01:00-07:00. No large bias in the total prevalence is expected due to this missing time period since it represents only a small share of the total driving population during weekend and weekday nights. The proportion of drivers during the weekday mornings, from 04:00-07:00, was larger than between 07:00 - 10:00 but the prevalence of psychoactive substances between 04:00 - 10:00 would probably not be very different from the prevalence from 07:00-10:00.

The Hungarian study had a non-response of 12%, which was above the prevalence of alcohol and drugs in Hungary. The Hungarian country report (see Part 2) shows there tends to be a small overrepresentation of women in the non-response group, as well as an overrepresentation of persons aged 35-40 years as compared to those who had participated. This would probably not result in a large bias. However, it was reported that some drivers could avoid being stopped and checked by the police. If this fact is taken into consideration, it cannot be ruled out that the prevalence figures may have been underestimated.
The Lithuanian roadside survey had a non-response of 24%. Somewhat surprisingly, there was a large overrepresentation of women in the non-response group: two-thirds of the non- responders were females, mostly in the age group below 35 years. The main reason of refusal appeared to be lack of time, and no signs of impairment were observed in this group. Therefore, the non-response bias is not expected to be high (see Part 2).
Non-response in the Swedish roadside survey was 38%. No information was gathered about the non-responders. However, in a similar study conducted a couple of years ago, where participation was mandatory, the gender and age distributions were similar. The researchers concluded that it was impossible to estimate how much the results deviate from the real prevalence (see Part 2). Furthermore, no data on alcohol above the legal limit of 0.2 g/L BAC was collected because of the Swedish legislation.

3.4 Conclusion

Based on the previous assessment it can be concluded that there are some limitations with regard to representativeness and non-response for one or more of the thirteen roadside survey studies. The overall representativeness for Northern and Western Europe is quite low. Therefore, generalisation of outcomes to a European level will be difficult and can only be calculated with the aid of some assumptions on the representativeness.
The expected representativeness on a national level varies per country. In order to correct for large under-representations in one of the eight time periods, clustering of the data is needed. Clustering will certainly not solve all representativity issues, but at least it will improve the validity of the data to some extent.

4. Results

This chapter presents the results of the 13 roadside surveys that were conducted in the DRUID-project. In the first paragraph general results will be presented. The second paragraph presents the average prevalence for Europe and the four European sub-regions. And finally an overview will be given for each of the substance groups.
The results in all tables are based on the weighted results for the participating countries. Weighted numbers and their 95% confidence intervals (see 2.7.1) are included in the tables and figures in section 4.3. The weighted numbers for male and female drivers may not always sum up to the total weighted number of samples due to missing values for gender and round up of sample numbers. For more information on the weighting procedure see section 2.4.

4.1 General results

The general results provide an overview of the general use of drugs in traffic by substance type (illicit drugs, medicinal drugs, alcohol and alcohol and drugs) and by substance group: amphetamines, cocaine, cannabis, illicit opiates, benzodiazepines, Z-drugs, medicinal opiates and opioids, alcohol and alcohol and drugs.

4.1.1 Prevalence by substance type

Table 4.1 provides an overview of the prevalence by substance group and by country. The following groups of drugs are regarded as illicit: amphetamines, cocaine, THC, and illicit opiates.
The group of medicinal drugs is formed by benzodiazepines, Z-drugs and medicinal opiates and opioids.
Drug-drug combinations are formed by the combination of drugs from two or more separate drug substance groups, either illicit or medicinal. The combined use of two substances from the same substance group, e.g. two different types of benzodiazepines is regarded as single substance use. More information on the effect of different drugs on driving behaviour will be presented in paragraph 4.3.

The results in table 4.1 show that the prevalence of Illicit drugs is the highest in Spain (8.20%), meaning that 8.2% of all drivers was positive for one or more illicit drug, Italy (3.92%), the Netherlands (2.51%), and Portugal (1.80%). For all other countries the prevalence varied between 0.22% (Sweden) and 0.94% (Belgium).

Medicinal drugs are most prevalent in Belgium (2.99%) and Portugal (2.84%). The prevalence of medicinal drugs in the other countries varied between 0.17% in Poland and 1.71% in Finland. The majority of the countries (7 out of 13) had a prevalence rate between 1.4 and 1.8%.

Single alcohol use (≥ 0.1 g/L) was most frequently detected in Italy (8.59%), Belgium (6.42%), Portugal (4.93%), Spain (3.92%) and Lithuania (3.86%). For all other countries the prevalence varied between 0.15% (Hungary) and 2.53% (Denmark). No data on alcohol was available for Sweden. Therefore Sweden was not coloured in figure 4.4.

The combination alcohol and drugs was most prevalent in Spain (1.14%) and Italy (1.01%). In all other countries the prevalence varied between 0.00% in Poland and 0.42% in Portugal. No information on the combined use of alcohol and drugs was available for Sweden. The expected prevalence for Sweden is low, because of the relatively low prevalence of illicit and medicinal drugs in Sweden. Therefore Sweden was not coloured in figure 4.5.

Figures 4.1-4.6 present a geographical representation of the prevalence of the various substance groups for the different countries.

Table 4.1. Overview of general prevalence by substance type and by country; prevalence are in %; in italics the 95% confidence intervals are shown.

	negative	illicit drugs	medicinal drugs	alcohol	drug+drug combinations	alcohol+drugs
BE	89.35 *88.18 - 90.41*	0.64 *0.41 – 1.00*	2.99 *2.43 - 3.66*	6.42 *5.59 - 7.36*	0.3 *0.16 - 0.58*	0.31 *0.16 - 0.58*
CZ	97.20 *96.39 - 97.83*	0.82 *0.51 – 1.31*	0.83 *0.52 - 1.33*	0.99 *0.65 - 1.53*	0.11 *0.03 - 0.38*	0.05 *0.01 - 0.28*
DK	95.52 *94.72 - 96.2*	0.22 *0.10 – 0.46*	1.58 *1.19 - 2.09*	2.53 *2.02 - 3.15*	0.06 *0.02 - 0.24*	0.10 *0.03 - 0.3*
ES	85.15 *83.87 - 86.34*	7.63 *6.76 – 8.61*	1.59 *1.21 - 2.09*	3.92 *3.3 - 4.66*	0.57 *0.36 - 0.89*	1.14 *0.83 - 1.58*
FI	98.66 *96.58 - 97.63*	0.12 *0.06 – 0.30*	1.71 *1.35 - 2.17*	0.64 *0.43 - 0.94*	0.29 *0.16 - 0.52*	0.08 *0.03 - 0.23*
HU	97.68 *97.04 - 98.18*	0.23 *0.11 – 0.49*	1.68 *1.26 - 2.23*	0.15 *0.06 - 0.38*	0.27 *0.13 - 0.54*	0.00 *0 - 0.14*
IT	84.99 *82.95 - 86.82*	2.7 *1.95 – 3.73*	1.50 *0.97 - 2.31*	8.59 *7.19 - 10.23*	1.22 *0.75 – 1.97*	1.01 *0.59 - 1.71*
LT	94.49 *93.09 - 95.61*	0.22 *0.07 – 0.66*	1.41 *0.9 - 2.23*	3.86 *2.93 - 5.06*	- -	0.03 0 - 0.36
NL	95.52 *93.81 - 95.1*	2.16 *1.79 – 2.61*	0.60 *0.42 - 0.87*	2.15 *1.78 - 2.6*	0.35 *0.22 - 0.56*	0.24 *0.13 - 0.42*
NO	97.03 *96.67 - 97.36*	0.6 *0.46 – 0.78*	1.69 *1.45 - 1.98*	0.32 *0.23 - 0.46*	0.28 *0.19 - 0.42*	0.07 *0.03 - 0.15*
PO	97.63 *97.11 - 98.05*	0.71 *0.49 – 1.02*	0.17 *0.08 - 0.35*	1.47 *1.14 - 1.9*	0.02 *0.00 - 0.14*	0.00 *0 - 0.1*
PT	90.01 *89.04 - 90.91*	1.57 *1.23 – 2.01*	2.84 *2.37 - 3.41*	4.93 *4.29 - 5.64*	0.23 *0.12 - 0.44*	0.42 *0.26 - 0.67*
SE	98.66 *98.34 - 98.92*	0.1 *0.04 – 0.21*	1.12 *0.89 - 1.42*	- -	0.12 *0.06 - 0.25*	- -

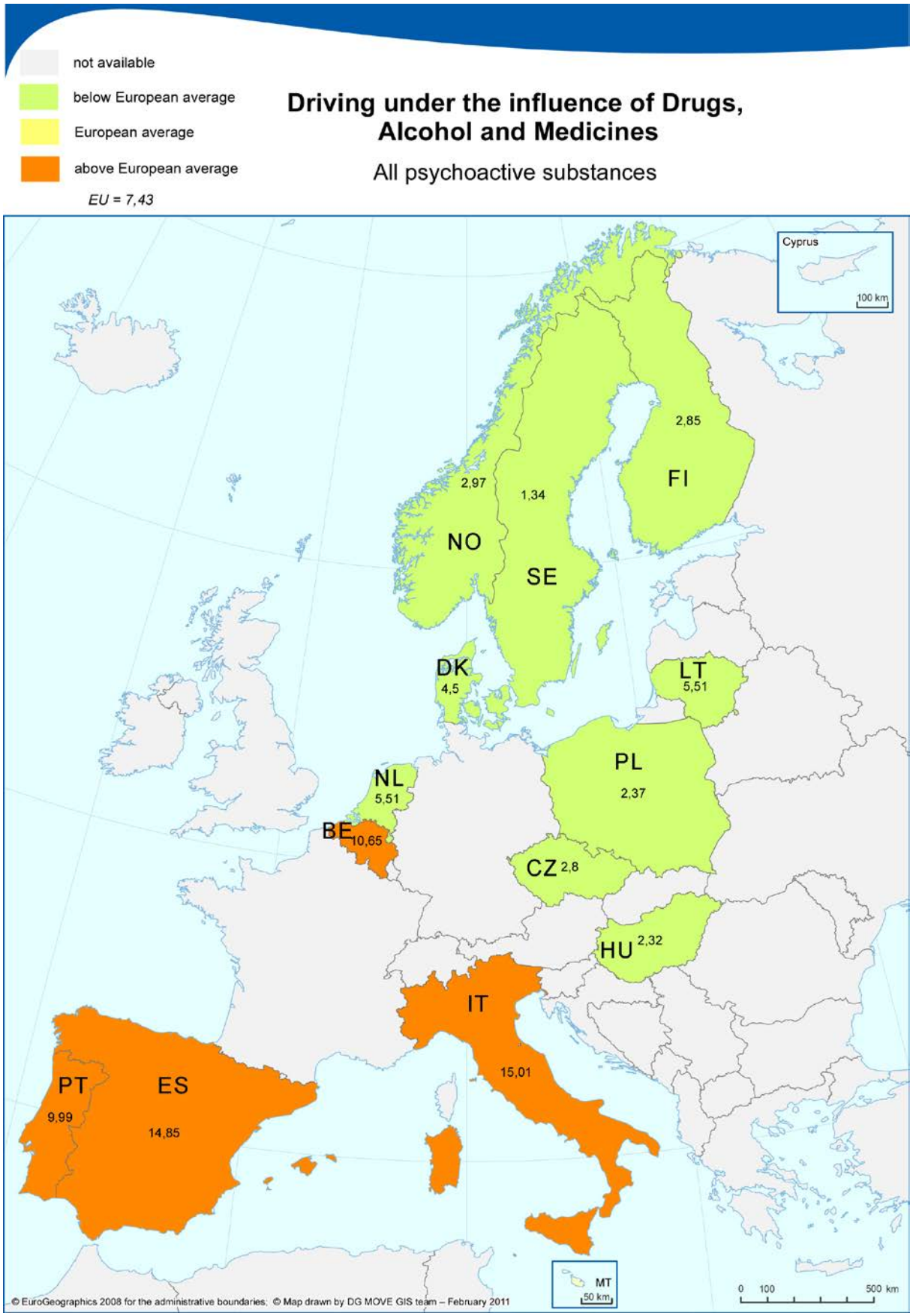

Figure 4.1. Geographical presentation of psychoactive substance use by car drivers in the EU

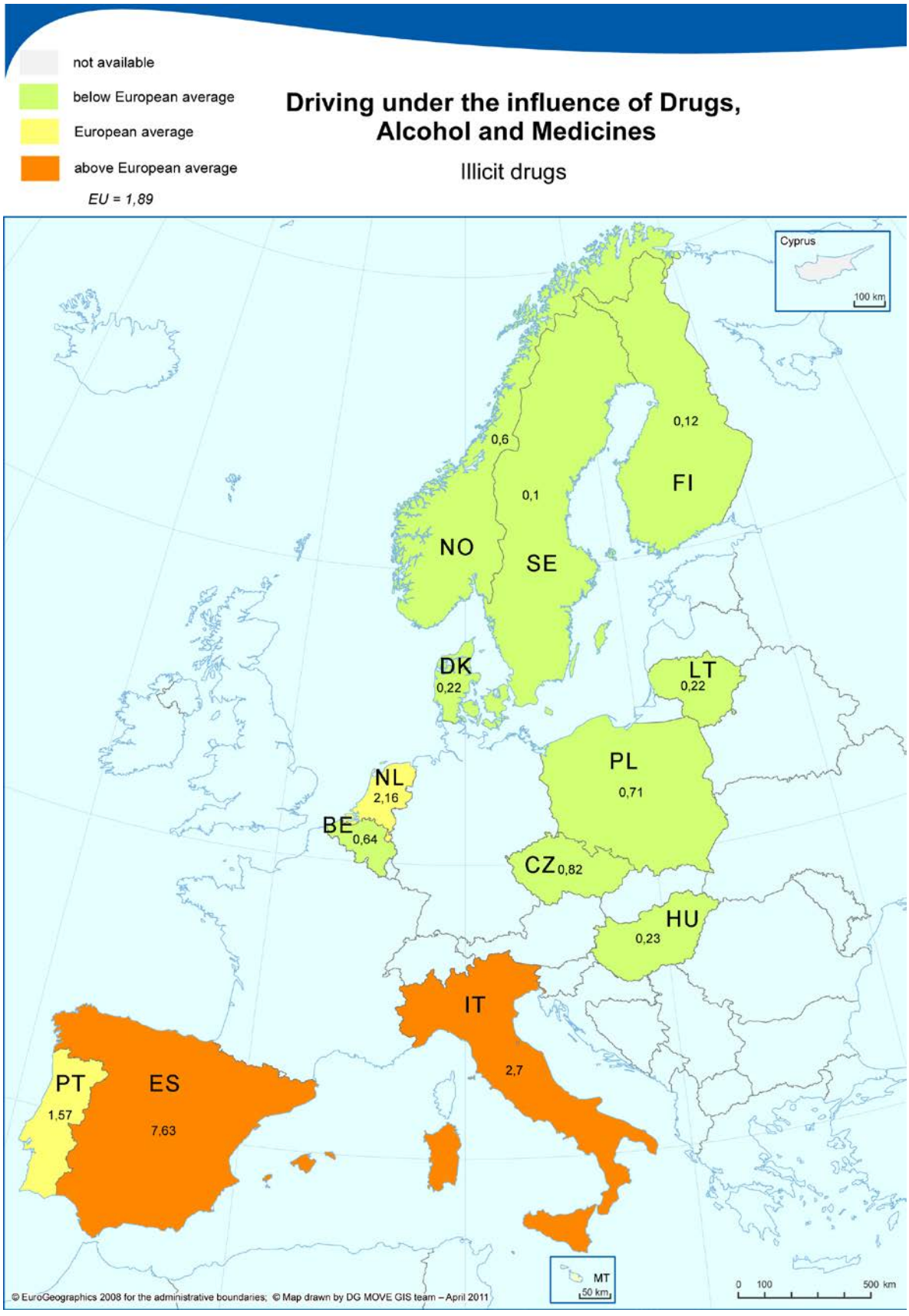

Figure 4.2. Geographical presentation of illicit drug use by car drivers in the EU

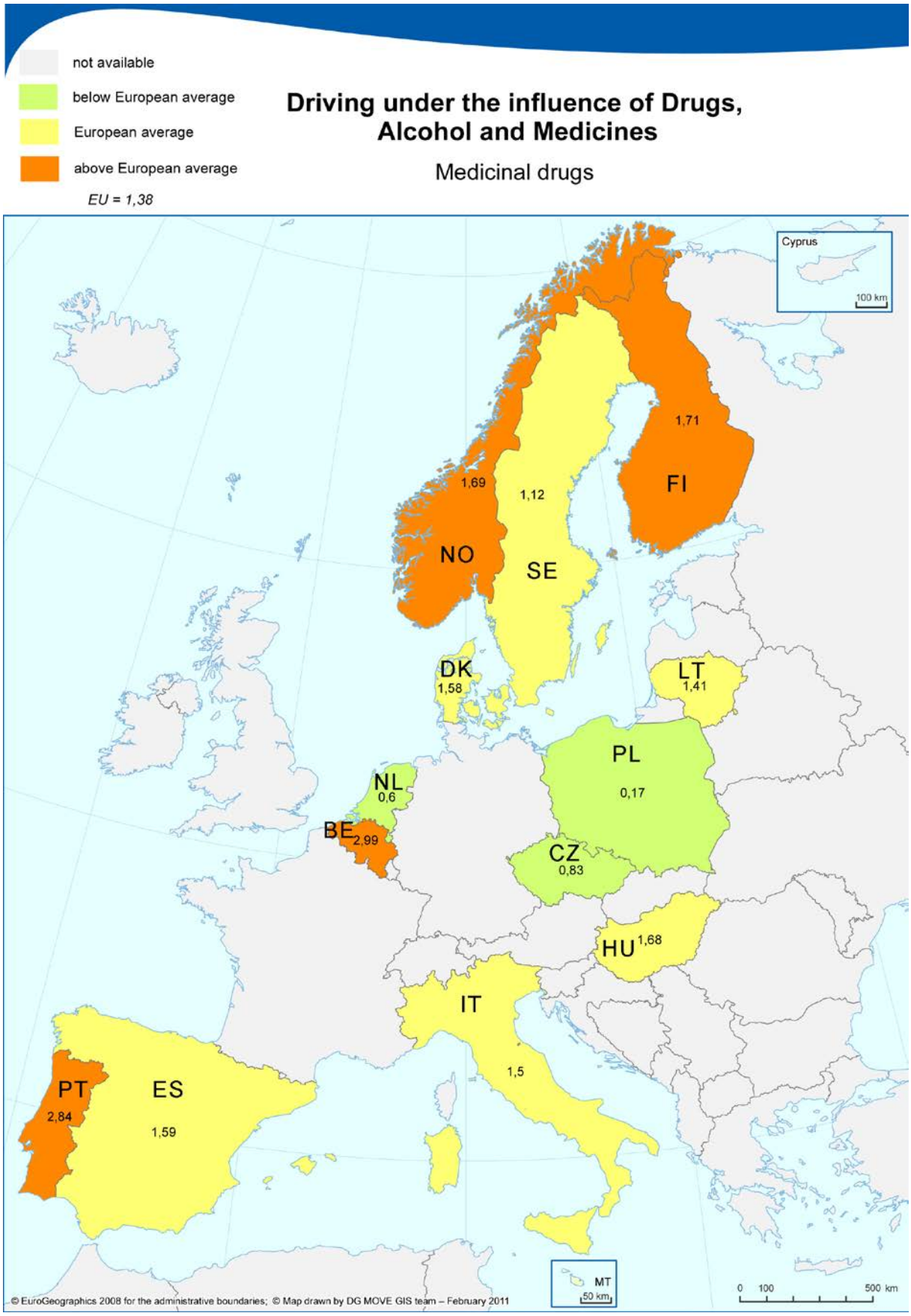

Figure 4.3. Geographical presentation of medicinal drug use by car drivers in the EU

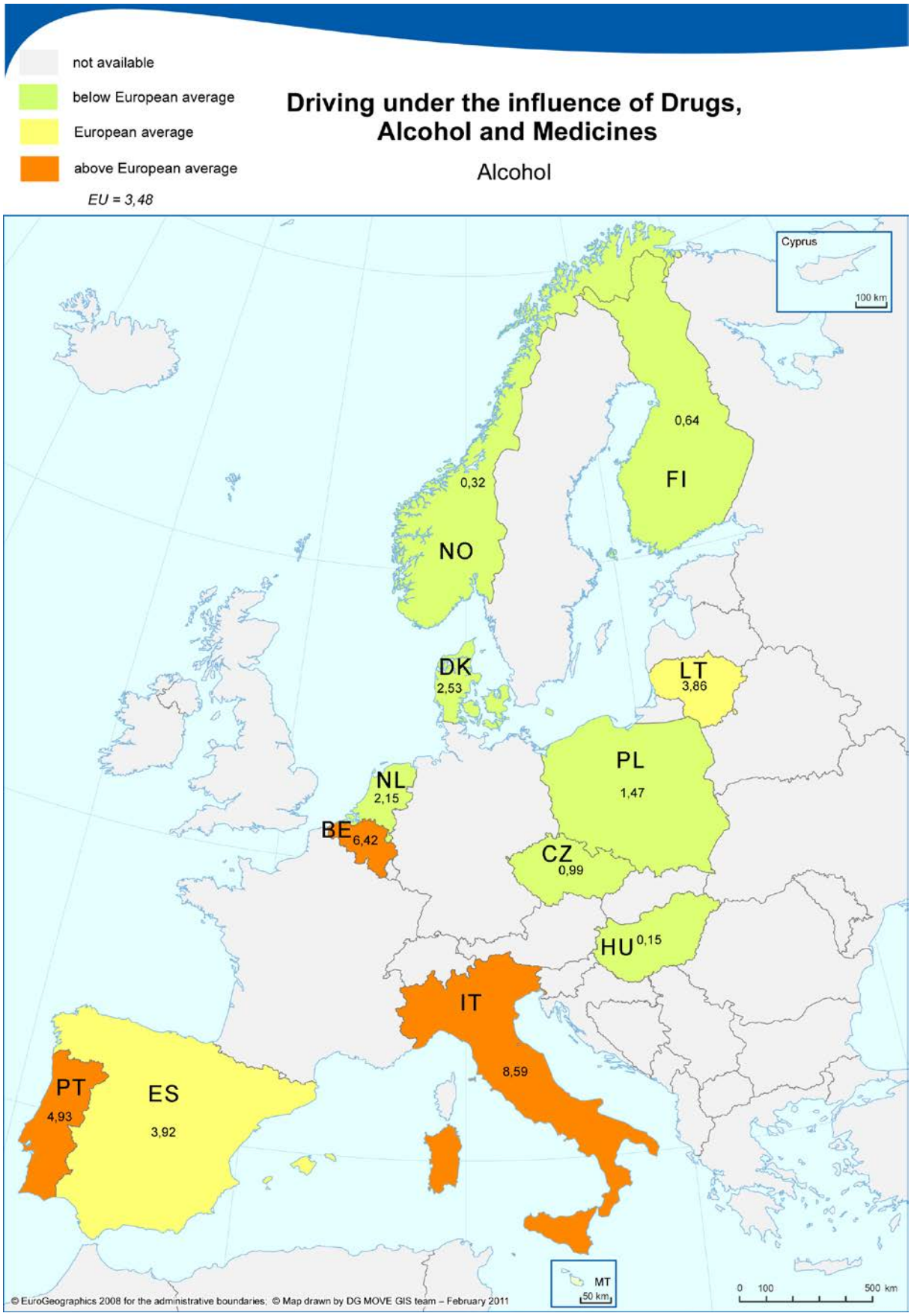

Figure 4.4. Geographical presentation of single alcohol use by car drivers in the EU

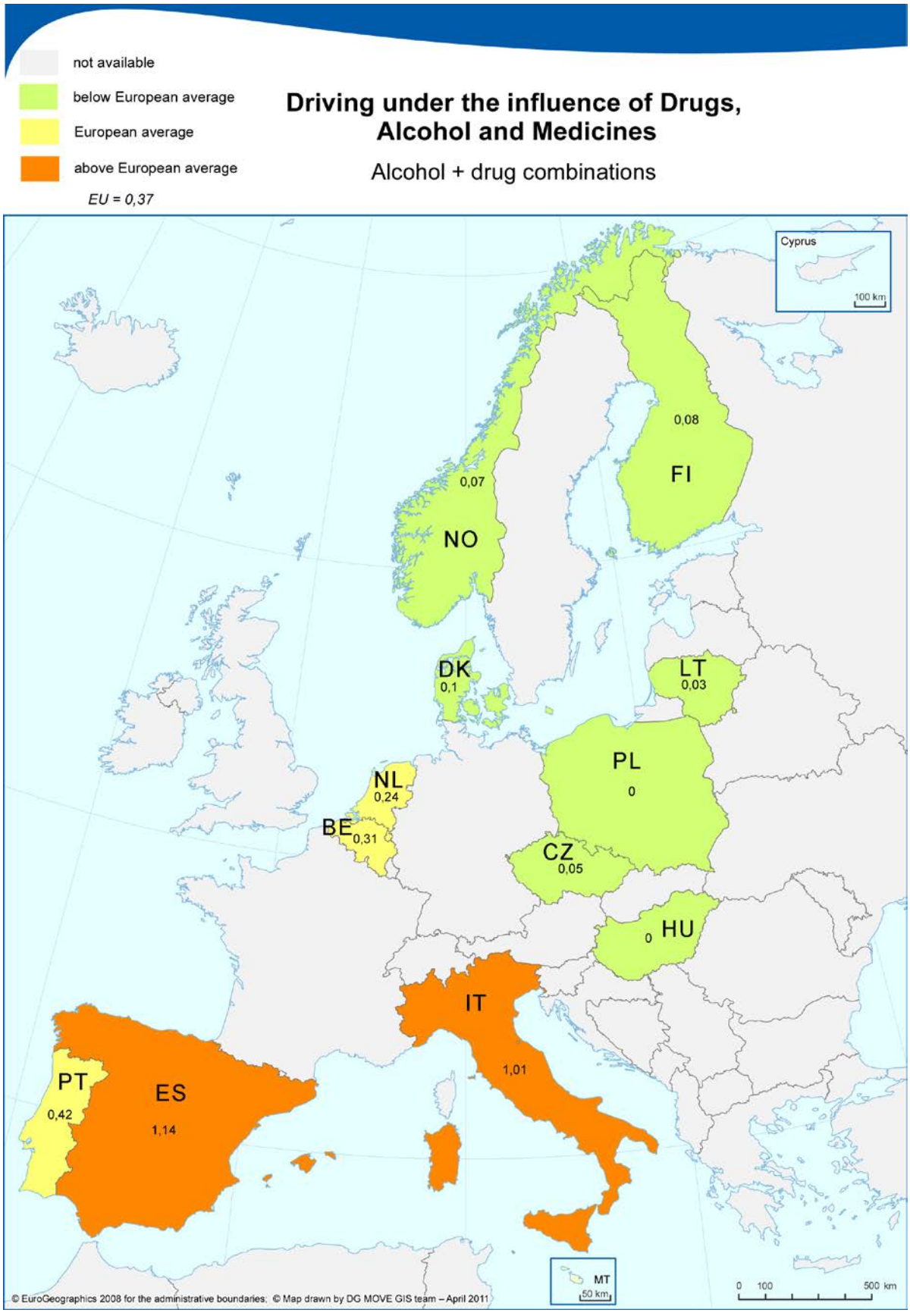

Figure 4.5. Geographical presentation of combinational use of alcohol and drugs by car drivers in the EU

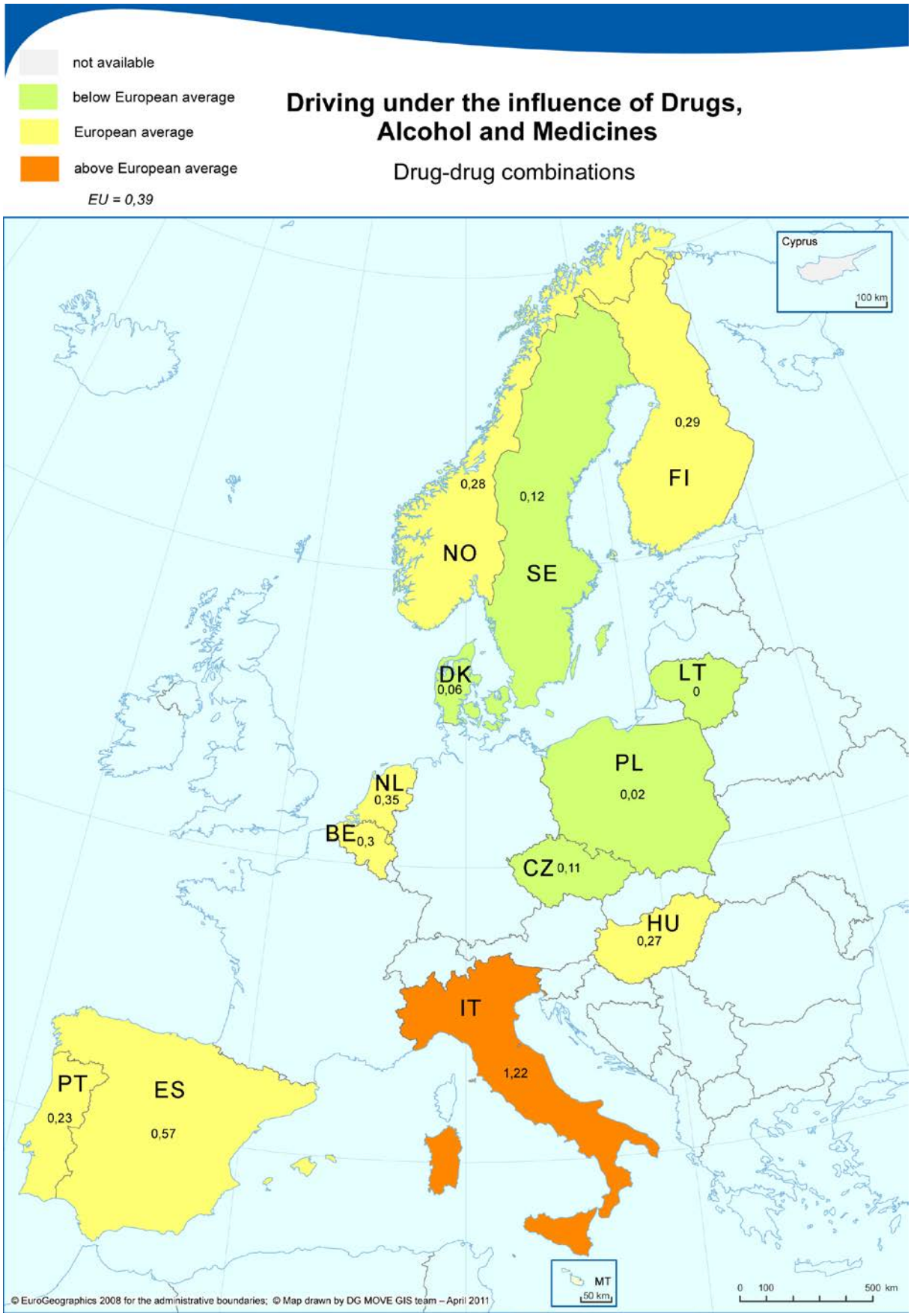

Figure 4.6. Geographical presentation drug-drug combinations by car drivers in the EU

In conclusion, the prevalence of illicit drugs was higher than the prevalence of medicinal drugs in the Southern European countries Spain and Italy and in the Netherlands, Czech Republic and Poland. Medicinal drugs were relatively more frequently detected than illicit drugs in the Northern European countries, Belgium, Portugal, Lithuania and Hungary.
The prevalence of drugs (including both illicit and medicinal drugs) exceeded the prevalence of alcohol in Czech Republic, Spain, Finland, Hungary, the Netherlands, and Norway. In all other countries the prevalence of alcohol was higher than that of other psychoactive substances.

4.1.2 Prevalence by substance group and country

Table 4.2 presents the prevalence of the substances by country for substance groups. This more detailed overview of prevalence of psychoactive substances shows that for illicit drugs THC is the most commonly detected drug in traffic, followed by cocaine. Amphetamines and illicit opiates were less frequently detected.
In general benzodiazepines were the most prevalent medicinal drugs in traffic. However, in Denmark and Sweden medicinal opiates and opioids were more frequently detected. Z-drugs were less prevalent and even not detected at all in Southern Europe and the Eastern European countries Czech Republic, Lithuania, and Poland. Only in Norway, the prevalence of Z-drugs was relatively high (0.69% of all drivers).

Table 4.2. Overview of general prevalence by substance groups and by country in percentages; 95% confidence intervals are shown in italics

	negative	amphe-tamines	cocaine	THC	illicit opiates	benzodia-zepines	Z-drugs	medicinal opiates	alcohol	alcohol + drugs	drugs-drugs
BE	89.35	-	0.2	0.35	0.09	2.01	0.22	0.75	6.42	0.31	0.3
	88.18 - 90.41	-	*0.09 - 0.43*	*0.19 - 0.64*	*0.03 - 0.28*	*1.57 - 2.59*	*0.1 - 0.47*	*0.5 - 1.13*	*5.59 - 7.36*	*0.16 - 0.58*	*0.16 - 0.58*
CZ	97.2	0.36	-	0.46	-	0.62	-	0.21	0.99	0.05	0.11
	96.39 - 97.83	*0.17 - 0.72*	-	*0.25 - 0.86*	-	*0.36 - 1.07*	-	*0.08 - 0.52*	*0.65 - 1.53*	*0.01 - 0.28*	*0.03 - 0.38*
DK	95.52	0.02	-	0.2	-	0.47	0.32	0.79	2.53	0.1	0.06
	94.72 - 96.2	*0 - 0.16*	-	*0.09 - 0.43*	-	*0.28 - 0.79*	*0.17 - 0.59*	*0.53 - 1.18*	*2.02 - 3.15*	*0.03 - 0.3*	*0.02 - 0.24*
ES	85.15	0.11	1.49	5.99	0.05	1.4	-	0.19	3.92	1.14	0.57
	83.87 - 86.34	*0.04 - 0.3*	*1.12 - 1.97*	*5.22 - 6.87*	*0.01 - 0.2*	*1.05 - 1.87*	-	*0.09 - 0.41*	*3.3 - 4.66*	*0.83 - 1.58*	*0.36 - 0.89*
FI	97.15	0.05	0.03	0.04	-	0.79	0.36	0.56	0.64	0.08	0.29
	96.58 - 97.63	*0.02 - 0.19*	*0.01 - 0.16*	*0.01 - 0.17*	-	*0.56 - 1.13*	*0.21 - 0.6*	*0.37 - 0.85*	*0.43 - 0.94*	*0.03 - 0.23*	*0.16 - 0.52*
HU	97.68	-	0.04	0.19	-	1.5	0.07	0.11	0.15	-	0.27
	97.04 - 98.18	-	*0.01 - 0.21*	*0.08 - 0.44*	-	*1.11 - 2.03*	*0.02 - 0.26*	*0.04 - 0.32*	*0.06 - 0.38*	-	*0.13 - 0.54*
IT	84.99	-	1.25	1.15	0.3	0.97	-	0.53	8.59	1.01	1.22
	82.95 - 86.82	-	*0.78 - 2.01*	*0.7 - 1.89*	*0.12 - 0.78*	*0.57 - 1.67*	-	*0.25 - 1.09*	*7.19 - 10.23*	*0.59 - 1.71*	*0.75 - 1.97*
LT	94.49	0.22	-	-	-	1.41	-	-	3.86	0.03	-
	93.09 - 95.61	0.07 - 0.66	-	-	-	0.9 - 2.23	-	-	2.93 - 5.06	0 - 0.36	-
NL	94.49	0.19	0.3	1.67	0.01	0.4	0.04	0.16	2.15	0.24	0.35
	93.81 - 95.1	*0.1 - 0.36*	*0.18 - 0.5*	*1.34 - 2.07*	*0 - 0.09*	*0.25 - 0.62*	*0.01 - 0.15*	*0.08 - 0.32*	*1.78 - 2.6*	*0.13 - 0.42*	*0.22 - 0.56*
NO	97.03	0.06	0.06	0.48	-	0.84	0.69	0.16	0.32	0.07	0.28
	96.67 - 97.36	*0.02 - 0.13*	*0.03 - 0.14*	*0.36 - 0.64*	-	*0.67 - 1.05*	*0.54 - 0.88*	*0.1 - 0.27*	*0.23 - 0.46*	*0.03 - 0.15*	*0.19 - 0.42*
PL	97.63	0.05	-	0.57	0.09	0.14	-	0.03	1.47	-	0.02
	97.11 - 98.05	*0.01 - 0.18*	-	*0.38 - 0.85*	*0.04 - 0.25*	*0.06 - 0.31*	-	*0.01 - 0.15*	*1.14 - 1.9*	-	*0 - 0.14*
PT	90.01	-	0.03	1.38	0.15	2.73	-	0.11	4.93	0.42	0.23
	89.04 - 90.91	-	*0.01 - 0.16*	*1.07 - 1.8*	*0.07 - 0.33*	*2.27 - 3.29*	-	*0.04 - 0.27*	*4.29 - 5.64*	*0.26 - 0.67*	*0.12 - 0.44*
SE	98.66	0.07	-	0.03	-	0.19	0.31	0.63	-	-	0.12
	98.34 - 98.92	*0.03 - 0.17*	-	*0.01 - 0.12*	-	*0.11 - 0.33*	*0.2 - 0.48*	*0.46 - 0.86*	-	-	*0.06 - 0.25*

4.2 Estimate of a European mean

The general results of the prevalence of psychoactive substances among drivers show differences in substance use between countries in the different European regions. These differences should be taken into account when trying to estimate the mean prevalence of substances for the European Union.
To estimate this mean prevalence the number of inhabitants of each country had to be used, since, unfortunately, traffic volume figures were not available in each of the 13 countries (SafetyNet, 2007). Therefore population was used as a surrogate exposure measure for the traffic volume in each country. Weight factors for each country have been calculated by dividing in each European region the number of inhabitants in a participating country by the total number of inhabitants in all participating countries in its European region.
Then a weighted mean was calculated for each region based upon the weight of each country.
Finally a weighted mean for the European Union was calculated by using the share of the number of inhabitants per European region by the total population of the EU as a weight factor.
All these calculations have been made under the assumption that the results of the roadside surveys are representative for the thirteen participating countries (see chapter 2).

Originally Lithuania was regarded as a Northern European country according to the geographical classification by the United Nations. However, looking at the pattern of the substance use and the political background it can be argued that Lithuania is not a Northern European country but an Eastern European country. Therefore, Lithuania is regarded in this report as an Eastern European country.

The European mean can be used to distinguish per substance whether a country is around, below or above the European mean. Table 4.3 presents the spread of the prevalence around the European mean. A yellow colour of the prevalence means that the European mean is within the 95% confidence interval of the prevalence. A green coloured prevalence indicates that the confidence interval is below the European mean, and for a red coloured prevalence the confidence interval is entirely above the European mean.

The results indicate that the use of psychoactive substances in traffic is in general low in Northern Europe. However, medicinal opiates and opioids and Z-drugs were more frequently detected among drivers in Northern European countries than in the rest of Europe. In Finland and Norway, benzodiazepines and drugs-drugs combinations were not used less than the European average, whereas in Denmark and Sweden they were.

Among drivers in the participating Eastern European countries the prevalence of psychoactive substances was even less than in Northern Europe. However, benzodiazepines were relatively more frequently detected in Lithuania and Hungary than on average in Europe. In Czech Republic amphetamines were detected the most from all participating countries.

The prevalence of psychoactive substances in traffic was the highest in Southern European countries. All illegal drugs except amphetamines were relatively highly prevalent, as well as benzodiazepines and alcohol. Z-drugs were not detected at all.

Western Europe is only represented by Belgium and the Netherlands and their relative prevalence is almost the exact opposite. In Belgium relatively high prevalence is observed for benzodiazepines, medicinal drugs and alcohol, whereas the use of THC and amphetamines is relatively low. In the Netherlands the use of THC and amphetamines is relatively high and the prevalence of benzodiazepines, medicinal drugs and alcohol is relatively low. For all other substance groups both countries have an average prevalence.

Table 4.3. Estimated European prevalence of psychoactive substances; prevalence in percentage; 95% confidence intervals in italics

		Inhabitants (million)	negative	amphetamines	cocaine	THC	illicit opiates	benzodiazepines	Z-drugs	medicinal opiates and opioids	alcohol	alcohol-drugs	drugs-drugs
Northern Europe	DK	5.4	95.52 *94.72 - 96.2*	0.02 *0 - 0.16*	- -	0.2 *0.09 - 0.43*	- -	0.47 *0.28 - 0.79*	0.32 *0.17 - 0.59*	0.79 *0.53 - 1.18*	2.53 *2.02 - 3.15*	0.1 *0.03 - 0.3*	0.06 *0.02 - 0.24*
	FI	5.3	97.15 *96.58 - 97.63*	0.05 *0.02 - 0.19*	0.03 *0.01 - 0.16*	0.04 *0.01 - 0.17*	- -	0.79 *0.56 - 1.13*	0.36 *0.21 - 0.6*	0.56 *0.37 - 0.85*	0.64 *0.43 - 0.94*	0.08 *0.03 - 0.23*	0.29 *0.16 - 0.52*
	NO	4.7	97.03 *96.67 - 97.36*	0.06 *0.02 - 0.13*	0.06 *0.03 - 0.14*	0.48 *0.36 - 0.64*	- -	0.84 *0.67 - 1.05*	0.69 *0.54 - 0.88*	0.16 *0.1 - 0.27*	0.32 *0.23 - 0.46*	0.07 *0.03 - 0.15*	0.28 *0.19 - 0.42*
	SE	9.1	98.66 *98.34 - 98.92*	0.07 *0.03 - 0.17*	- -	0.03 *0.01 - 0.12*	- -	0.19 *0.11 - 0.33*	0.31 *0.2 - 0.48*	0.63 *0.46 - 0.86*	NA	NA	0.12 *0.06 - 0.25*
	Total N-EU	*93.3*	*97.32*	*0.05*	*0.02*	*0.16*	*0.00*	*0.51*	*0.40*	*0.56*	*1.20*	*0.05*	*0.17*
Eastern Europe	CZ	10.3	97.2 *96.39 - 97.83*	0.36 *0.17 - 0.72*	- -	0.46 *0.25 - 0.86*	- -	0.62 *0.36 - 1.07*	- -	0.21 *0.08 - 0.52*	0.99 *0.65 - 1.53*	0.05 *0.01 - 0.28*	0.11 *0.03 - 0.38*
	HU	10.1	97.68 *97.04 - 98.18*	- -	0.04 *0.01 - 0.21*	0.19 *0.08 - 0.44*	- -	1.5 *1.11 - 2.03*	0.07 *0.02 - 0.26*	0.11 *0.04 - 0.32*	0.15 *0.06 - 0.38*	- -	0.27 *0.13 - 0.54*
	LT	3.4	94.49 93.09 - 95.61	0.22 0.07 - 0.66	- -	- -	- -	1.41 0.9 - 2.23	- -	- -	3.86 2.93 - 5.06	0.03 0 - 0.36	- -
	PL	38.2	97.63 *97.11 - 98.05*	0.05 *0.01 - 0.18*	- -	0.57 *0.38 - 0.85*	0.09 *0.04 - 0.25*	0.14 *0.06 - 0.31*	- -	0.03 *0.01 - 0.15*	1.47 *1.14 - 1.9*	- -	0.02 *0 - 0.14*
	Total E-EU	*96.7*	*97.57*	*0.09*	*0.01*	*0.47*	*0.06*	*0.52*	*0.02*	*0.08*	*1.10*	*0.01*	*0.07*
Southern Europe	ES	44.5	85.15 *83.87 - 86.34*	0.11 *0.04 - 0.3*	1.49 *1.12 - 1.97*	5.99 *5.22 - 6.87*	0.05 *0.01 - 0.2*	1.4 *1.05 - 1.87*	- -	0.19 *0.09 - 0.41*	3.92 *3.3 - 4.66*	1.14 *0.83 - 1.58*	0.57 *0.36 - 0.89*
	IT	59.1	84.99 *82.95 - 86.82*	- -	1.25 *0.78 - 2.01*	1.15 *0.7 - 1.89*	0.3 *0.12 - 0.78*	0.97 *0.57 - 1.67*	- -	0.53 *0.25 - 1.09*	8.59 *7.19 - 10.23*	1.01 *0.59 - 1.71*	1.22 *0.75 - 1.97*
	PT	10.6	90.01 *89.04 - 90.91*	- -	0.03 *0.01 - 0.16*	1.38 *1.07 - 1.8*	0.15 *0.07 - 0.33*	2.73 *2.27 - 3.29*	- -	0.11 *0.04 - 0.27*	4.93 *4.29 - 5.64*	0.42 *0.26 - 0.67*	0.23 *0.12 - 0.44*
	Total S-EU	*128.6*	*85.52*	*0.04*	*1.23*	*3.06*	*0.19*	*1.30*	*0.00*	*0.36*	*6.43*	*1.01*	*0.87*
Western Europe	BE	10.6	89.35 *88.18 - 90.41*	- -	0.2 *0.09 - 0.43*	0.35 *0.19 - 0.64*	0.09 *0.03 - 0.28*	2.01 *1.57 - 2.59*	0.22 *0.1 - 0.47*	0.75 *0.5 - 1.13*	6.42 *5.59 - 7.36*	0.31 *0.16 - 0.58*	0.3 *0.16 - 0.58*
	NL	16.4	94.49 *93.81 - 95.1*	0.19 *0.1 - 0.36*	0.3 *0.18 - 0.5*	1.67 *1.34 - 2.07*	0.01 *0 - 0.09*	0.4 *0.25 - 0.62*	0.04 *0.01 - 0.15*	0.16 *0.08 - 0.32*	2.15 *1.78 - 2.6*	0.24 *0.13 - 0.42*	0.35 *0.22 - 0.56*
	Total W-EU	*181.4*	*92.46*	*0.12*	*0.26*	*1.15*	*0.04*	*1.03*	*0.11*	*0.39*	*3.83*	*0.27*	*0.33*
Weighted European mean		***500.0***	***92.57***	***0.08***	***0.42***	***1.32***	***0.07***	***0.90***	***0.12***	***0.35***	***3.48***	***0.37***	***0.39***

4.3 Results per substance

The results per substance will be discussed in the following sections. Interesting findings on the results by gender, by age and by time period will be presented. The results will be shown for single use of each substance group. The combination of a substance with a substance from another substance group will be regarded as combinational use. The share of combinational use in relation to single use is presented as well for each substance.
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.1 Alcohol

In all European countries alcohol is a legal drug for persons who are old enough to drive a car. Worldwide there has already been a lot of research conducted on the prevalence and risk of driving under the influence of alcohol (ethanol). The general finding is that alcohol use in traffic is already risky at low BAC levels, especially for younger drivers who have less driving experience than older drivers.
Alcohol affects the driving behaviour by increasing the reaction time and decreasing concentration, coordination and tracking. Furthermore, alcohol leads to more risk-taking behaviour and affects decision making and planning, since drivers overestimate their skills and underestimate the risk due to the effects of alcohol (Kelly et al., 2004; Steyvers and Brookhuis, 1996).

4.3.1.1 General results

Alcohol (ethanol) was detected among car drivers by using breath alcohol testers or analysing blood or oral fluid. The breath alcohol results were converted to blood alcohol results by using a conversion factor of 1:2100, since most participating countries use this conversion factor in their legislation. The results for alcohol are presented in table 4.3.1.1 subdivided into four blood alcohol concentration (BAC) categories: 0.1-0.49 g/L, 0.5-0.79 g/L, 0.8-1.19 g/L, and 1.2 g/L and higher. No alcohol results were available for Sweden.

Table 4.3.1.1. Prevalence of alcohol alone by BAC (g/L) category and country; prevalence in percentages; 95% confidence intervals in italics

	alcohol 0.1-0.5	alcohol 0.5-0.8	alcohol 0.8-1.2	alcohol 1.2+	Total
BE (n=2949)	4.27 *3.59 - 5.06*	1.33 *0.97 - 1.81*	0.42 *0.24 - 0.72*	0.41 *0.23 - 0.71*	6.42 *5.59 - 7.36*
CZ (n=2037)	0.54 *0.30 - 0.97*	0.24 *0.10 - 0.57*	0.15 *0.05 - 0.44*	0.06 *0.01 - 0.30*	0.99 *0.65 - 1.53*
DK (n=3002)	2.05 *1.60 - 2.62*	0.28 *0.14 - 0.54*	0.18 *0.08 - 0.41*	0.02 *0.00 - 0.16*	2.53 *2.02 - 3.15*
ES (n=3174)	2.31 *1.84 - 2.89*	0.90 *0.62 - 1.29*	0.23 *0.11 - 0.47*	0.49 *0.30 - 0.80*	3.92 *3.30 - 4.66*
FI (n=3842)	0.38 *0.23 - 0.63*	0.10 *0.04 - 0.27*	0.02 *0.00 - 0.14*	0.13 *0.05 - 0.30*	0.64 *0.43 - 0.94*
HU (n=2741)	0.05 *0.01 - 0.24*	0.02 *0.00 - 0.18*	0.00 *0.00 - 0.14*	0.08 *0.02 - 0.28*	0.15 *0.06 - 0.38*
IT (n=1311)	3.35 *2.51 - 4.47*	2.02 *1.39 - 2.94*	1.81 *1.22 - 2.69*	1.40 *0.89 - 2.19*	8.59 *7.19 - 10.23*
LT (n=1267)	1.55 *1.00 - 2.39*	0.43 *0.19 - 0.97*	0.41 *0.18 - 0.94*	1.47 *0.94 - 2.29*	3.86 *2.93 - 5.06*
NL (n=4822)	1.54 *1.23 - 1.93*	0.26 *0.15 - 0.44*	0.14 *0.07 - 0.29*	0.21 *0.12 - 0.39*	2.15 *1.78 - 2.60*
NO (n=9236)	0.26 *0.17 - 0.38*	0.04 *0.02 - 0.11*	0.02 *0.00 - 0.07*	0.01 *0.00 - 0.06*	0.32 *0.23 - 0.46*
PL (n=4008)	0.89 *0.64 - 1.23*	0.18 *0.09 - 0.36*	0.27 *0.15 - 0.48*	0.14 *0.06 - 0.31*	1.47 *1.14 - 1.90*
PT (n=3965)	3.71 *3.17 - 4.35*	0.44 *0.27 - 0.69*	0.47 *0.30 - 0.74*	0.31 *0.18 - 0.53*	4.93 *4.29 - 5.64*

In general the highest prevalence is present among the lower BAC categories. However, in Lithuania a large share of alcohol-intoxicated drivers had a BAC level of 1.2 g/L or higher. The total prevalence for alcohol ranged between 0.15% in Hungary and 8.59% in Italy. The average use of alcohol ≥ 0.1 g/L in European traffic is 3.48%.

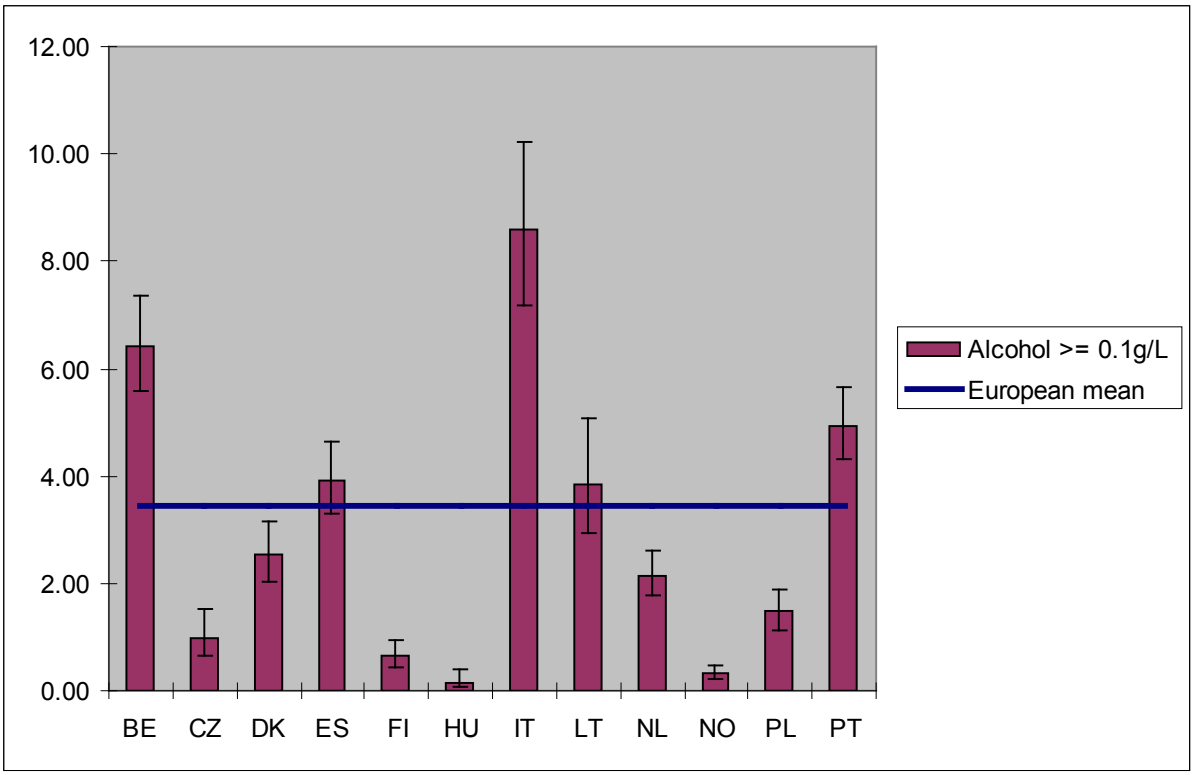

Figure 4.3.1.1. Prevalence of alcohol alone ≥ 0.1 g/L by country; prevalence in percentages

Figure 4.3.1.1 presents an overview of the total prevalence of alcohol ≥ 0.1 g/L with a reference line for the European mean. Single alcohol use is most prevalent among car drivers in the three Southern European countries, in Belgium and in Lithuania. All other countries had a prevalence that was relatively far below the European mean. The prevalence for single alcohol use was the lowest in Hungary, Norway and Finland.

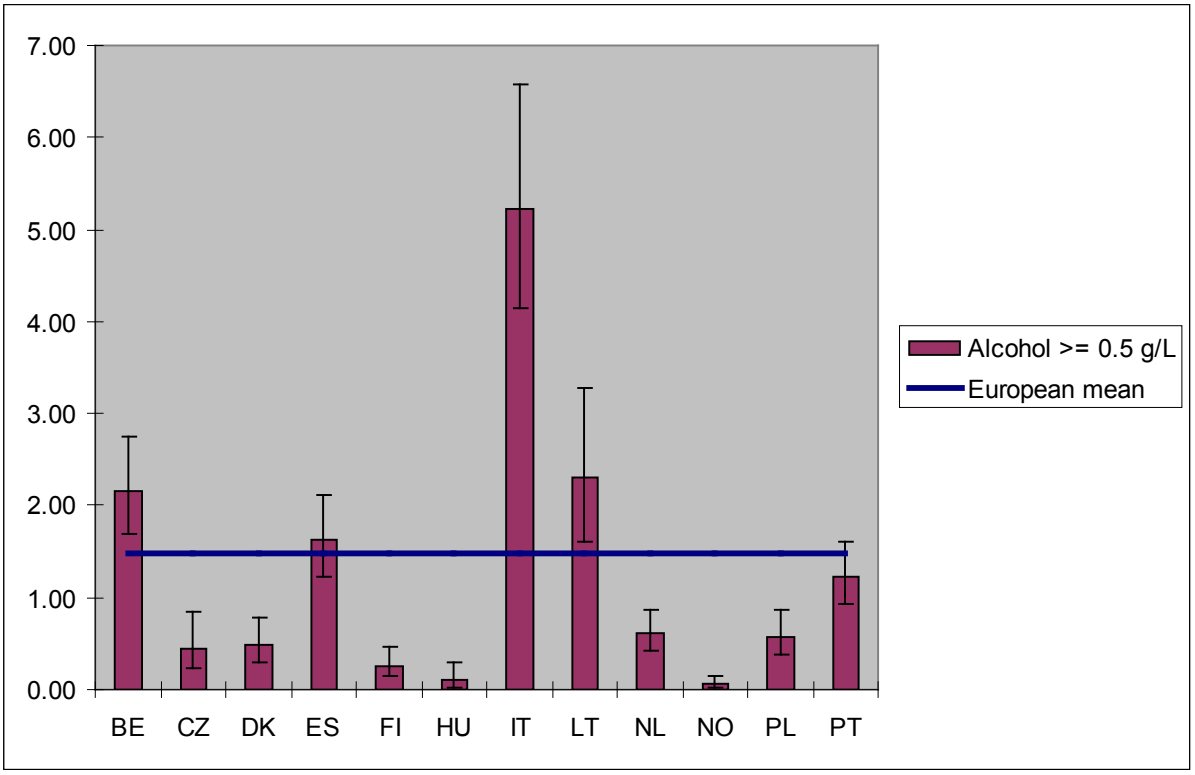

Figure 4.3.1.2. Prevalence of alcohol alone ≥ 0.5 g/L by country; prevalence in percentages

Figure 4.3.1.2 presents the distribution of those drivers who have a BAC of 0.5 g/L and higher. Seven European countries that participated in the roadside survey have a legal BAC limit of 0.5 g/L (Belgium, Denmark, Spain, Italy, the Netherlands, Portugal and Finland). Lithuania has a legal limit of 0.4 g/L, Poland, Norway and Sweden have a legal limit of 0.2 g/L, and Czech Republic and Hungary have a legal limit of 0.0 g/L. The average prevalence for a BAC of 0.5 g/L and higher was 1.49%.
The relative prevalence between countries for a BAC of 0.5 g/L and higher is similar to that of 0.1 g/L and higher. Italy (5.23%) has over twice the prevalence of the second and third ranked countries, Lithuania (2.31%) and Belgium (2.16%), respectively.

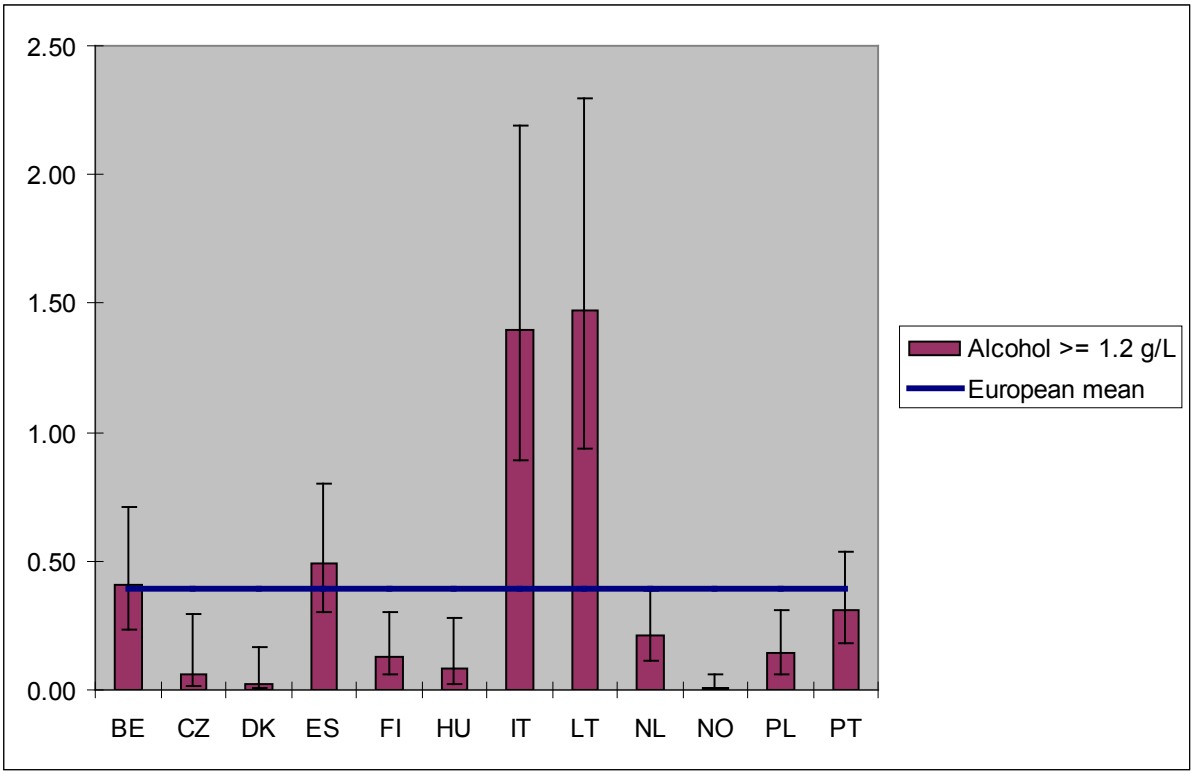

Figure 4.3.1.3. Prevalence of alcohol alone ≥ 1.2 g/L by country; prevalence in percentages

Figure 4.3.1.3 presents the distribution of those drivers who have a BAC of 1.2 g/L and higher. Italy and Lithuania have the highest shares of drivers with this very high BAC. The prevalence in these two countries was almost three times higher than that of Spain, which had the third highest prevalence. In Lithuania almost 40% of all drivers with alcohol in their blood had a BAC of 1.2 g/L or higher, while for most other countries this share is below 15%. High BAC-drivers were virtually absent in Norway and Denmark.

Table 4.3.1.2. Prevalence of alcohol alone and alcohol in combination with other psychoactive substances; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
Alcohol alone	6.42	0.99	2.53	3.92	0.64	0.15	8.59	3.86	2.15	0.32	1.47	6.42	NA
Alcohol in combi	0.31	0.05	0.1	1.14	0.08	0.03	1.01	0.03	0.24	0.07	-	0.31	NA
Total	6.73	1.04	2.63	5.06	0.72	0.18	9.6	3.89	2.39	0.39	1.47	6.73	NA
Share	5%	5%	4%	23%	11%	17%	11%	1%	10%	18%	-	5%	NA

Table 4.3.1.2 and figure 4.3.1.4 present the prevalence of alcohol alone together with the prevalence of alcohol in combination with other psychoactive substances. The relative share of alcohol in combination with drugs as a total of all alcohol use is between 0% (Poland) and 23% (Spain). So, in Spain the combination of alcohol and drugs is relatively frequent. In almost one quarter of the alcohol cases drugs was prevalent as well. In general, countries with a higher prevalence of alcohol and drugs

alone (see table 4.3) have a higher prevalence as well for the combination of alcohol and drugs. No alcohol data were available for Sweden.

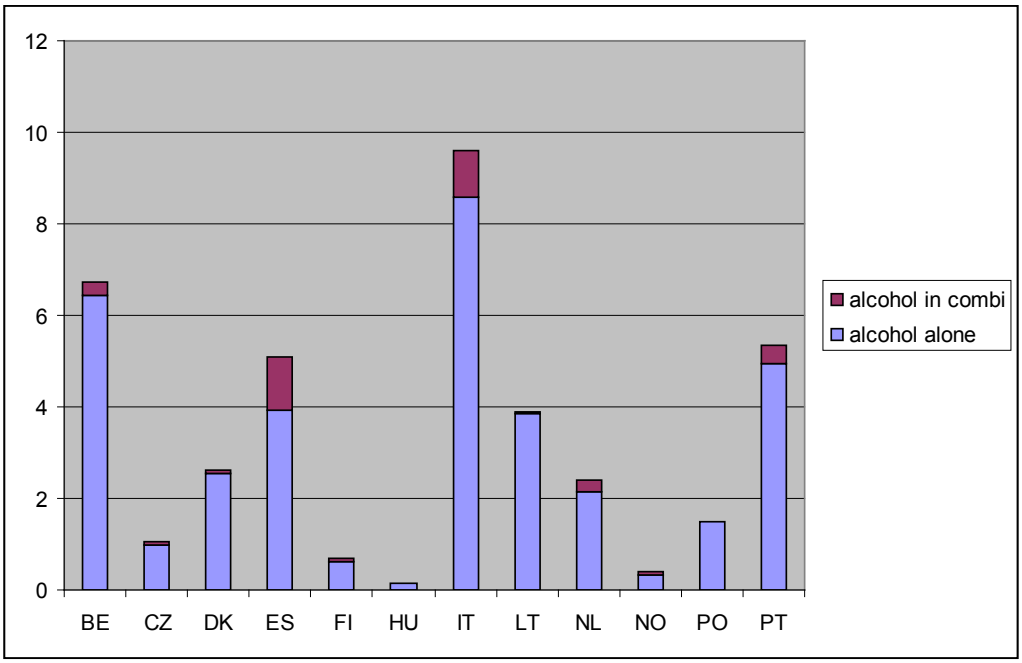

Figure 4.3.1.4. Prevalence of alcohol alone ≥ 0.1 g/L and alcohol in combination with other psychoactive substances in 12 European countries; prevalence in percentages

4.3.1.2 Alcohol by gender and age

Table 4.3.1.3 presents the prevalence of single alcohol use by age group. The highest prevalence in Europe was detected among drivers in Italy aged 50+ (13.40%) and 18-24 (9.18%) and among young drivers in Portugal (8.97%). The 95% confidence intervals are very large for some countries. Therefore, it is difficult to assign exact differences between age groups for the participating countries.

Table 4.3.1.3. Prevalence of alcohol alone ≥ 0.1 g/L by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE	6.58	6.62	5.20	7.68	6.42
(n=2949)	*4.28 - 10*	*4.92 - 8.87*	*4.04 - 6.67*	*6.12 - 9.6*	*5.59 - 7.36*
CZ	0.86	0.27	1.59	1.00	0.99
(n=2037)	*0.24 - 3.02*	*0.06 - 1.16*	*0.9 - 2.79*	*0.44 - 2.29*	*0.65 - 1.53*
DK	1.48	1.40	2.34	3.35	2.53
(n=3002)	*0.53 - 4.1*	*0.67 - 2.89*	*1.59 - 3.43*	*2.47 - 4.52*	*2.02 - 3.15*
ES	2.20	3.61	4.19	6.19	3.92
(n=3174)	*1.29 - 3.74*	*2.63 - 4.93*	*3.12 - 5.6*	*4.38 - 8.69*	*3.3 - 4.66*
FI	0.72	0.76	0.40	0.74	0.64
(n=3842)	*0.25 - 2.09*	*0.34 - 1.69*	*0.17 - 0.96*	*0.41 - 1.32*	*0.43 - 0.94*
HU	0.00	0.00	0.28	0.23	0.15
(n=2741)	*0 - 1.49*	*0 - 0.43*	*0.09 - 0.88*	*0.05 - 0.99*	*0.06 - 0.38*
IT	9.18	7.91	8.13	13.40	8.59
(n=1311)	*6.46 - 12.89*	*5.72 - 10.84*	*6.03 - 10.87*	*7.28 - 23.37*	*7.19 - 10.23*
LT	4.12	3.16	4.04	3.45	3.86
(n=1267)	*2.02 - 8.19*	*1.73 - 5.69*	*2.59 - 6.26*	*1.89 - 6.2*	*2.93 - 5.06*
NL	0.75	1.86	2.33	2.60	2.15
(n=4822)	*0.29 - 1.96*	*1.19 - 2.89*	*1.72 - 3.16*	*1.92 - 3.51*	*1.78 - 2.6*
NO	0.39	0.12	0.30	0.39	0.32
(n=9236)	*0.15 - 1.02*	*0.03 - 0.45*	*0.16 - 0.55*	*0.23 - 0.67*	*0.23 - 0.46*
PL	0.47	2.16	1.95	0.41	1.47
(n=4008)	*0.15 - 1.42*	*1.5 - 3.08*	*1.31 - 2.89*	*0.15 - 1.12*	*1.14 - 1.9*
PT	8.97	4.50	4.16	4.21	4.93
(n=3965)	*6.83 - 11.7*	*3.46 - 5.82*	*3.19 - 5.39*	*3.07 - 5.75*	*4.29 - 5.64*

Figure 4.3.1.5 presents the distribution of alcohol ≥ 0.1 g/L by age group. There is no general pattern in the distribution of drivers positive for alcohol over the different age groups between the countries.
In Denmark, Czech Republic, Spain, Hungary and the Netherlands the share of drivers younger than 35 years old is smaller than the share of older drivers. In Belgium, Finland, Italy, Lithuania, Norway and Poland the distributions of shares are similar, while in Portugal the share of alcohol positive drivers was the highest among young drivers. No results were available for Sweden.

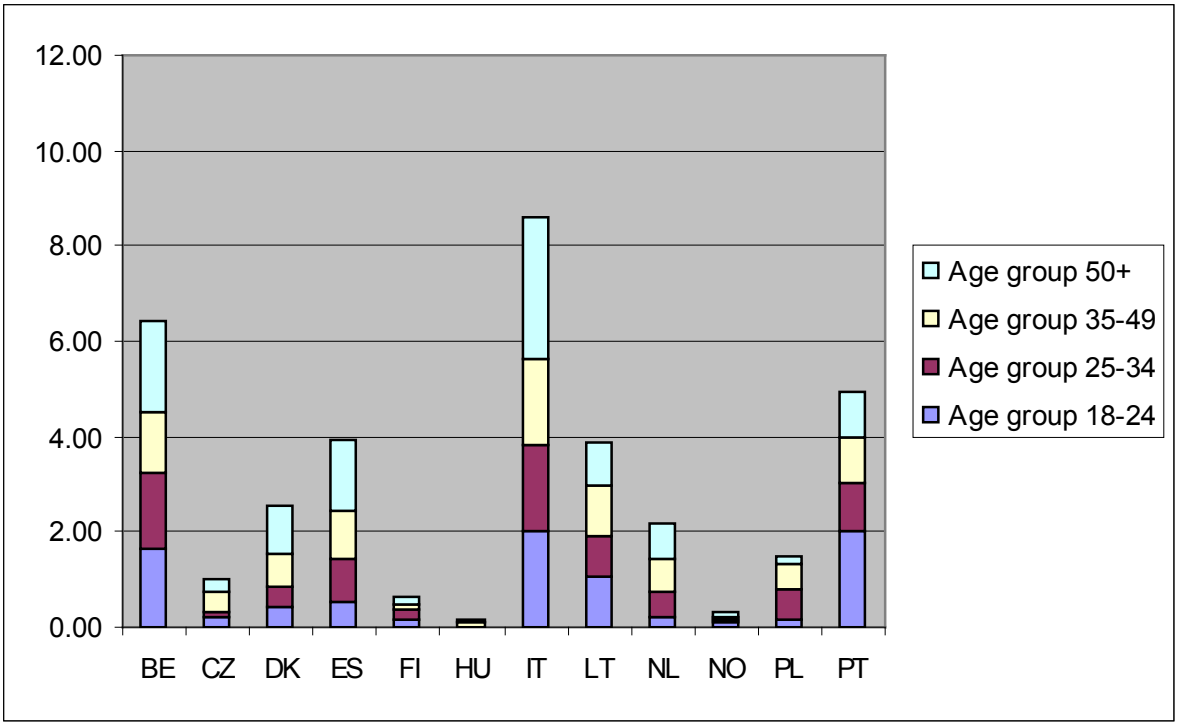

Figure 4.3.1.5. Distribution of the prevalence of alcohol alone ≥ 0.1 g/L among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Figure 4.3.1.6 presents an overview of the prevalence of alcohol (≥ 0.1 g/L) by gender. In all countries the prevalence for male drivers is higher than for female drivers. The only exceptions are Norway, where the prevalence of alcohol among male drivers is equal to that of female drivers, and Italy where the prevalence of alcohol among female drivers is even higher than that of men.

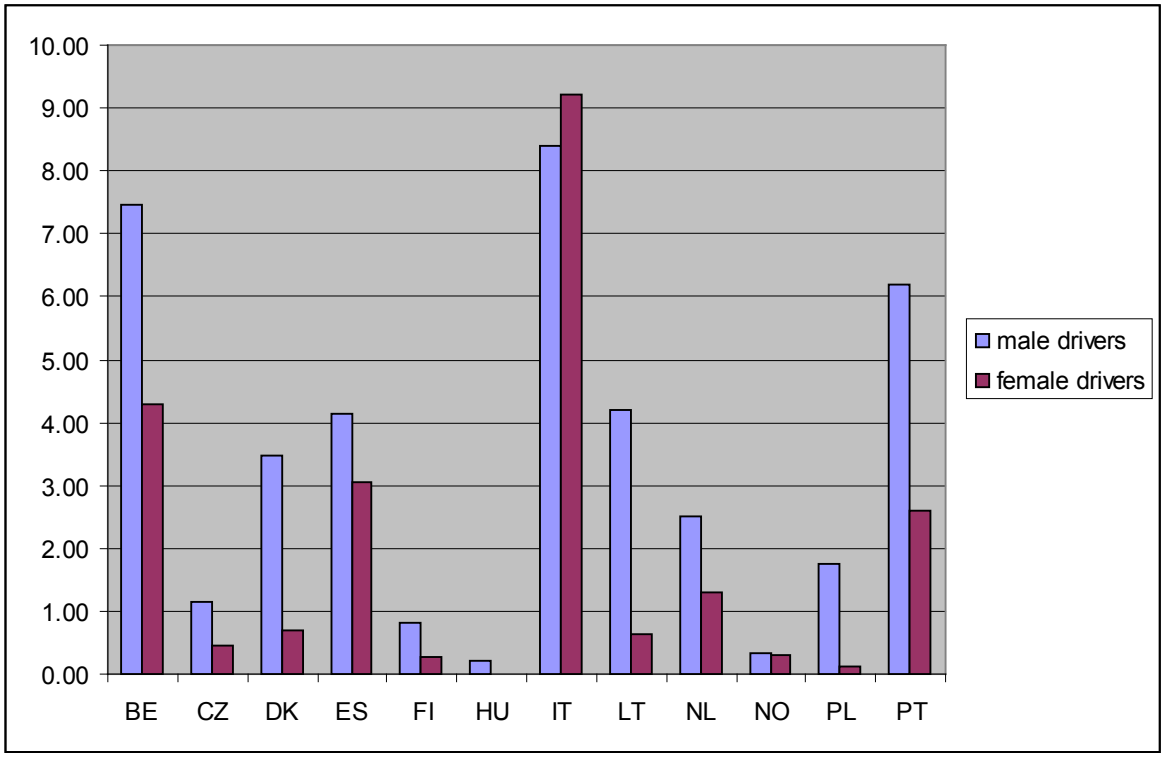

Figure 4.3.1.6. Prevalence of alcohol alone ≥ 0.1 g/L by gender; prevalence in percentages

Table 4.3.1.4 provides an overview of the distribution of alcohol by age for male drivers.
The prevalence among male drivers is the lowest in Hungary (0.20%) and the highest in Italy (8.39%). The 95% confidence intervals are very large for some countries. Therefore, differences between age groups for the participating countries should be interpreted with care.

Table 4.3.1.4. Prevalence of alcohol alone ≥ 0.1 g/L by age group for male drivers; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE	7.08	7.51	6.24	8.92	7.47
(n=1957)	*4.2 - 11.71*	*5.23 - 10.66*	*4.71 - 8.21*	*6.98 - 11.33*	*6.39 - 8.72*
CZ	1.33	0.36	1.70	1.14	1.15
(n=1589)	*0.38 - 4.62*	*0.08 - 1.54*	*0.91 - 3.15*	*0.5 - 2.61*	*0.73 - 1.81*
DK	1.31	2.19	3.25	4.50	3.47
(n=1975)	*0.35 - 4.76*	*1.06 - 4.5*	*2.15 - 4.89*	*3.3 - 6.11*	*2.75 - 4.37*
ES	2.41	3.55	4.31	6.81	4.14
(n=2520)	*1.36 - 4.24*	*2.48 - 5.06*	*3.12 - 5.92*	*4.78 - 9.62*	*3.43 - 4.98*
FI	1.08	1.19	0.44	0.85	0.82
(n=2511)	*0.37 - 3.11*	*0.53 - 2.62*	*0.15 - 1.27*	*0.45 - 1.6*	*0.54 - 1.26*
HU	0.00	0.00	0.38	0.28	0.20
(n=2062)	*0 - 2.09*	*0 - 0.58*	*0.12 - 1.18*	*0.06 - 1.21*	*0.08 - 0.51*
IT	9.48	5.38	10.08	12.32	8.39
(n=998)	*6.44 - 13.74*	*3.46 - 8.27*	*7.37 - 13.66*	*5.54 - 25.2*	*6.82 - 10.27*
LT	4.54	3.60	4.40	3.52	4.20
(n=1130)	*2.24 - 9.01*	*1.96 - 6.55*	*2.82 - 6.8*	*1.91 - 6.4*	*3.18 - 5.52*
NL	0.82	2.17	2.79	3.01	2.52
(n=3363)	*0.27 - 2.42*	*1.34 - 3.51*	*1.98 - 3.91*	*2.17 - 4.18*	*2.04 - 3.11*
NO	0.44	0.06	0.29	0.43	0.34
(n=6520)	*0.15 - 1.29*	*0.01 - 0.45*	*0.14 - 0.62*	*0.24 - 0.77*	*0.22 - 0.51*
PL	0.54	2.61	2.41	0.45	1.75
(n=3331)	*0.17 - 1.68*	*1.82 - 3.73*	*1.62 - 3.57*	*0.16 - 1.23*	*1.35 - 2.25*
PT	9.76	5.99	6.37	4.47	6.21
(n=2541)	*6.95 - 13.53*	*4.47 - 8*	*4.89 - 8.26*	*3.17 - 6.26*	*5.34 - 7.21*

Figure 4.3.1.7 shows that for male drivers in Portugal, Italy and Belgium the share of drivers with a BAC of 0.1 g/L is the highest. In most countries the share of alcohol positive male drivers is the highest for the two oldest age groups (35-49 and 50+).

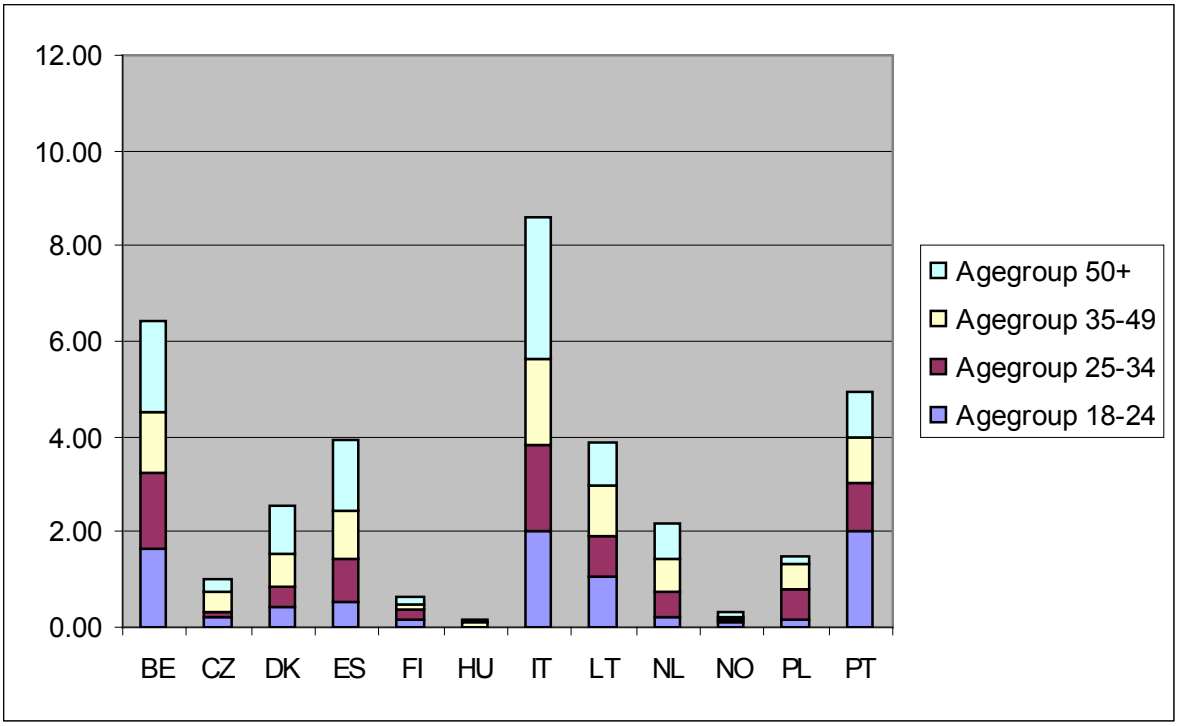

Figure 4.3.1.7. Distribution of the prevalence of alcohol alone ≥ 0.1 g/L among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups.

Table 4.3.1.5 provides an overview of the distribution of alcohol positive female drivers by age. No single alcohol use was detected among female drivers in Hungary. In Italy however, the share of alcohol positive drivers was 9.22%. In Finland, Poland, Norway and Czech Republic the share of female drivers positive for alcohol was beneath the 0.5%. The 95% confidence intervals are very large for some countries. Therefore, it is difficult to assign exact differences between age groups for the participating countries.

Table 4.3.1.5. Prevalence of alcohol alone ≥ 0.1 g/L by age group for female drivers; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE	5.77	5.32	3.10	4.31	4.28
(n=971)	*2.73 - 11.8*	*3.15 - 8.85*	*1.76 - 5.42*	*2.4 - 7.64*	*3.17 - 5.74*
CZ	0.00	0.00	1.21	0.00	0.44
(n=448)	*0 - 4.32*	*0 - 2.73*	*0.33 - 4.34*	*0 - 5.68*	*0.12 - 1.6*
DK	1.86	0.00	0.84	0.66	0.70
(n=1015)	*0.41 - 8.1*	*0 - 2.15*	*0.3 - 2.3*	*0.2 - 2.15*	*0.34 - 1.43*
ES	1.39	3.82	3.71	2.19	3.05
(n=605)	*0.34 - 5.5*	*1.99 - 7.2*	*1.84 - 7.36*	*0.49 - 9.21*	*1.96 - 4.72*
FI	0.00	0.00	0.35	0.45	0.27
(n=1283)	*0 - 2.71*	*0 - 1.44*	*0.09 - 1.38*	*0.12 - 1.74*	*0.1 - 0.74*
HU	0.00	0.00	0.00	0.00	0.00
(n=679)	*0 - 4.9*	*0 - 1.56*	*0 - 1.56*	*0 - 3.08*	*0 - 0.56*
IT	7.98	18.35	3.21	15.24	9.22
(n=313)	*3.44 - 17.41*	*11.54 - 27.91*	*1.33 - 7.58*	*6.02 - 33.55*	*6.49 - 12.94*
LT	0.00	0.76	0.00	2.25	0.64
(n=121)	*0 - 19*	*0.06 - 8.41*	*0 - 9.35*	*0.19 - 21.84*	*0.09 - 4.21*
NL	0.61	1.07	1.44	1.51	1.30
(n=1454)	*0.1 - 3.5*	*0.37 - 3.07*	*0.74 - 2.78*	*0.72 - 3.15*	*0.83 - 2.02*
NO	0.29	0.27	0.30	0.30	0.29
(n=2709)	*0.05 - 1.74*	*0.06 - 1.22*	*0.1 - 0.87*	*0.09 - 0.95*	*0.15 - 0.58*
PL	0.13	0.20	0.11	0.00	0.13
(n=672)	*0 - 3.74*	*0.02 - 1.87*	*0.01 - 1.78*	*0 - 4.88*	*0.02 - 0.81*
PT	8.00	2.44	0.29	3.14	2.59
(n=1342)	*5.05 - 12.46*	*1.4 - 4.22*	*0.06 - 1.33*	*1.38 - 6.97*	*1.88 - 3.58*

Figure 4.3.1.8 presents an overview of the distribution of alcohol (≥ 0.1 g/L) among the various age groups of female drivers. It shows that in Portugal, Italy, Spain and Belgium the shares of female drivers with a BAC of 0.1 g/L are the highest. As was the case for male drivers, in many countries the share of alcohol positive drivers is the highest for the two oldest age groups (35-49 and 50+).

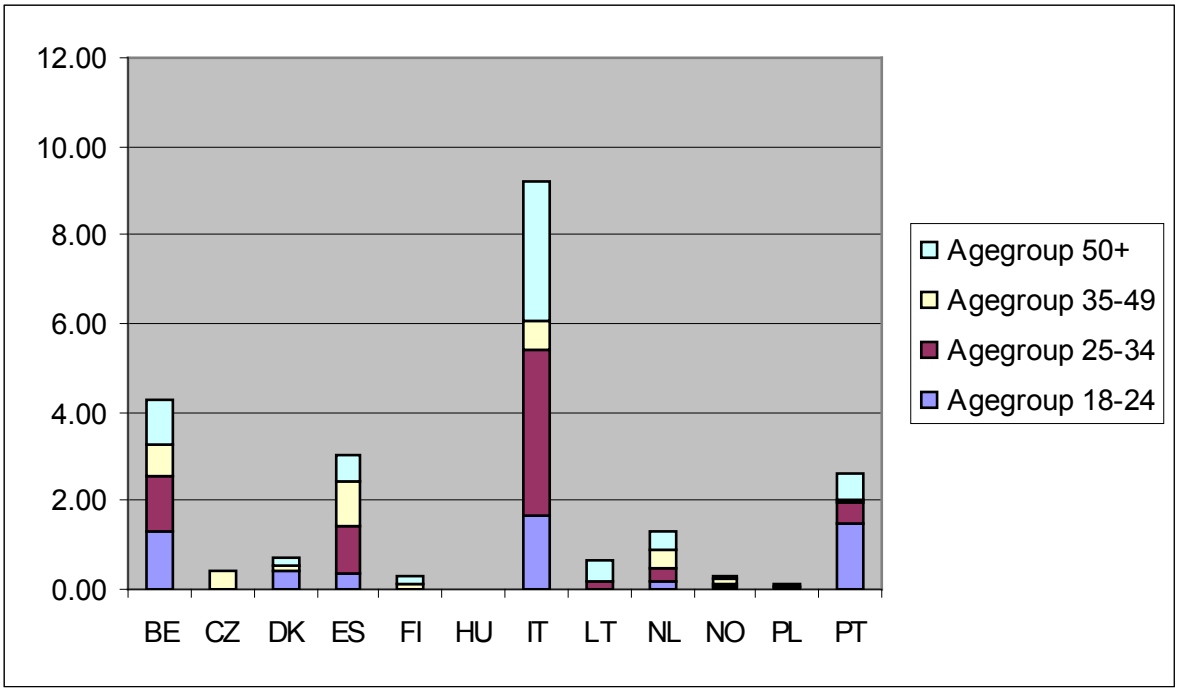

Figure 4.3.1.8 Distribution of the prevalence of alcohol alone ≥ 0.1 g/L among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.1.3. Alcohol by time period

Table 4.3.1.6 presents the distribution of alcohol by time period. In general alcohol use is higher during nighttime hours than during day time hours. However, in some Eastern European countries such as Hungary, Lithuania and Poland this was not the case. The highest prevalence was detected in Belgium during weekday nights (21.05%) and during weekend nights (16.60%).
The 95% confidence intervals are very large for some countries. Therefore, it is difficult to assign exact differences between time periods for the participating countries.

Table 4.3.1.6. Prevalence of alcohol alone ≥ 0.1 g/L by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE	3.99	21.05	8.94	16.60	6.42
(n=2949)	*3.22 - 4.93*	*15.61 - 27.76*	*7 - 11.34*	*9.85 - 26.61*	*5.59 - 7.36*
CZ	0.83	1.23	1.26	3.09	0.99
(n=2037)	*0.46 - 1.47*	*0.13 - 10.75*	*0.64 - 2.44*	*0.39 - 20.67*	*0.65 - 1.53*
DK	2.25	2.46	3.31	2.45	2.53
(n=3002)	*1.69 - 2.97*	*0.63 - 9.1*	*2.25 - 4.84*	*0.64 - 8.89*	*2.02 - 3.15*
ES	2.40	8.22	5.78	11.24	3.92
(n=3174)	*1.83 - 3.15*	*4.59 - 14.32*	*4.36 - 7.63*	*7.22 - 17.1*	*3.3 - 4.66*
FI	0.49	1.08	0.83	2.03	0.64
(n=3842)	*0.29 - 0.85*	*0.23 - 4.79*	*0.43 - 1.58*	*0.48 - 8.14*	*0.43 - 0.94*
HU	0.16	0.00	0.15	0.00	0.15
(n=2741)	*0.06 - 0.46*	*0 - 5.75*	*0.03 - 0.85*	*0 - 6.88*	*0.06 - 0.38*
IT	8.51	10.64	8.60	8.90	8.59
(n=1311)	*6.89 - 10.46*	*3.81 - 26.37*	*5.97 - 12.24*	*2.62 - 26.17*	*7.19 - 10.23*
LT	3.64	3.85	4.99	0.00	3.86
(n=1267)	*2.62 - 5.03*	*0.76 - 17.35*	*2.95 - 8.31*	*0 - 13.37*	*2.93 - 5.06*
NL	1.59	9.20	2.51	6.65	2.15
(n=4822)	*1.22 - 2.06*	*5.49 - 15.02*	*1.72 - 3.64*	*3.49 - 12.28*	*1.78 - 2.6*
NO	0.34	0.00	0.27	0.79	0.32
(n=9236)	*0.22 - 0.52*	*0 - 0.69*	*0.12 - 0.58*	*0.3 - 2.1*	*0.23 - 0.46*
PL	1.41	1.72	1.70	0.86	1.47
(n=4008)	*1.04 - 1.91*	*0.41 - 6.9*	*1.05 - 2.73*	*0.11 - 6.32*	*1.14 - 1.9*
PT	5.08	3.06	4.24	9.00	4.93
(n=3965)	*4.34 - 5.94*	*0.9 - 9.9*	*3.11 - 5.76*	*4.37 - 17.64*	*4.29 - 5.64*

The share of alcohol use was in general the lowest at weekdays during daytime hours. However, in Portugal the share of alcohol drivers was higher during weekday hours than during weekday nights. Despite a general large share of high BAC drivers (see table 4.3.1.6 and figure 4.3.1.9), no alcohol use was found during weekend nights in Lithuania. In Hungary no alcohol was found at all during night time hours.

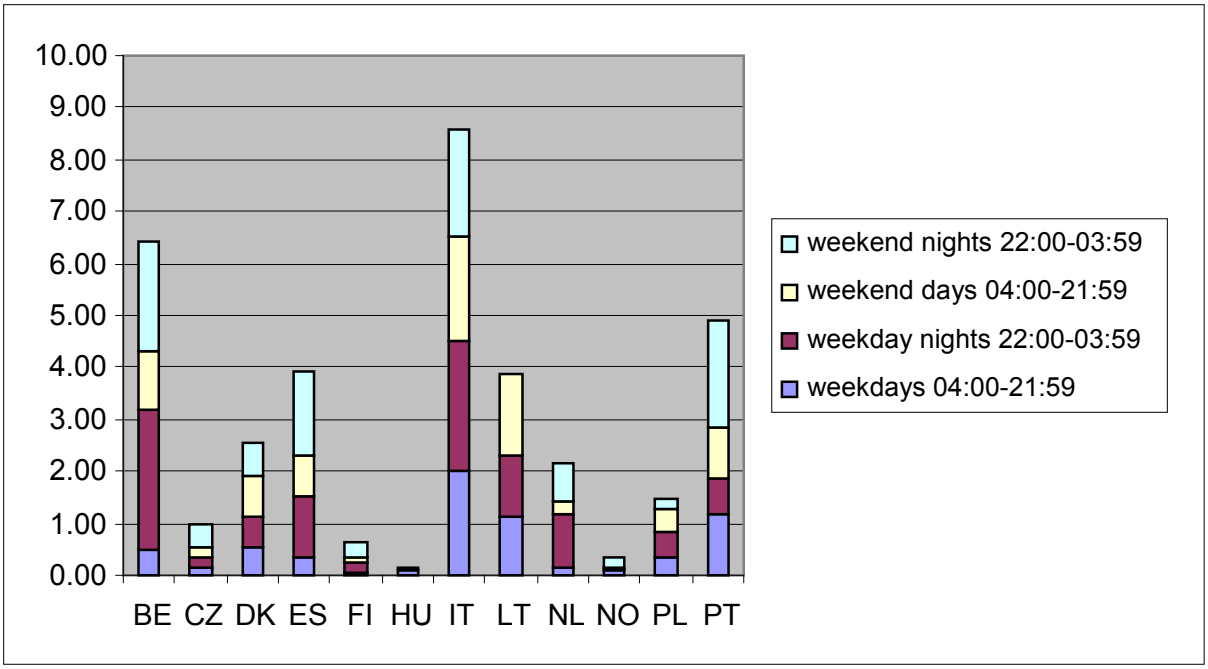

Figure 4.3.1.9. Distribution of the prevalence of alcohol alone ≥ 0.1 g/L among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

4.3.2 Amphetamines

Amphetamines are drugs that have a stimulating effect on mental and physical performance. Impairing effects on driving behaviour were mainly found at high doses, among chronic users and in the crash phase, when fatigue sets in. More complex tasks will be more affected by amphetamine use and a driving behaviour tends to be more impulsive. Negative effects of stimulants can also be expected when the stimulant effect is gone and users become very tired (Kelly et al., 2004; Scheers et al., 2006; Steyvers and Brookhuis, 1996).
The results are presented for single use of amphetamines. The combination of amphetamines with a substance from an other substance group is regarded as combinational use. The share of combinational use in relation to single use is presented in table 4.3.2.1 and figure 4.3.2.2.
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.2.1 General results

The amphetamine drugs group consisted of amphetamine, metamphetamine, MDMA, MDA, and MDEA. Cut-off values for these substances in blood and saliva are presented in table 2.2.

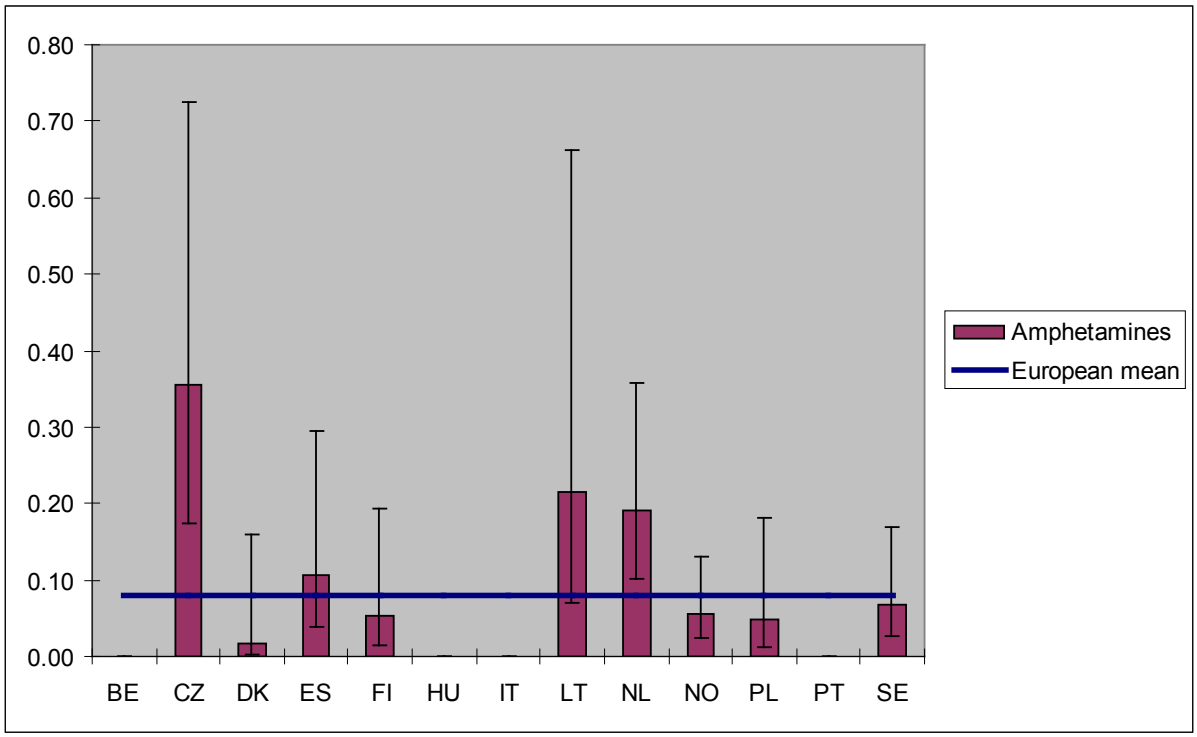

Figure 4.3.2.1. Prevalence of amphetamines alone by country; prevalence in percentages

Figure 4.3.2.1 presents the prevalence of amphetamines. The prevalence is very low in most of the 13 countries. The Czech Republic has the highest share with 0.38%, which is almost the double of the share of the countries that are ranked 2 and 3, Lithuania and The Netherlands with 0.22% and 0.19% respectively. However, most countries have a prevalence that is lower than 0.10%. No single amphetamines were detected in Belgium, Hungary, Italy and Portugal. The average prevalence for amphetamines in Europe is 0.08%.

Table 4.3.2.1. Prevalence of amphetamines alone and amphetamines in combination with other psychoactive substances; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
Alone	-	0.36	0.02	0.11	0.05	-	-	0.22	0.19	0.06	0.05	-	0.07
Combi	-	0.02	0.02	0.11	0.05	-	0.33	-	0.18	0.15	0.02	0.02	-
Total	-	0.38	0.04	0.22	0.10	-	0.33	0.22	0.37	0.21	0.07	0.02	0.07
Share	-	5%	55%	51%	48%	-	100%	0%	49%	73%	29%	100%	0%

Table 4.3.2.1 and figure 4.3.2.2 present the relative share of amphetamines in combination with other psychoactive substances. In Italy and Portugal amphetamines were only detected in combination with other substances, while in Lithuania and Sweden amphetamines were only detected as single substance. In general amphetamines are equally often detected alone as in combinations.

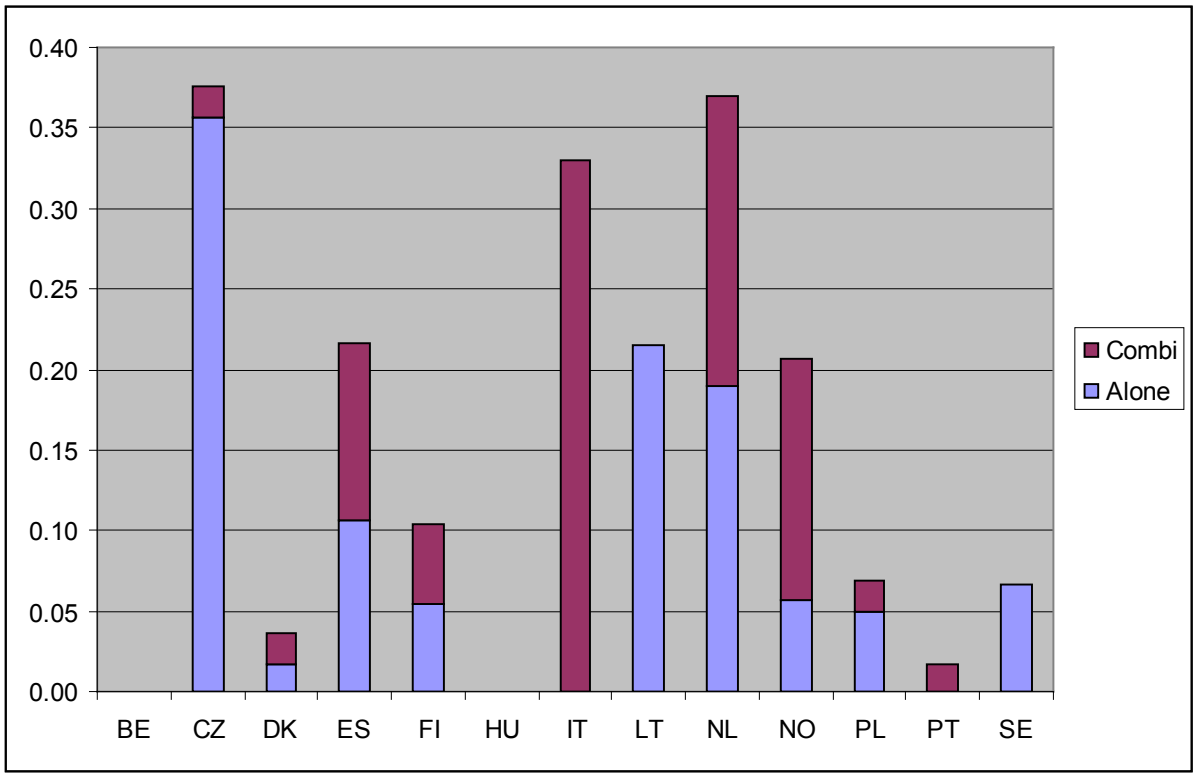

Figure 4.3.2.2. Prevalence of amphetamines alone and in combination with other psychoactive substances; prevalence in percentages

4.3.2.2. Amphetamines by gender and age

Table 4.3.2.2 provides an overview of the prevalence of amphetamines distributed by age. The highest prevalence was detected among drivers in Czech Republic aged 25-34 years (1.13%), and for drivers in Lithuania aged 18-24 years (1.06%).

Table 4.3.2.2. Prevalence of amphetamines alone by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
CZ	0.41	1.13	0.00	0.00	0.36
(n=2037)	*0.07 - 2.3*	*0.53 - 2.4*	*0 - 0.53*	*0 - 0.74*	*0.17 - 0.72*
DK	0.00	0.10	0.00	0.00	0.02
(n=3002)	*0 - 1.71*	*0.01 - 0.98*	*0 - 0.36*	*0 - 0.32*	*0 - 0.16*
ES	0.40	0.08	0.02	0.00	0.11
(n=3174)	*0.12 - 1.33*	*0.01 - 0.52*	*0 - 0.41*	*0 - 0.78*	*0.04 - 0.3*
FI	0.00	0.28	0.00	0.00	0.05
(n=3842)	*0 - 0.9*	*0.08 - 1*	*0 - 0.32*	*0 - 0.26*	*0.02 - 0.19*
LT	1.06	0.27	0.00	0.00	0.22
(n=1267)	*0.28 - 3.96*	*0.04 - 1.67*	*0 - 0.83*	*0 - 1.28*	*0.07 - 0.66*
NL	0.12	0.22	0.36	0.00	0.19
(n=4822)	*0.02 - 0.98*	*0.07 - 0.76*	*0.17 - 0.78*	*0 - 0.24*	*0.1 - 0.36*
NO	0.17	0.13	0.04	0.00	0.06
(n=9236)	*0.04 - 0.68*	*0.04 - 0.45*	*0.01 - 0.2*	*0 - 0.11*	*0.02 - 0.13*
PL	0.12	0.08	0.00	0.02	0.05
(n=4008)	*0.02 - 0.86*	*0.02 - 0.43*	*0 - 0.31*	*0 - 0.49*	*0.01 - 0.18*
SE	0.00	0.09	0.14	0.02	0.07
(n=6198)	*0 - 0.78*	*0.01 - 0.57*	*0.05 - 0.43*	*0 - 0.17*	*0.03 - 0.17*

Figure 4.3.2.3 shows that in general amphetamines are used by drivers younger than 35 years old. In the Netherlands and Sweden however, the largest share was formed by drivers aged 35-49 years.

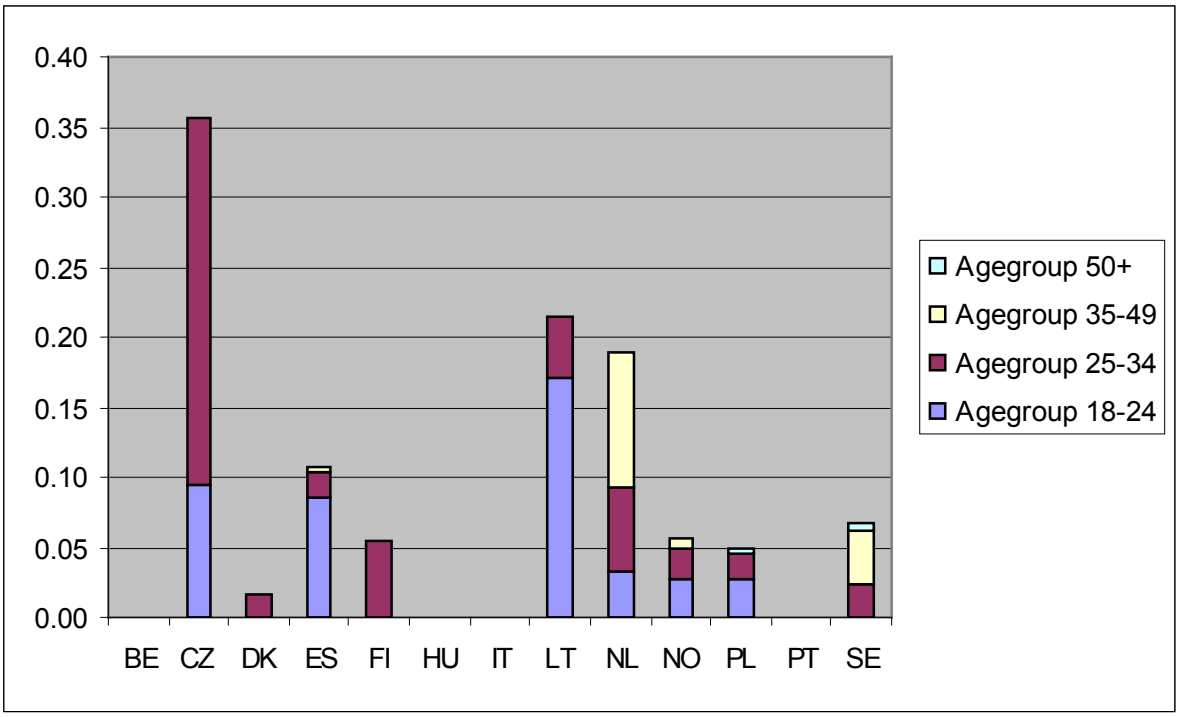

Figure 4.3.2.3. Distribution of the prevalence of amphetamines alone among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Figure 4.3.2.4 shows that single amphetamines use is in some countries more prevalent among male drivers and in other countries more among female drivers. In Lithuania the prevalence of amphetamines among female drivers was almost 20 times higher than for male drivers.

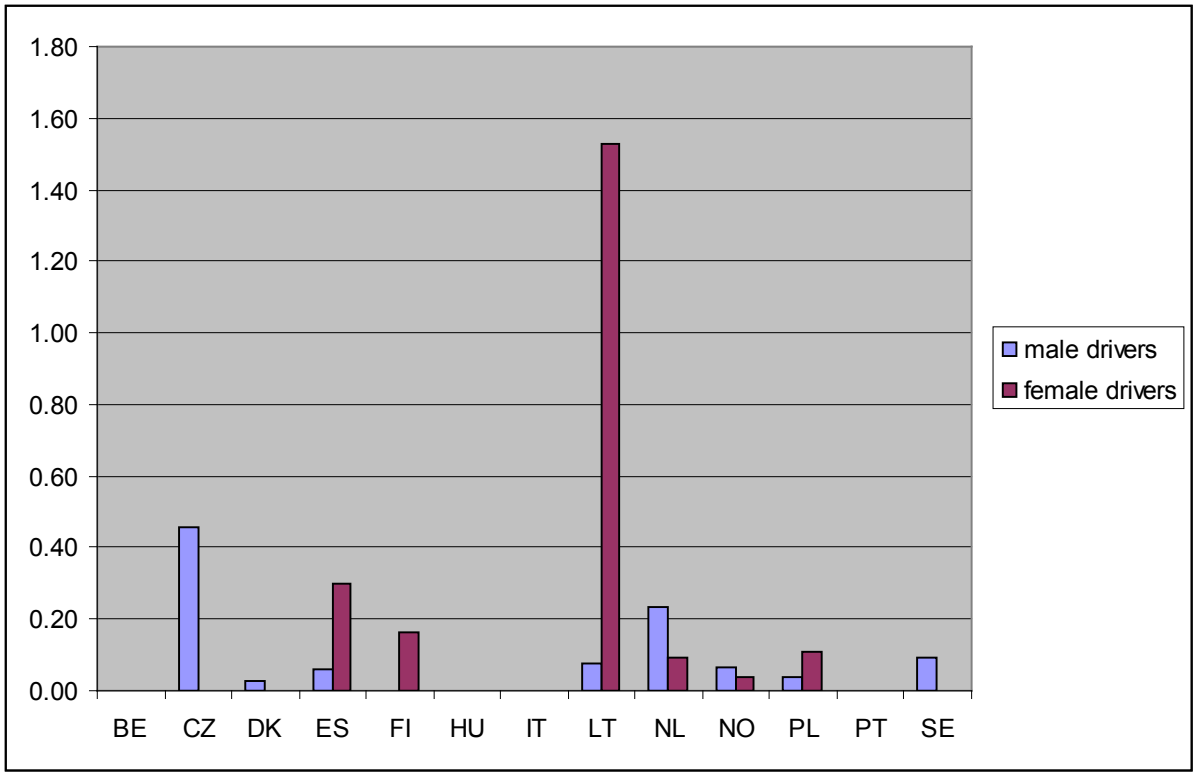

Figure 4.3.2.4. Prevalence of amphetamines alone by gender; prevalence in percentages

Table 4.3.2.3 presents the distribution of amphetamines by age group among male drivers. No single amphetamine use was detected among male drivers from Belgium, Hungary, Italy and Portugal. Male drivers in Czech Republic have the highest prevalence for single amphetamine use. The highest prevalence was among 25-34 years old men from Czech Republic with 1.50%. Among male drivers aged 50+ almost no amphetamine use was found.

Table 4.3.2.3. Prevalence of amphetamines alone among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
CZ (n=1589)	0.64 *0.11 - 3.52*	1.50 *0.7 - 3.18*	0.00 *0 - 0.68*	0.00 *0 - 0.84*	0.46 *0.22 - 0.93*
DK (n=1975)	0.00 *0 - 2.56*	0.16 *0.02 - 1.52*	0.00 *0 - 0.57*	0.00 *0 - 0.45*	0.03 *0 - 0.24*
ES (n=2520)	0.29 *0.06 - 1.33*	0.02 *0 - 0.52*	0.00 *0 - 0.46*	0.00 *0 - 0.9*	0.06 *0.01 - 0.26*
FI (n=2511)	0.00 *0 - 1.35*	0.00 *0 - 0.8*	0.00 *0 - 0.55*	0.00 *0 - 0.35*	0.00 *0 - 0.15*
LT (n=1130)	0.00 *0 - 2.38*	0.32 *0.05 - 1.98*	0.00 *0 - 0.9*	0.00 *0 - 1.36*	0.08 *0.01 - 0.47*
NL (n=3363)	0.18 *0.02 - 1.41*	0.13 *0.02 - 0.76*	0.55 *0.26 - 1.17*	0.00 *0 - 0.34*	0.23 *0.12 - 0.46*
NO (n=6520)	0.14 *0.02 - 0.81*	0.19 *0.05 - 0.66*	0.05 *0.01 - 0.27*	0.00 *0 - 0.15*	0.06 *0.03 - 0.16*
PL (n=3331)	0.15 *0.02 - 1.04*	0.04 *0 - 0.42*	0.00 *0 - 0.39*	0.02 *0 - 0.53*	0.04 *0.01 - 0.18*
SE (n=4352)	0.00 *0 - 1.12*	0.13 *0.02 - 0.85*	0.22 *0.07 - 0.67*	0.03 *0 - 0.23*	0.09 *0.04 - 0.24*

Figure 4.3.2.5 presents an overview of male drivers by age group. Amphetamine use among male drivers is mainly found among drivers between 18 and 34 years old. However, in the Netherlands and Sweden users were mainly aged 35 to 50. No amphetamines were found among male drivers from Belgium, Finland, Hungary, Italy and Portugal.

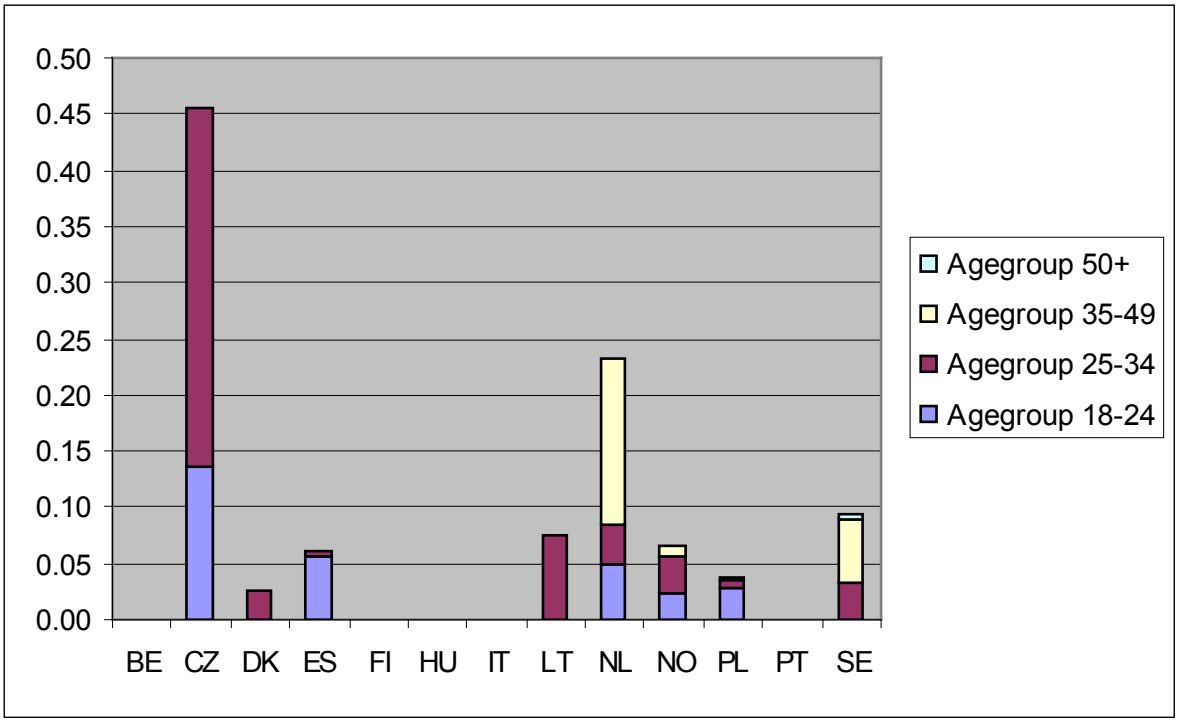

Figure 4.3.2.5. Distribution of the prevalence of amphetamines alone among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.2.4 and figure 4.3.2.6 present the prevalence of amphetamines among female drivers. Amphetamines among female drivers are almost without exception used by the young. The share of female amphetamine users was lower than the share of male users except for Lithuania, where 1.5% of all young female drivers (aged 18-24) were positive for amphetamines.

Table 4.3.2.4. Prevalence of amphetamines alone among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
CZ (n=448)	0.00 *0 - 4.32*	0.00 *0 - 2.73*	0.00 *0 - 2.31*	0.00 *0 - 5.68*	0.00 *0 - 0.85*
DK (n=1015)	0.00 *0 - 4.97*	0.00 *0 - 2.15*	0.00 *0 - 0.94*	0.00 *0 - 1.05*	0.00 *0 - 0.38*
ES (n=605)	0.86 *0.15 - 4.67*	0.29 *0.04 - 2.22*	0.09 *0 - 2.09*	0.00 *0 - 5.56*	0.30 *0.08 - 1.13*
FI (n=1283)	0.00 *0 - 2.71*	0.79 *0.22 - 2.77*	0.00 *0 - 0.78*	0.00 *0 - 0.96*	0.16 *0.05 - 0.57*
LT (n=121)	11.30 *3.02 - 34.29*	0.00 *0 - 7.06*	0.00 *0 - 9.35*	0.00 *0 - 18.35*	1.53 *0.4 - 5.63*
NL (n=1454)	0.00 *0 – 2.42*	0.46 *0.1 - 2.13*	0.00 *0 - 0.66*	0.00 *0 - 0.88*	0.09 *0.02 - 0.42*
NO (n=2709)	0.24 *0.03 - 1.65*	0.00 *0 - 0.75*	0.02 *0 - 0.42*	0.00 *0 - 0.45*	0.04 *0.01 - 0.21*
PL (n=672)	0.00 *0 - 3.51*	0.29 *0.04 - 2.03*	0.00 *0 - 1.57*	0.00 *0 - 4.88*	0.11 *0.01 - 0.77*
SE (n=1835)	0.00 *0 - 2.57*	0.00 *0 - 1.24*	0.00 *0 - 0.56*	0.00 *0 - 0.54*	0.00 *0 - 0.21*

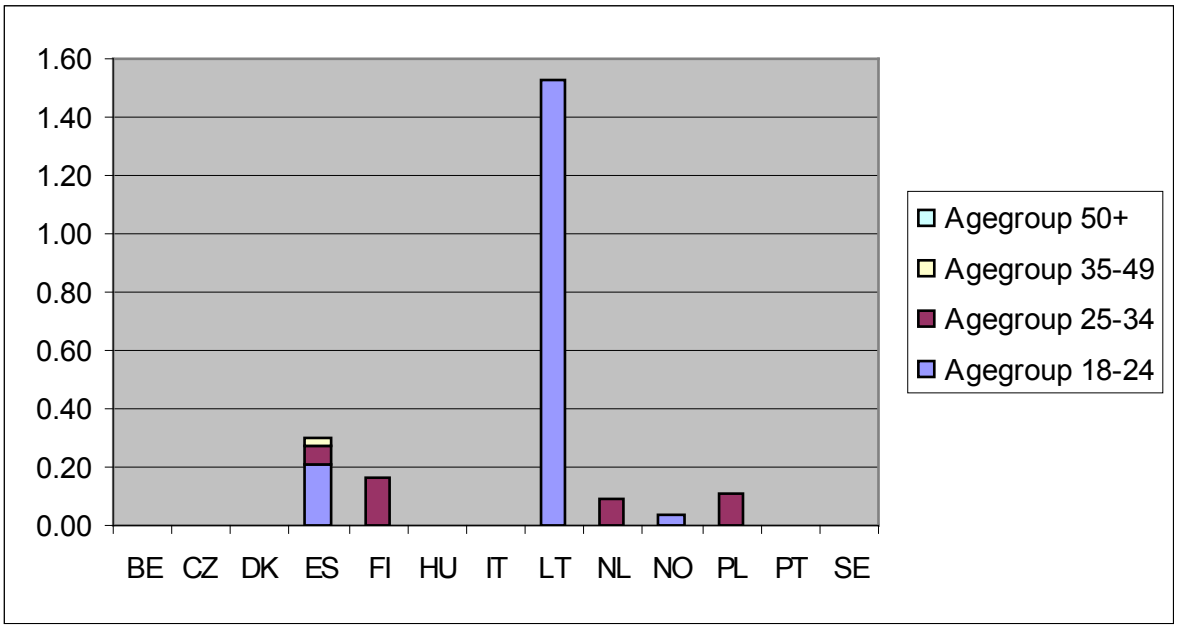

Figure 4.3.2.6. Distribution of the prevalence of amphetamines alone among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.2.3. Amphetamines by time period

Table 4.3.2.5 presents the distribution of amphetamines by time period. The highest prevalence was found in weekends both during day and night time hours.

Table 4.3.2.5. Prevalence of amphetamines alone by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
CZ (n=2037)	0.22 *0.08 - 0.66*	0.00 *0 - 8.62*	0.64 *0.25 - 1.6*	0.62 *0.02 - 16.88*	0.36 *0.17 - 0.72*
DK (n=3002)	0.00 *0 - 0.18*	0.00 *0 - 5.06*	0.07 *0.01 - 0.63*	0.00 *0 - 4.87*	0.02 *0 - 0.16*
ES (n=3174)	0.00 *0 - 0.18*	0.00 *0 - 2.94*	0.38 *0.13 - 1.11*	0.23 *0.02 - 2.8*	0.11 *0.04 - 0.3*
FI (n=3842)	0.00 *0 - 0.15*	0.00 *0 - 2.94*	0.20 *0.05 - 0.7*	0.00 *0 - 4.76*	0.05 *0.02 - 0.19*
LT (n=1267)	0.29 *0.09 - 0.88*	0.00 *0 - 11.28*	0.00 *0 - 1.43*	0.00 *0 - 13.37*	0.22 *0.07 - 0.66*
NL (n=4822)	0.15 *0.07 - 0.35*	0.45 *0.06 - 3.4*	0.22 *0.07 - 0.74*	0.63 *0.1 - 4*	0.19 *0.1 - 0.36*
NO (n=9236)	0.04 *0.01 - 0.13*	0.13 *0.02 - 0.94*	0.02 *0 - 0.21*	0.40 *0.1 - 1.51*	0.06 *0.02 - 0.13*
PL (n=4008)	0.00 *0 - 0.13*	0.29 *0.02 - 4.54*	0.15 *0.03 - 0.67*	0.34 *0.02 - 5.44*	0.05 *0.01 - 0.18*
SE (n=6198)	0.06 *0.02 - 0.19*	0.44 *0.05 - 3.82*	0.06 *0.01 - 0.36*	0.00 *0 - 3.01*	0.07 *0.03 - 0.17*

Figure 4.3.2.7 presents an overview of the distribution of amphetamines by time period. This distribution differs per country. In the Netherlands, Norway and Poland amphetamine is mainly used in night time periods. In Sweden it is detected during night times as well, but only on weekdays. In Denmark and Finland amphetamine use was only detected during weekend days and in Czech Republic and Spain it was detected primarily in the weekend both during the day and during the night. In Lithuania amphetamines were only detected in traffic during weekday hours.

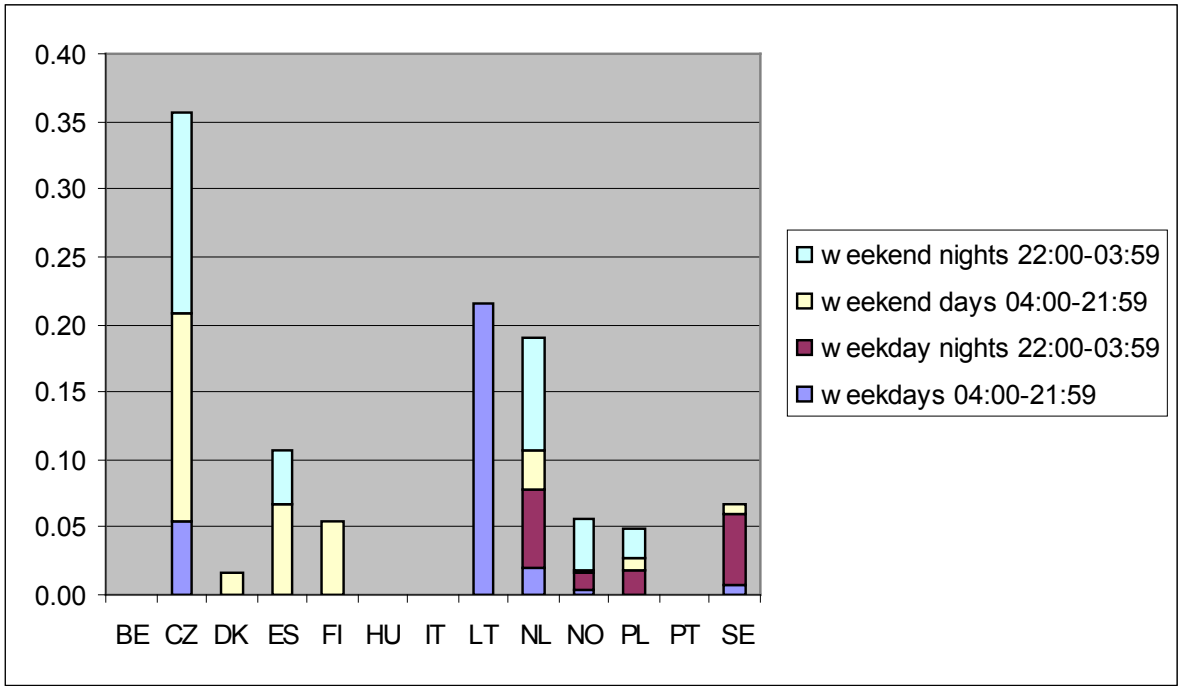

Figure 4.3.2.7. Distribution of the prevalence of amphetamines alone among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

4.3.3 Cocaine

Cocaine is a stimulant drug with a short half life. This means that the effect of cocaine is quite short (in general the effect of a normal dose lasts for half an hour). A user gets more alert and feels less tired. The after effect is the opposite to the initial effect. A driver becomes reckless when under the influence of cocaine. Most negative effects of cocaine on driving behaviour are expected among heavy and chronic users (Kelly et al., 2004; Scheers et al., 2006; Steyvers and Brookhuis, 1996).
The results are presented for single use of cocaine. The combination of cocaine with a substance from another substance group is regarded as combinational use. The share of combinational use in relation to single use is presented in table 4.3.3.1 and figure 4.3.3.2.
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.3.1. General results

The cocaine group includes both drivers with cocaine and with its metabolite benzoylecgonine. Since cocaine has a short halflife both substances are covered by most countries with a zero-tolerance driving legislation.
The cut-off levels for cocaine and benzoylecgonine are presented in table 2.2.

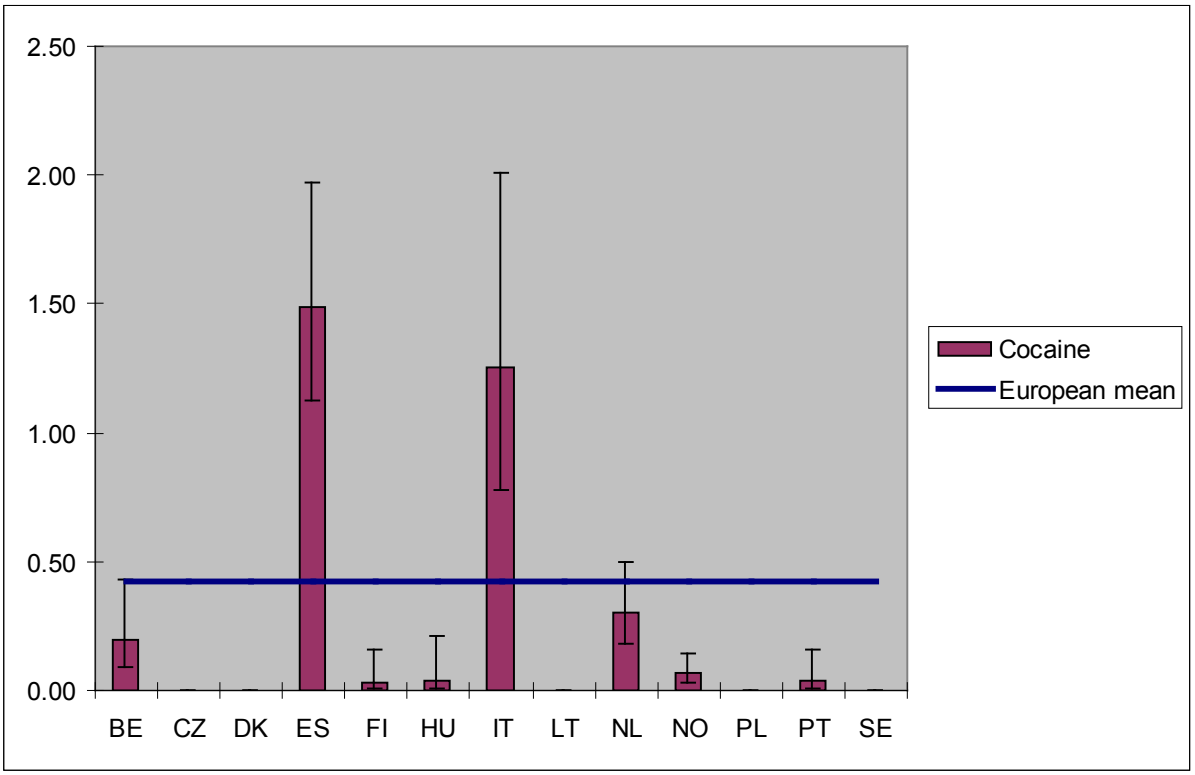

Figure 4.3.3.1. Prevalence of cocaine alone by country; prevalence in percentages

Figure 4.3.3.1 shows that single cocaine use is mainly prevalent among drivers from Spain (1.49%) and Italy (1.25%). No cocaine was detected among drivers in Czech Republic, Denmark, Lithuania, Poland and Sweden. The average prevalence for cocaine in Europe is 0.42%.

Table 4.3.3.1. Prevalence of cocaine alone and cocaine in combination with other psychoactive substances; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
Cocaine alone	0.20	-	-	1.49	0.03	0.04	1.25	-	0.30	0.06	-	0.03	-
Cocaine in combi	0.23	0.05	0.06	1.09	-	-	0.39	-	0.36	0.07	-	0.22	0.01
Total	0.43	0.05	0.06	2.58	0.03	0.04	1.64	-	0.66	0.13	-	0.25	0.01
Share	54%	100%	100%	42%	0%	0%	24%	-	54%	52%	-	87%	100%

Table 4.3.3.1 and figure 4.3.3.2 present an overview of cocaine use in traffic both as a single drug and in combination with other psychoactive substances. When cocaine was used, it was often in combination with other psychoactive substances. On average around half of the times cocaine was detected in combination with other substances. Only in Finland and Hungary cocaine was used solely as a single drug.

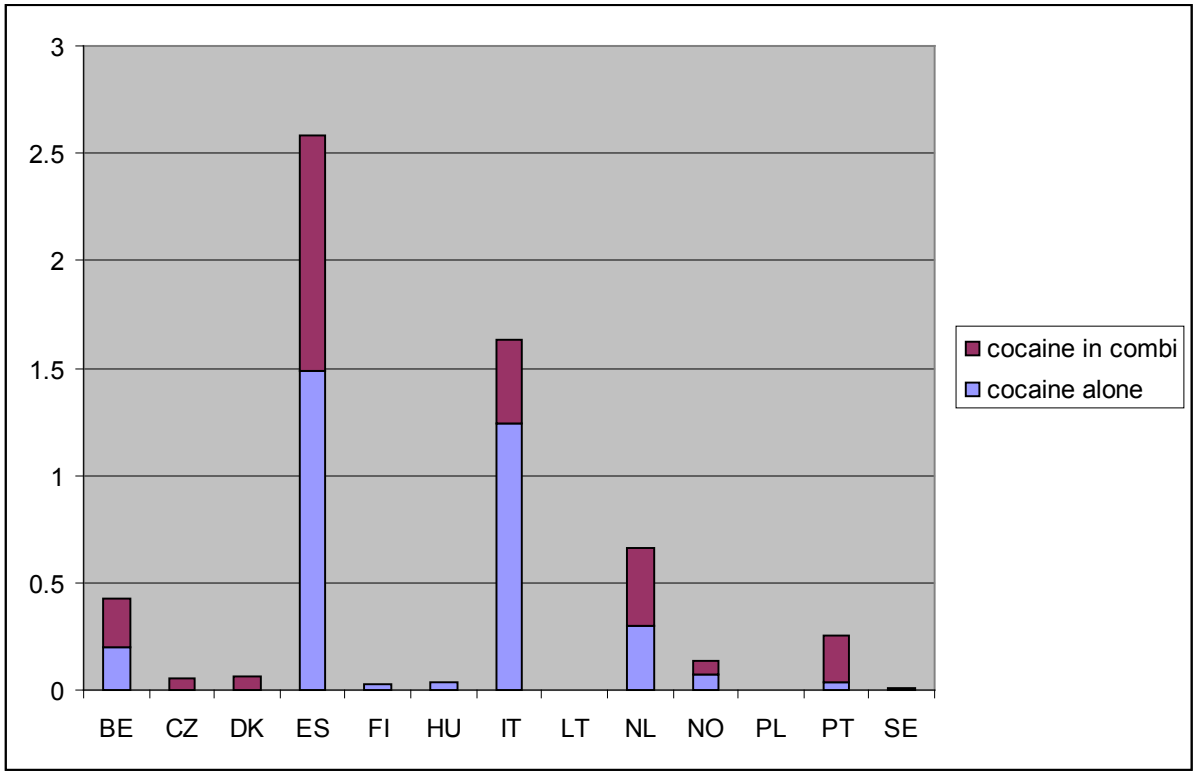

Figure 4.3.3.2. Prevalence of cocaine alone and cocaine in combination with other psychoactive substances; prevalence in percentages

4.3.3.2 Cocaine use by gender and age

Table 4.3.3.2 presents the distribution of cocaine by age group. The highest prevalence was among 25-34 and 35-49 years old drivers from Spain with 2.07% and 1.81%, respectively. Among drivers aged 50+ almost no cocaine use was found.

Table 4.3.3.2. Prevalence of cocaine alone by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE (n=2949)	0.61 *0.16 - 2.33*	0.35 *0.1 - 1.21*	0.10 *0.02 - 0.52*	0.03 *0 - 0.48*	0.20 *0.09 - 0.43*
ES (n=3174)	1.22 *0.6 - 2.48*	2.07 *1.36 - 3.13*	1.81 *1.16 - 2.83*	0.04 *0 - 0.86*	1.49 *1.12 - 1.97*
FI (n=3842)	0.00 *0 - 0.9*	0.00 *0 - 0.52*	0.11 *0.02 - 0.51*	0.00 *0 - 0.26*	0.03 *0.01 - 0.16*
HU (n=2741)	0.00 *0 - 1.49*	0.06 *0.01 - 0.54*	0.05 *0.01 - 0.51*	0.00 *0 - 0.59*	0.04 *0.01 - 0.21*
IT (n=1311)	1.29 *0.5 - 3.25*	0.92 *0.36 - 2.35*	1.67 *0.86 - 3.22*	0.13 *0 - 5.51*	1.25 *0.78 - 2.01*
NL (n=4822)	0.70 *0.26 – 0.81*	0.81 *0.41 - 1.57*	0.16 *0.05 - 0.49*	0.00 *0 - 0.24*	0.30 *0.18 - 0.5*
NO (n=9236)	0.00 *0 - 0.39*	0.10 *0.02 - 0.41*	0.11 *0.04 - 0.29*	0.03 *0 - 0.16*	0.06 *0.03 - 0.14*
PT (n=3965)	0.00 *0 - 0.72*	0.09 *0.02 - 0.48*	0.02 *0 - 0.34*	0.00 *0 - 0.44*	0.03 *0.01 - 0.16*

Figure 4.3.3.3 shows that the use of cocaine as a single substance is the highest in Spain and Italy. In all other countries single cocaine use is very low or even not detected. Almost all single cocaine users were younger than 50.

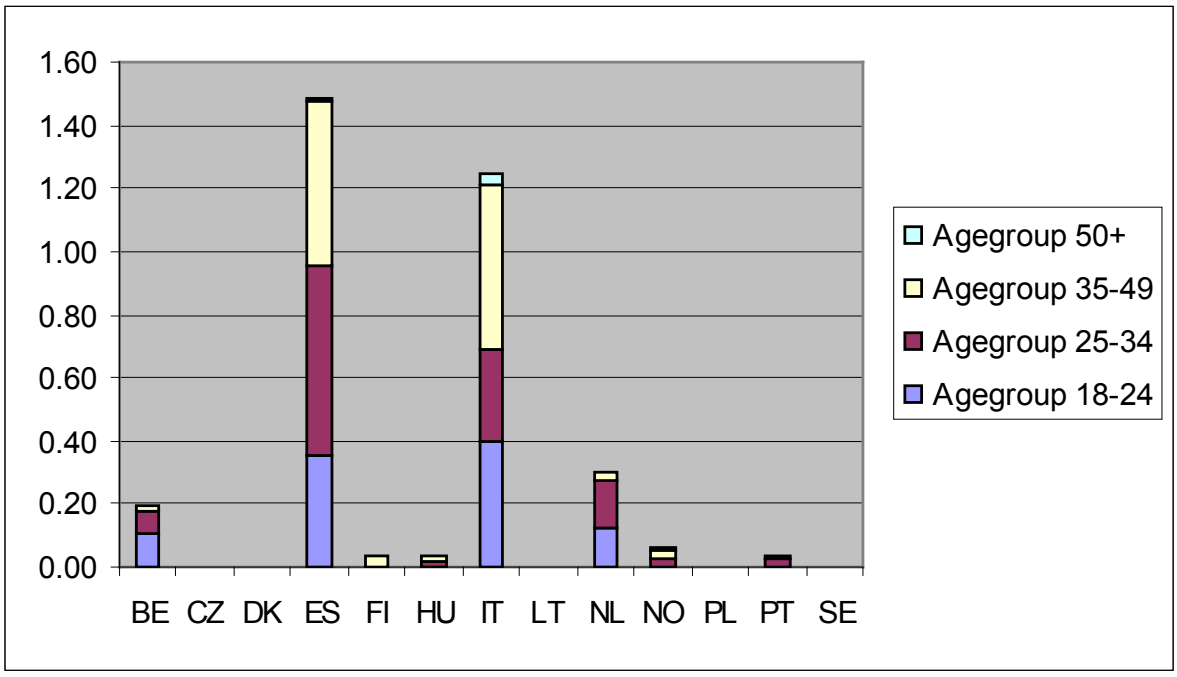

Figure 4.3.3.3. Distribution of the prevalence of cocaine alone among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Figure 4.3.3.4 presents the distribution of cocaine use among drivers by gender. Cocaine is mainly used by male drivers. However, female drivers in Spain have a higher prevalence than most male users from other countries.

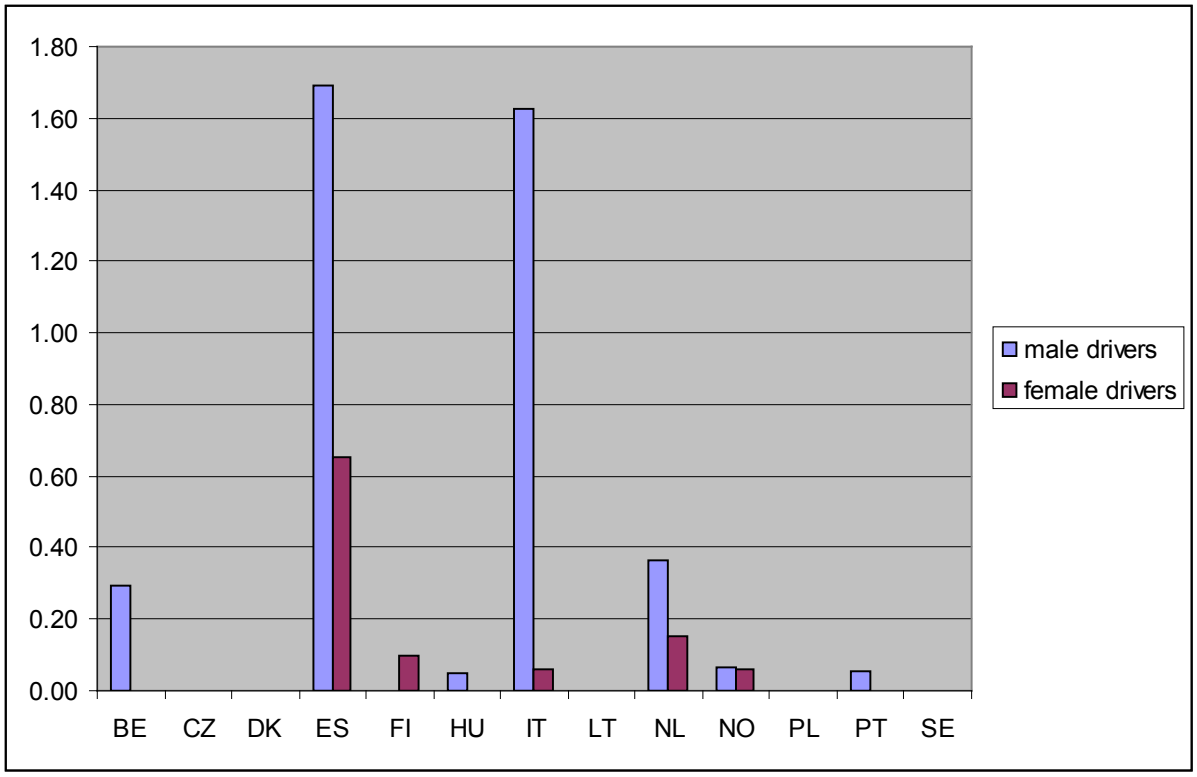

Figure 4.3.3.4. Prevalence of cocaine alone by gender; prevalence in percentages

Table 4.3.3.3 presents the distribution of cocaine by age group among male drivers. The highest prevalence was among 25-34 years old men from Spain with 2.58% and among drivers aged 35-49 in Italy (2.33). Among male drivers aged 50+ almost no cocaine use was detected.

Table 4.3.3.3. Prevalence of cocaine alone among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE (n=1957)	0.97 *0.25 - 3.68*	0.58 *0.17 - 2.02*	0.15 *0.03 - 0.78*	0.04 *0 - 0.66*	0.29 *0.13 - 0.65*
ES (n=2520)	1.49 *0.72 - 3.05*	2.58 *1.69 - 3.92*	1.84 *1.12 - 3.01*	0.05 *0 - 0.99*	1.69 *1.26 - 2.27*
FI (n=2511)	0.00 *0 - 1.35*	0.00 *0 - 0.8*	0.00 *0 - 0.55*	0.00 *0 - 0.35*	0.00 *0 - 0.15*
HU (n=2062)	0.00 *0 - 2.09*	0.08 *0.01 - 0.73*	0.07 *0.01 - 0.68*	0.00 *0 - 0.72*	0.05 *0.01 - 0.28*
IT (n=998)	1.57 *0.61 - 3.99*	1.12 *0.43 - 2.87*	2.33 *1.2 - 4.49*	0.21 *0 - 8.47*	1.62 *1.01 - 2.61*
NL (n=3363)	0.86 *0.29 – 2.49*	0.91 *0.43 - 1.91*	0.23 *0.07 - 0.71*	0.00 *0 - 0.34*	0.36 *0.21 - 0.63*
NO (n=6520)	0.00 *0 - 0.56*	0.15 *0.04 - 0.59*	0.08 *0.02 - 0.32*	0.04 *0.01 - 0.22*	0.07 *0.03 - 0.17*
PT (n=2541)	0.00 *0 - 1.2*	0.15 *0.03 - 0.82*	0.03 *0 - 0.53*	0.00 *0 - 0.54*	0.05 *0.01 - 0.24*

Figure 4.3.3.5 presents the distribution of cocaine use among male drivers by age group. The highest prevalence of single cocaine use was found among male drivers in Spain and Italy. Almost all male drivers who used cocaine were younger than 50.

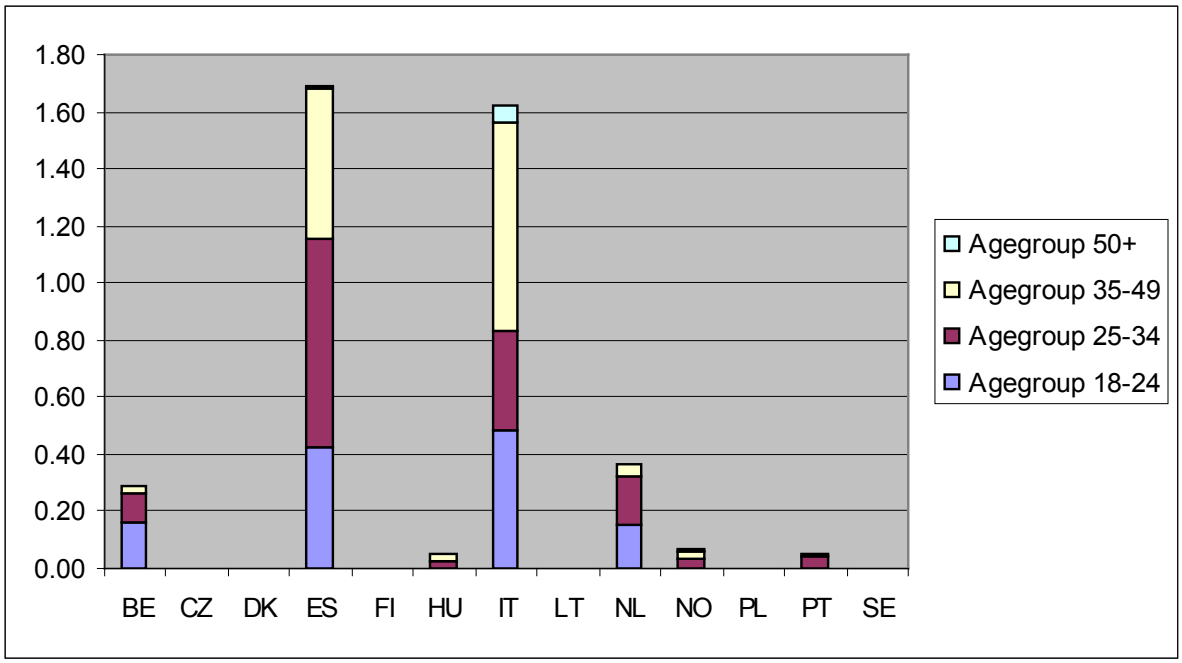

Figure 4.3.3.5. Distribution of the prevalence of cocaine alone among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.3.4 presents an overview of the distribution of cocaine among female drivers by age group. It shows that the highest prevalence of cocaine in traffic among female drivers was in Spain (0.65%). Lower prevalences were found in the Netherlands, Finland, Italy and Norway. In all other countries no cocaine use was detected among female drivers. The highest prevalence was detected among 35-49 year old females in Spain (1.70%). The next two highest prevalence among female drivers were found in the Netherlands among female drivers aged 18-24 (0.34%) and aged 25-34 (0.53%).

Table 4.3.3.4. Prevalence of cocaine alone among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE (n=971)	0.00 *0 - 3.37*	0.00 *0 - 1.52*	0.00 *0 - 1.04*	0.00 *0 - 1.55*	0.00 *0 - 0.39*
ES (n=605)	0.16 *0.01 - 3.45*	0.23 *0.02 - 2.11*	1.70 *0.61 - 4.63*	0.00 *0 - 5.56*	0.65 *0.26 - 1.65*
FI (n=1283)	0.00 *0 - 2.71*	0.00 *0 - 1.44*	0.26 *0.05 - 1.24*	0.00 *0 - 0.96*	0.10 *0.02 - 0.47*
HU (n=679)	0.00 *0 - 4.9*	0.00 *0 - 1.56*	0.00 *0 - 1.56*	0.00 *0 - 3.08*	0.00 *0 - 0.56*
IT (n=313)	0.15 *0 - 6.1*	0.11 *0 - 4.55*	0.00 *0 - 2.65*	0.00 *0 - 13.07*	0.06 *0 - 1.32*
NL (n=1454)	0.34 *0.04 – 3.04*	0.53 *0.12 - 2.25*	0.04 *0 - 0.73*	0.00 *0 - 0.88*	0.15 *0.05 - 0.53*
NO (n=2709)	0.00 *0 - 1.21*	0.00 *0 - 0.75*	0.16 *0.04 - 0.64*	0.00 *0 - 0.45*	0.06 *0.01 - 0.25*
PT (n=1342)	0.00 *0 - 1.79*	0.00 *0 - 0.77*	0.00 *0 - 0.81*	0.00 *0 - 2.21*	0.00 *0 - 0.28*

Figure 4.3.3.6 shows that in Finland, Spain and Norway single cocaine use was mainly detected among female drivers aged 35-49. In the Netherlands and Italy single cocaine use was most prevalent among drivers younger than 35 years. The range of cocaine use among female drivers was between 0 and 0.15% for all countries, except for Spain.

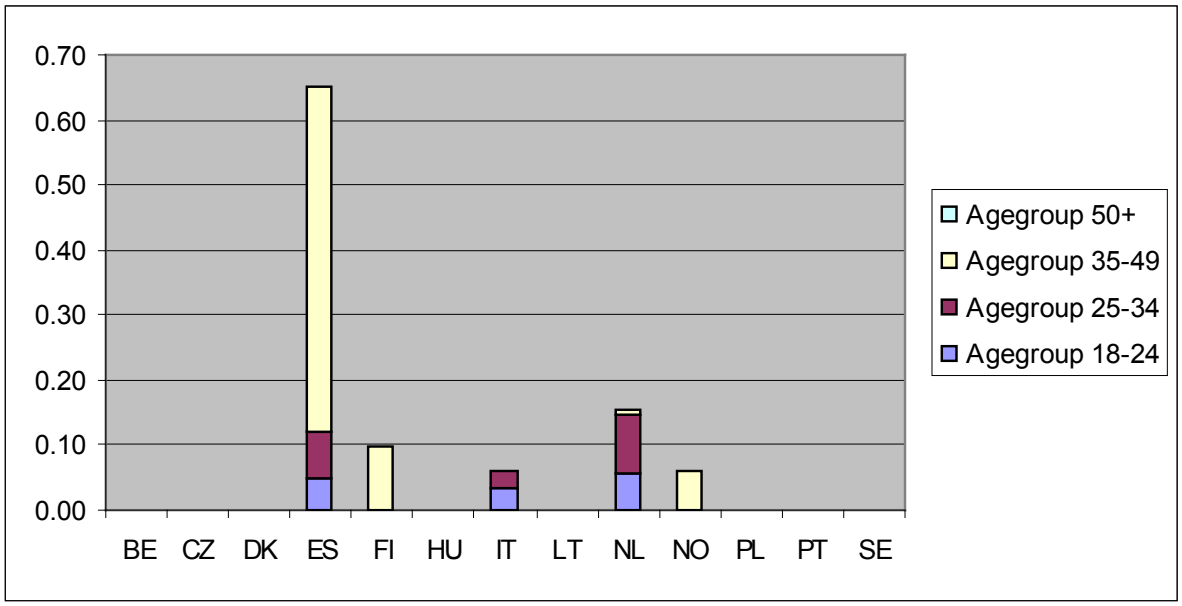

Figure 4.3.3.6. Distribution of the prevalence of cocaine alone among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.3.5 presents the distribution of cocaine by time period. The highest prevalence was during weekday nights (1.97%) and weekend days (1.91%) and weekend nights (2.11) in Spain. In Italy highest prevalence was found during weekdays at daytime (1.63%) and weekends at night time (1.16%).

4.3.3.3. Cocaine use by time period

Table 4.3.3.5. Prevalence of cocaine alone by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE (n=2949)	0.11 *0.03 - 0.37*	1.05 *0.27 - 3.98*	0.23 *0.05 - 0.98*	0.39 *0.03 - 5.59*	0.20 *0.09 - 0.43*
ES (n=3174)	1.25 *0.86 - 1.82*	1.97 *0.61 - 6.15*	1.91 *1.16 - 3.12*	2.11 *0.76 - 5.72*	1.49 *1.12 - 1.97*
FI (n=3842)	0.05 *0.01 - 0.24*	0.00 *0 - 2.94*	0.00 *0 - 0.36*	0.00 *0 - 4.76*	0.03 *0.01 - 0.16*
HU (n=2741)	0.05 *0.01 - 0.29*	0.00 *0 - 5.75*	0.00 *0 - 0.59*	0.00 *0 - 6.88*	0.04 *0.01 - 0.21*
IT (n=1311)	1.63 *1 - 2.65*	0.91 *0.06 - 12.87*	0.14 *0.01 - 1.49*	1.16 *0.08 - 15.31*	1.25 *0.78 - 2.01*
NL (n=4822)	0.25 *0.13 - 0.48*	0.15 *0.01 - 2.87*	0.42 *0.17 - 1.03*	0.95 *0.19 - 4.52*	0.30 *0.18 - 0.5*
NO (n=9236)	0.04 *0.01 - 0.14*	0.27 *0.06 - 1.16*	0.00 *0 - 0.17*	0.40 *0.1 - 1.51*	0.06 *0.03 - 0.14*
PT (n=3965)	0.00 *0 - 0.13*	0.00 *0 - 4.98*	0.12 *0.02 - 0.64*	0.37 *0.02 - 5.56*	0.03 *0.01 - 0.16*

Table 4.3.3.5 and figure 4.3.3.7 indicate that in Finland and Hungary cocaine use in traffic was only detected at weekdays during daytime hours. In Spain it was frequently detected during all time periods. In Italy it was detected frequently in all time periods except in the weekend at daytime hours.

In the Netherlands single cocaine use was primarily detected during weekend nights, while in Belgium it was more often detected during weekday nights.

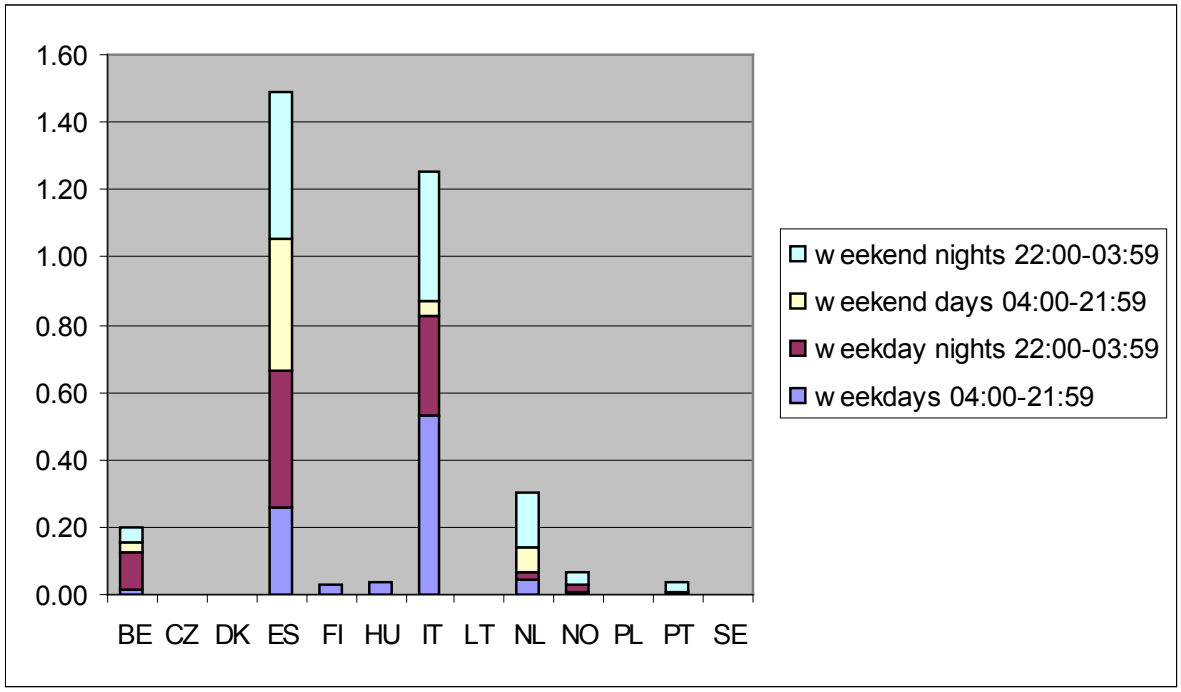

Figure 4.3.3.7. Distribution of the prevalence of cocaine alone among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

4.3.4 THC (cannabis)

THC is the psychoactive component of cannabis. It impairs driving performance in several ways. Even in small amounts tasks like attention, reaction time, and hand-eye coordination are decreased by THC use. Furthermore, it was concluded from driving simulator experiments that various vehicle control tasks were impaired as well. However, THC users seem to be aware of their impairment and try to compensate by driving more slowly and avoiding risky manoeuvres (Kelly et al., 2004; Scheers et al., 2006; Steyvers and Brookhuis, 1996).
The results are presented for single use of THC. The combination of a THC with a substance from another substance group is regarded as combinational use. The share of combinational use in relation to single use is presented in table 4.3.4.1 and figure 4.3.4.2.
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.4.1 General results

The THC substance group is formed by THC only. THC-COOH was detected as well in blood, but this inactive metabolite of THC will be regarded as negative. THC-COOH can not be detected in saliva which was used for analysis in most of the participating countries (see table 3.5). The cut-off values for THC are presented in table 2.2.

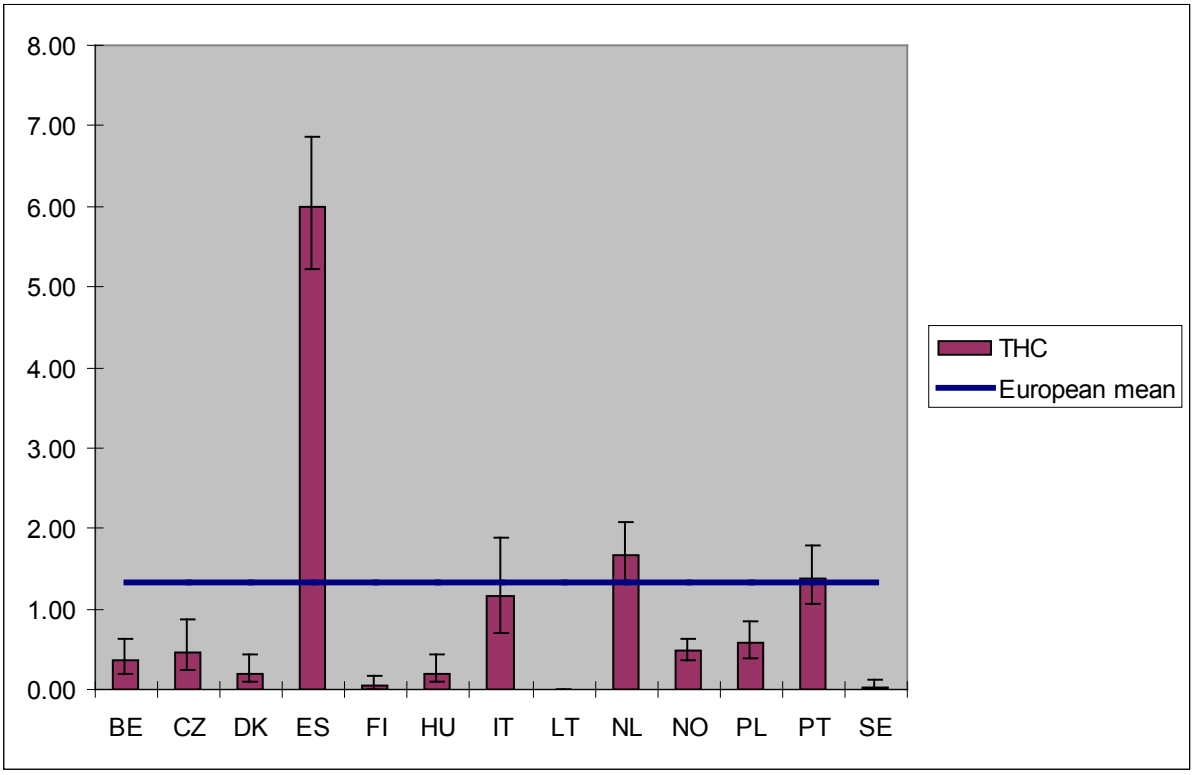

Figure 4.3.4.1. Prevalence of THC alone by country; prevalence in percentages

Figure 4.3.4.1 shows that THC was mainly used in Spain where the prevalence was almost 4 times higher than in that of the second ranked country: The Netherlands. The prevalence of THC in Portuguese traffic was higher than the European mean as well. In Lithuania no THC was detected among drivers. The average prevalence in Europe for THC is 1.32%.

Table 4.3.4.1. Prevalence of THC alone and THC in combination with other psychoactive substances; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
THC alone	0.35	0.46	0.20	5.99	0.04	0.19	1.15	-	1.67	0.48	0.57	1.38	0.03
THC in combi	0.14	0.11	0.11	0.90	-	0.02	0.96	-	0.43	0.16	0.02	0.41	-
Total	0.49	0.57	0.31	6.89	0.04	0.21	2.11	-	2.10	0.64	0.59	1.79	0.03
Share	29%	19%	36%	13%	0%	9%	46%	-	21%	25%	3%	23%	0%

Table 4.3.4.1 and figure 4.3.4.2 show that THC is mainly used alone. On average between 20% and 30% of THC use was in combination with other psychoactive substances. Combinational THC use was the highest in the Southern European countries (Italy, Spain, Portugal) and the Netherlands.

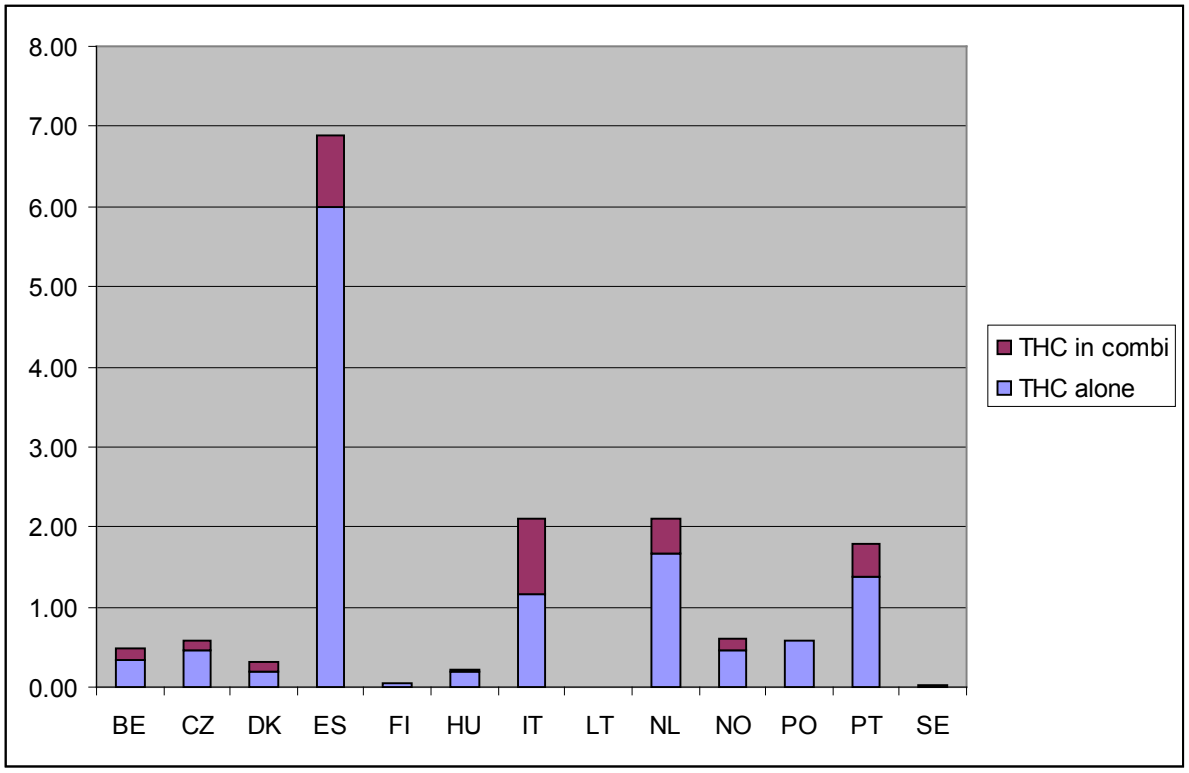

Figure 4.3.4.2. Prevalence of THC alone and THC in combination with other psychoactive substances; prevalence in percentages

4.3.4.2 THC use by gender and age

Table 4.3.4.2 presents the single use of THC in traffic by age group. Prevalence was the highest among young drivers in Spain aged 18-24 and 25-34 with 12.44% and 9.10%, respectively. And among young drivers aged 18-24 in the Netherlands (4.49%).

Table 4.3.4.2. Prevalence of THC alone by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE	2.55	0.38	0.04	0.00	0.35
(n=2949)	*1.27 - 5.04*	*0.11 - 1.26*	*0 - 0.43*	*0 - 0.42*	*0.19 - 0.64*
CZ	1.84	0.71	0.14	0.00	0.46
(n=2037)	*0.75 - 4.44*	*0.28 - 1.83*	*0.02 - 0.78*	*0 - 0.74*	*0.25 - 0.86*
DK	0.75	0.61	0.13	0.00	0.20
(n=3002)	*0.18 - 3*	*0.21 - 1.79*	*0.03 - 0.58*	*0 - 0.32*	*0.09 - 0.43*
ES	12.44	9.10	1.93	0.04	5.99
(n=3174)	*10.01 - 15.37*	*7.5 - 11.01*	*1.25 - 2.97*	*0 - 0.86*	*5.22 - 6.87*
FI	0.11	0.00	0.00	0.08	0.04
(n=3842)	*0.01 - 1.11*	*0 - 0.52*	*0 - 0.32*	*0.02 - 0.4*	*0.01 - 0.17*
HU	0.41	0.36	0.11	0.00	0.19
(n=2741)	*0.08 - 2.22*	*0.13 - 1.02*	*0.02 - 0.61*	*0 - 0.59*	*0.08 - 0.44*
IT	0.57	0.91	1.89	0.00	1.15
(n=1311)	*0.15 - 2.19*	*0.35 - 2.33*	*1.01 - 3.5*	*0 - 5.26*	*0.7 - 1.89*
NL	4.49	2.22	1.62	0.45	1.67
(n=4822)	*3 - 6.66*	*1.48 - 3.33*	*1.12 - 2.33*	*0.22 - 0.93*	*1.34 - 2.07*
NO	1.15	1.06	0.34	0.12	0.48
(n=9236)	*0.65 - 2.03*	*0.66 - 1.67*	*0.19 - 0.61*	*0.05 - 0.31*	*0.36 - 0.64*
PL	1.52	0.85	0.18	0.00	0.57
(n=4008)	*0.81 - 2.86*	*0.48 - 1.5*	*0.05 - 0.62*	*0 - 0.45*	*0.38 - 0.85*
PT	1.36	2.72	0.65	0.54	1.38
(n=3965)	*0.67 - 2.75*	*1.94 - 3.8*	*0.34 - 1.26*	*0.22 - 1.28*	*1.07 - 1.8*
SE	0.00	0.14	0.03	0.00	0.03
(n=6198)	*0 - 0.78*	*0.03 - 0.67*	*0 - 0.25*	*0 - 0.14*	*0.01 - 0.12*

Figure 4.3.4.3 shows that most drivers that were screened positive for THC were younger than 35 years in all countries.

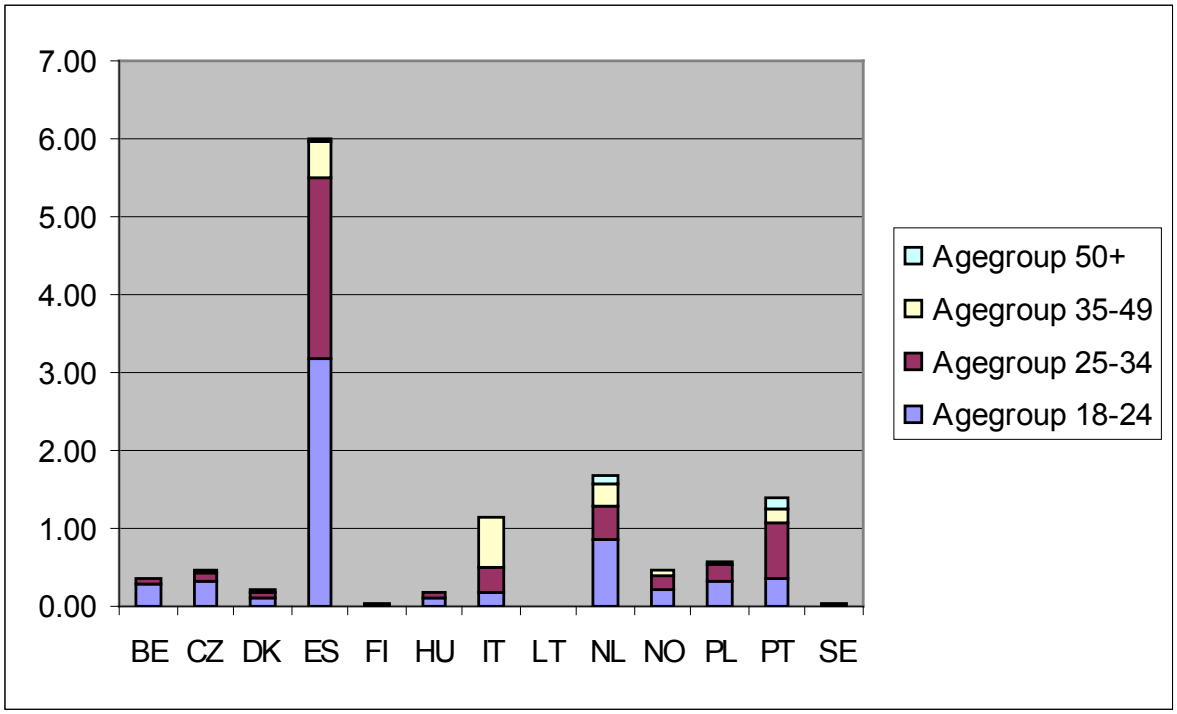

Figure 4.3.4.3. Distribution of the prevalence of THC alone among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Figure 4.3.4.4 shows that THC is predominantly used by male drivers. Only in Italy the prevalence of THC is more or less the same for male and female users. Among male drivers single THC use was detected mainly among Spanish drivers, followed by male drivers from Portugal, the Netherlands and Italy.

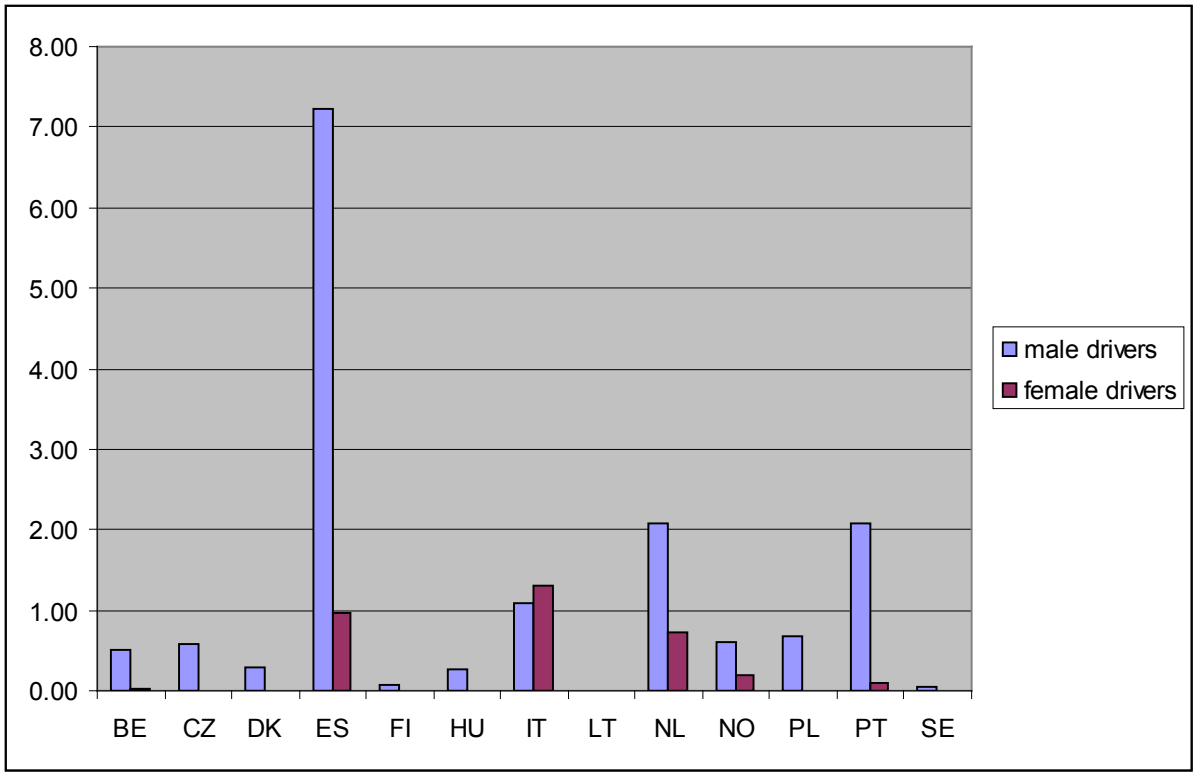

Figure 4.3.4.4. Prevalence of THC by gender; prevalence in percentages

Table 4.3.4.3 provides an overview of the use of THC by male drivers. Prevalence was the highest among young male drivers in Spain aged 18-24 and 25-34 with 14.93% and 11.27%, respectively, and among young male drivers aged 18-24 in the Netherlands (5.75%).

Table 4.3.4.3. Prevalence of THC alone among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE	3.91	0.64	0.06	0.00	0.51
(n=1957)	*1.93 - 7.76*	*0.19 - 2.11*	*0.01 - 0.64*	*0 - 0.57*	*0.28 - 0.93*
CZ	2.84	0.94	0.18	0.00	0.59
(n=1589)	*1.16 - 6.78*	*0.37 - 2.42*	*0.03 - 1*	*0 - 0.84*	*0.32 - 1.1*
DK	1.13	0.96	0.20	0.00	0.30
(n=1975)	*0.28 - 4.5*	*0.32 - 2.79*	*0.04 - 0.93*	*0 - 0.45*	*0.14 - 0.66*
ES	14.93	11.27	2.39	0.05	7.22
(n=2520)	*11.99 - 18.45*	*9.27 - 13.64*	*1.54 - 3.67*	*0 - 0.99*	*6.28 - 8.29*
FI	0.16	0.00	0.00	0.11	0.06
(n=2511)	*0.02 - 1.65*	*0 - 0.8*	*0 - 0.55*	*0.02 - 0.55*	*0.02 - 0.26*
HU	0.58	0.49	0.15	0.00	0.26
(n=2062)	*0.11 - 3.13*	*0.17 - 1.39*	*0.03 - 0.82*	*0 - 0.72*	*0.11 - 0.59*
IT	0.04	0.44	2.62	0.00	1.10
(n=998)	*0 - 1.58*	*0.1 - 1.86*	*1.4 - 4.86*	*0 - 8.08*	*0.61 - 1.96*
NL	5.75	2.51	2.12	0.63	2.08
(n=3363)	*3.76 - 8.69*	*1.6 - 3.91*	*1.43 - 3.13*	*0.31 - 1.28*	*1.65 - 2.62*
NO	1.54	1.34	0.41	0.16	0.59
(n=6520)	*0.85 - 2.78*	*0.81 - 2.18*	*0.22 - 0.78*	*0.06 - 0.42*	*0.43 - 0.81*
PL	1.85	1.05	0.23	0.00	0.68
(n=3331)	*0.98 - 3.46*	*0.59 - 1.84*	*0.07 - 0.78*	*0 - 0.5*	*0.46 - 1.03*
PT	2.23	4.50	1.03	0.67	2.08
(n=2541)	*1.09 - 4.52*	*3.2 - 6.29*	*0.53 - 1.98*	*0.28 - 1.59*	*1.6 - 2.71*
SE	0.00	0.21	0.04	0.00	0.04
(n=4352)	*0 - 1.12*	*0.05 - 0.99*	*0 - 0.38*	*0 - 0.18*	*0.01 - 0.16*

Figure 4.3.4.5 shows that in most countries THC positive male drivers were younger than 35 years old. However, in Italy the larger part of the male drivers positive for THC was aged 35-49.

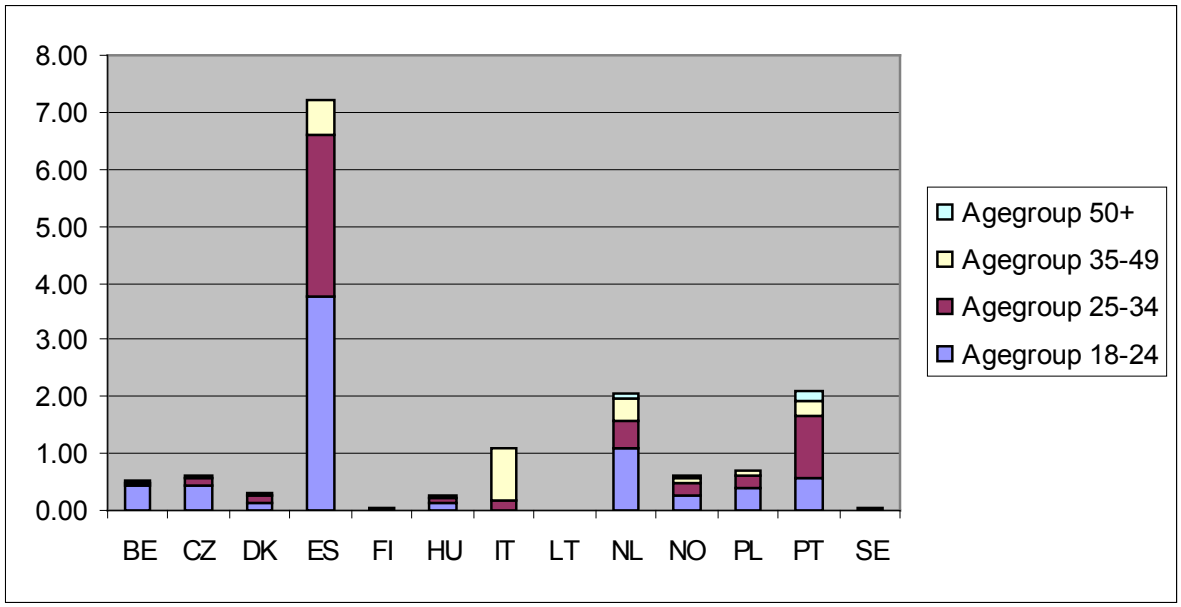

Figure 4.3.4.5. Distribution of the prevalence of THC alone among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.4.4 presents the use of THC by female drivers. Prevalence was the highest among young female drivers in Italy aged 18-24 and 25-34 with 2.71% and 2.83%, respectively. And among young female drivers aged 18-24 in Spain (2.58%).

Table 4.3.4.4. Prevalence of THC alone among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE	0.26	0.00	0.00	0.00	0.03
(n=971)	*0.02 - 3.86*	*0 - 1.52*	*0 - 1.04*	*0 - 1.55*	*0 - 0.45*
CZ	0.00	0.00	0.00	0.00	0.00
(n=448)	*0 - 4.32*	*0 - 2.73*	*0 - 2.31*	*0 - 5.68*	*0 - 0.85*
DK	0.00	0.00	0.00	0.00	0.00
(n=1015)	*0 - 4.97*	*0 - 2.15*	*0 - 0.94*	*0 - 1.05*	*0 - 0.38*
ES	2.58	1.31	0.00	0.00	0.96
(n=605)	*0.89 - 7.27*	*0.44 - 3.81*	*0 - 1.91*	*0 - 5.56*	*0.44 - 2.08*
FI	0.00	0.00	0.00	0.00	0.00
(n=1283)	*0 - 2.71*	*0 - 1.44*	*0 - 0.78*	*0 - 0.96*	*0 - 0.3*
HU	0.00	0.00	0.00	0.00	0.00
(n=679)	*0 - 4.9*	*0 - 1.56*	*0 - 1.56*	*0 - 3.08*	*0 - 0.56*
IT	2.71	2.83	0.03	0.00	1.32
(n=313)	*0.67 - 10.25*	*0.86 - 8.9*	*0 - 2.72*	*0 - 13.07*	*0.52 - 3.29*
NL	1.61	1.51	0.62	0.00	0.71
(n=1454)	*0.5 - 5.07*	*0.61 - 3.69*	*0.23 - 1.66*	*0 - 0.88*	*0.39 - 1.3*
NO	0.32	0.43	0.20	0.00	0.19
(n=2709)	*0.06 - 1.78*	*0.12 - 1.47*	*0.06 - 0.71*	*0 - 0.45*	*0.08 - 0.44*
PL	0.00	0.00	0.00	0.00	0.00
(n=672)	*0 - 3.51*	*0 - 1.51*	*0 - 1.57*	*0 - 4.88*	*0 - 0.57*
PT	0.09	0.24	0.00	0.00	0.10
(n=1342)	*0 - 1.96*	*0.05 - 1.21*	*0 - 0.81*	*0 - 2.21*	*0.02 - 0.46*
SE	0.00	0.00	0.00	0.00	0.00
(n=1835)	*0 - 2.57*	*0 - 1.24*	*0 – 0.56*	*0 – 0.54*	*0 - 0.21*

Figure 4.3.4.6 shows THC use is strongly concentrated among female drivers younger than 35 years. Only in the Netherlands and Norway a small share of THC positive drivers was 35 years or older. THC was not detected among female drivers in Czech Republic, Denmark, Finland, Hungary, Lithuania, Poland and Sweden.

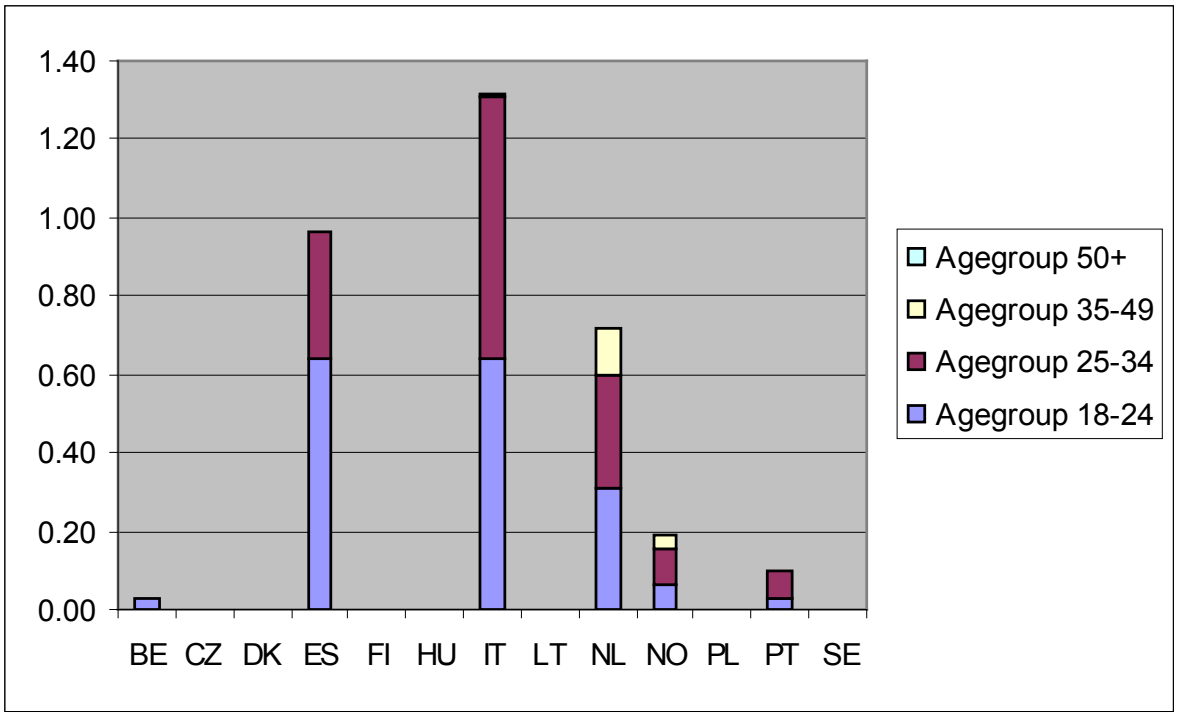

Figure 4.3.4.6. Distribution of the prevalence of THC alone among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.4.3. THC use by time period

Table 4.3.4.5 gives an overview of the use of THC by time period. Prevalence was the highest during all time periods in Spain, during weekend days in Italy and during week and weekend nights in the Netherlands.

Table 4.3.4.5. Prevalence of THC alone by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE (n=2949)	0.20 *0.08 - 0.51*	0.00 *0 - 2.2*	0.76 *0.33 - 1.76*	1.54 *0.3 - 7.51*	0.35 *0.19 - 0.64*
CZ (n=2037)	0.43 *0.19 - 0.95*	0.00 *0 - 8.62*	0.51 *0.18 - 1.42*	1.85 *0.15 - 18.82*	0.46 *0.25 - 0.86*
DK (n=3002)	0.24 *0.1 - 0.56*	0.00 *0 - 5.06*	0.00 *0 - 0.51*	1.22 *0.2 - 6.99*	0.20 *0.09 - 0.43*
ES (n=3174)	5.97 *5.04 - 7.07*	7.24 *3.88 - 13.11*	5.96 *4.52 - 7.83*	5.39 *2.81 - 10.07*	5.99 *5.22 - 6.87*
FI (n=3842)	0.05 *0.01 - 0.23*	0.36 *0.03 - 3.6*	0.00 *0 - 0.36*	0.00 *0 - 4.76*	0.04 *0.01 - 0.17*
HU (n=2741)	0.11 *0.03 - 0.38*	0.00 *0 - 5.75*	0.48 *0.17 - 1.38*	0.00 *0 - 6.88*	0.19 *0.08 - 0.44*
IT (n=1311)	0.00 *0 - 0.41*	0.30 *0.01 - 11.84*	4.72 *2.86 - 7.67*	1.16 *0.08 - 15.31*	1.15 *0.7 - 1.89*
NL (n=4822)	1.44 *1.1 - 1.89*	3.26 *1.37 - 7.58*	2.04 *1.34 - 3.09*	2.85 *1.08 - 7.32*	1.67 *1.34 - 2.07*
NO (n=9236)	0.39 *0.26 - 0.58*	0.80 *0.33 - 1.96*	0.45 *0.25 - 0.83*	1.39 *0.65 - 2.92*	0.48 *0.36 - 0.64*
PL (n=4008)	0.52 *0.31 - 0.85*	0.86 *0.13 - 5.53*	0.61 *0.28 - 1.34*	1.54 *0.3 - 7.44*	0.57 *0.38 - 0.85*
PT (n=3965)	1.44 *1.07 - 1.94*	2.42 *0.62 - 8.96*	0.96 *0.5 - 1.84*	3.25 *1 - 10.08*	1.38 *1.07 - 1.8*
SE (n=6198)	0.01 *0 - 0.11*	0.44 *0.05 - 3.82*	0.06 *0.01 - 0.36*	0.00 *0 - 3.01*	0.03 *0.01 - 0.12*

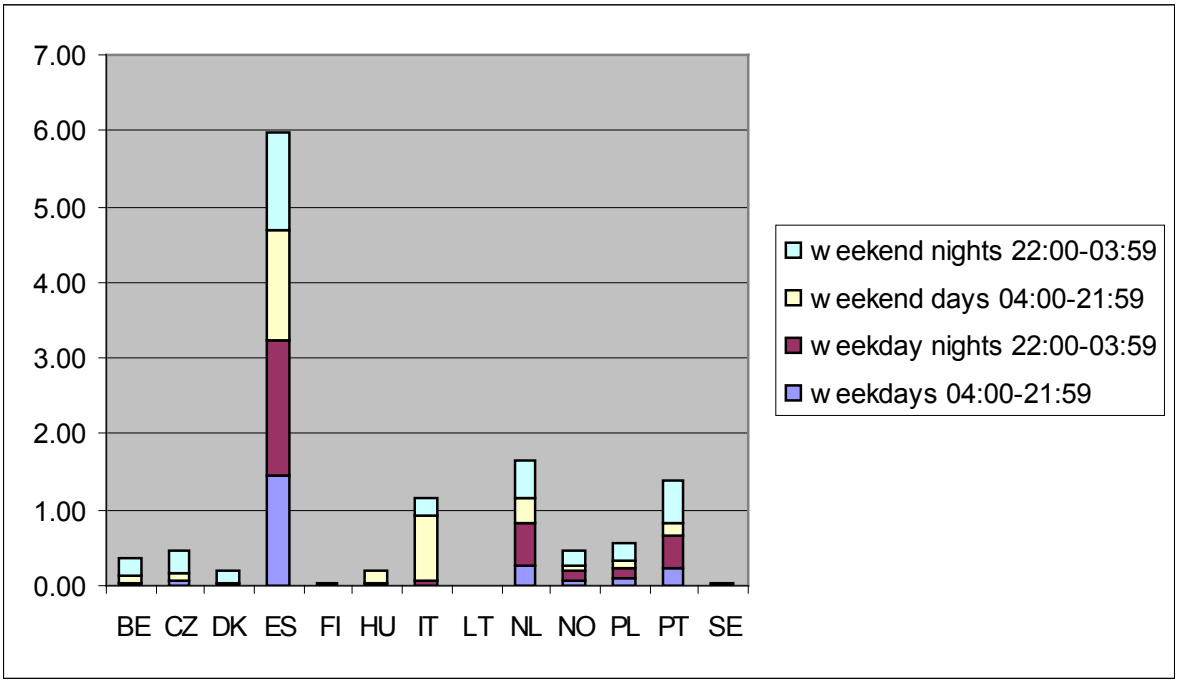

Figure 4.3.4.7. Distribution of the prevalence of THC alone among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

Figure 4.3.4.7 shows that THC is prevalent at all days of the week during all hours of the week in most countries. However, in Belgium, Czech Republic, Denmark, Italy and Hungary, single THC use was mainly detected during the weekend.

4.3.5 Illicit opiates

Illicit opiates are depressants. A user has in general feelings of sleepiness, drowsiness or calmness and has lower sense of pain. Opiates are also used as analgesics. The depressant effect of opiates is most of the time that heavy that drivers don't feel able or motivated to drive a vehicle. The effects of illicit opiates vary per type of substance, route of administration and tolerance (Kelly et al., 2004; Scheers et al., 2006; Steyvers and Brookhuis, 1996).
The results of the roadside surveys are presented for single use of illicit opiates. The combination of an illicit opiate with a substance from another substance group is regarded as combinational use. The share of combinational use in relation to single use is presented in table 4.3.5.1 and figure 4.3.5.2.

The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.5.1. General results

The illicit opiates group includes drivers that were positive for heroin (6-acetylmorphine) or the combination of morphine and codeine where the concentration of morphine is equal to or higher than the concentration of codeine. If the concentration of codeine is higher than that of morphine, the use was regarded as medicinal opiates and opioids use. The cut-off levels for heroin, morphine and codeine are presented in table 2.2.

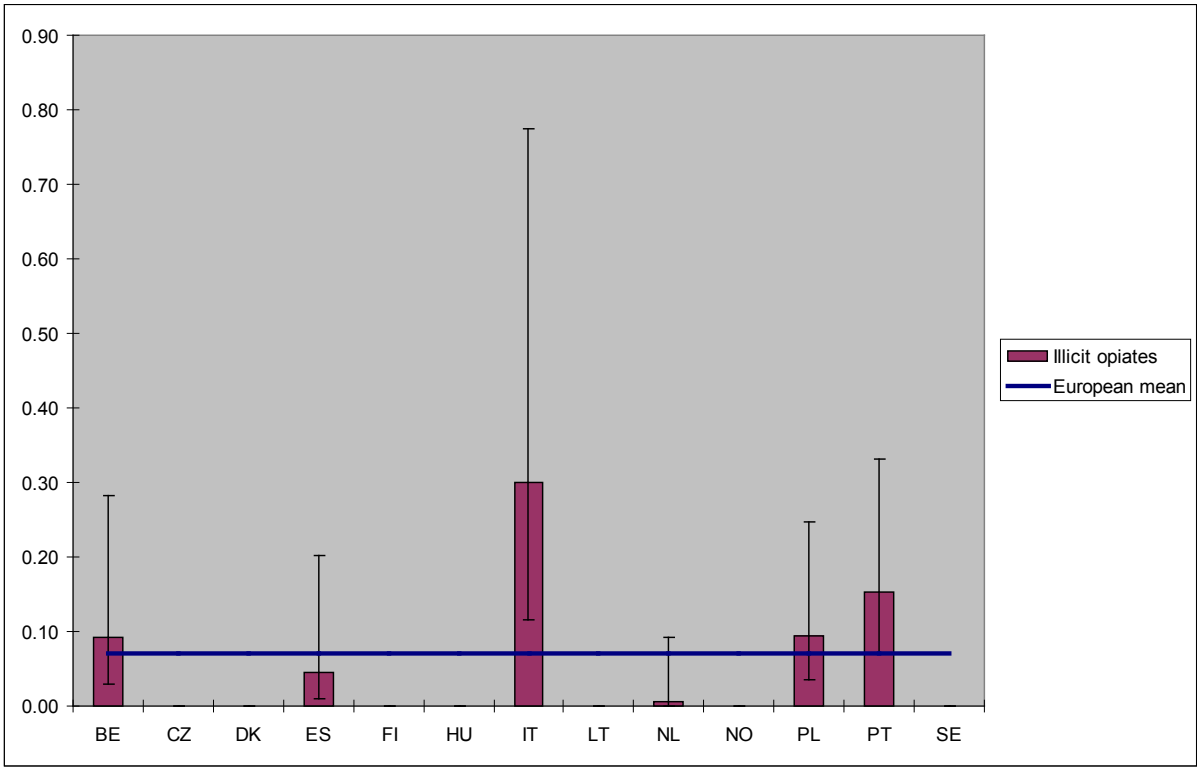

Figure 4.3.5.1. Prevalence of illicit opiates alone by country; prevalence in percentages

Figure 4.3.5.1 shows that illicit opiates are barely prevalent in European traffic. Italy has the highest share with 0.3%. In the Northern European counties no illicit opiates were detected among drivers. In the Eastern European countries they were only detected in Poland. The average prevalence for illicit opiates in Europe is 0.07%.

Table 4.3.5.1. Prevalence of illicit opiates alone and illicit opiates in combination with other psychoactive substances; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
Illicit opiates alone	0.09	-	-	0.05	-	-	0.30	-	0.01	-	0.09	0.15	-
Illicit opiates in combi	0.07	-	-	0.21	-	-	0.71	-	-	-	-	0.03	-
Total	0.16	-	-	0.26	-	-	1.01	-	0.01	-	0.09	0.18	-
Share	43%	-	-	82%	-	-	70%	-	0%	-	0%	16%	-

Table 4.3.5.1 and figure 4.3.5.2 show that Illicit opiates were relatively frequently used in combination with other psychoactive substances in Belgium, Spain and Italy. In Portugal around 1 in 6 illicit opiate users combined it with other substances. Illicit opiates use was not detected among drivers from Northern European countries (Denmark, Finland, Norway and Sweden) and from Czech Republic, Lithuania, and Hungary.

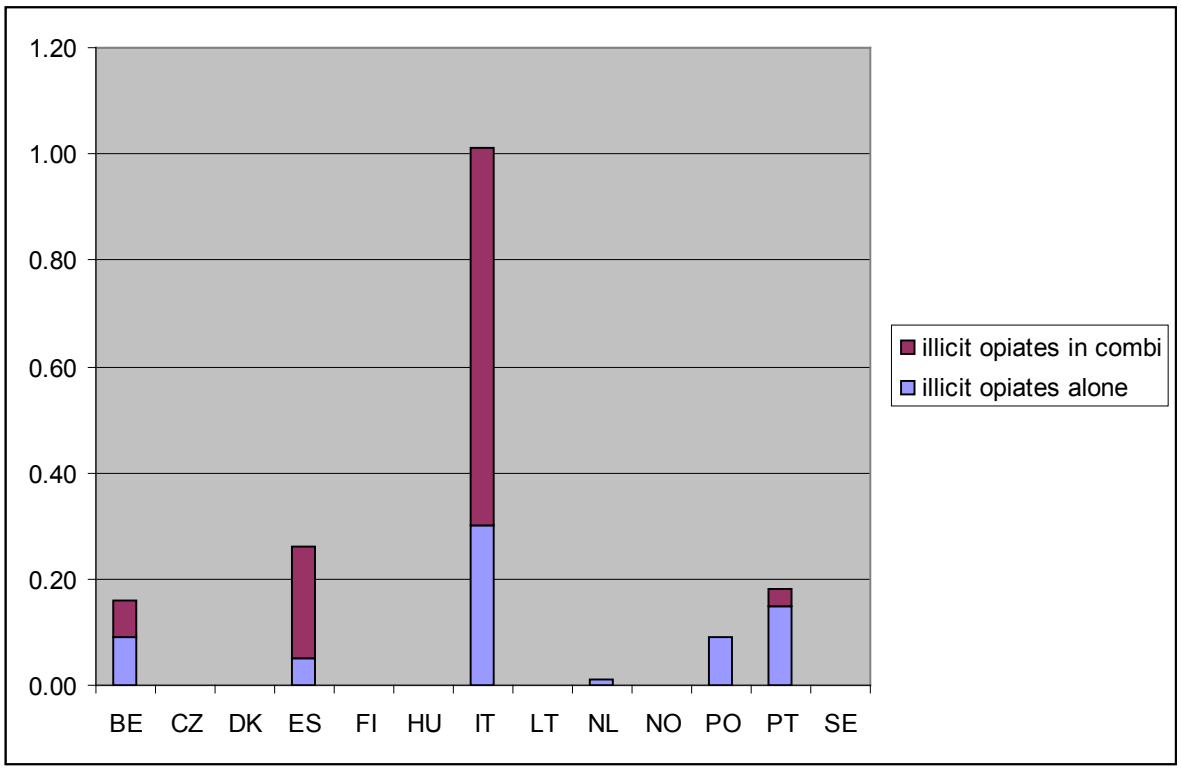

Figure 4.3.5.2. Prevalence of illicit opiates alone and illicit opiates in combination with other psychoactive substances; prevalence in percentages

4.3.5.2. Illicit opiates use by gender and age

Table 4.3.5.2 gives an overview of the prevalence of illicit opiates by age group. In general the prevalence is very low. Only Italian drivers aged 35-49 have a prevalence higher than 0.5%, namely 0.77%. Furthermore, in Belgium young drivers aged 18-24, have a prevalence of 0.40%.

Table 4.3.5.2. Prevalence of illicit opiates alone by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE	0.40	0.17	0.04	0.00	0.09
(n=2949)	*0.08 - 1.99*	*0.03 - 0.93*	*0 - 0.43*	*0 - 0.42*	*0.03 - 0.28*
ES	0.03	0.00	0.12	0.00	0.05
(n=3174)	*0 - 0.71*	*0 - 0.37*	*0.03 - 0.59*	*0 - 0.78*	*0.01 - 0.2*
IT	0.03	0.00	0.77	0.00	0.30
(n=1311)	*0 - 1.27*	*0 - 0.88*	*0.3 - 2.01*	*0 - 5.26*	*0.12 - 0.78*
NL	0.00	0.03	0.00	0.00	0.01
(n=4822)	*0 - 0.75*	*0 - 0.44*	*0 - 0.22*	*0 - 0.24*	*0 - 0.09*
PL	0.00	0.09	0.20	0.00	0.09
(n=4008)	*0 - 0.64*	*0.02 - 0.45*	*0.06 - 0.66*	*0 - 0.45*	*0.04 - 0.25*
PT	0.00	0.21	0.25	0.00	0.15
(n=3965)	*0 - 0.72*	*0.07 - 0.68*	*0.09 - 0.71*	*0 - 0.44*	*0.07 - 0.33*

Figure 4.3.5.3 shows that most users are between 35 and 49 years old, except for Belgium where most users were younger than 25.

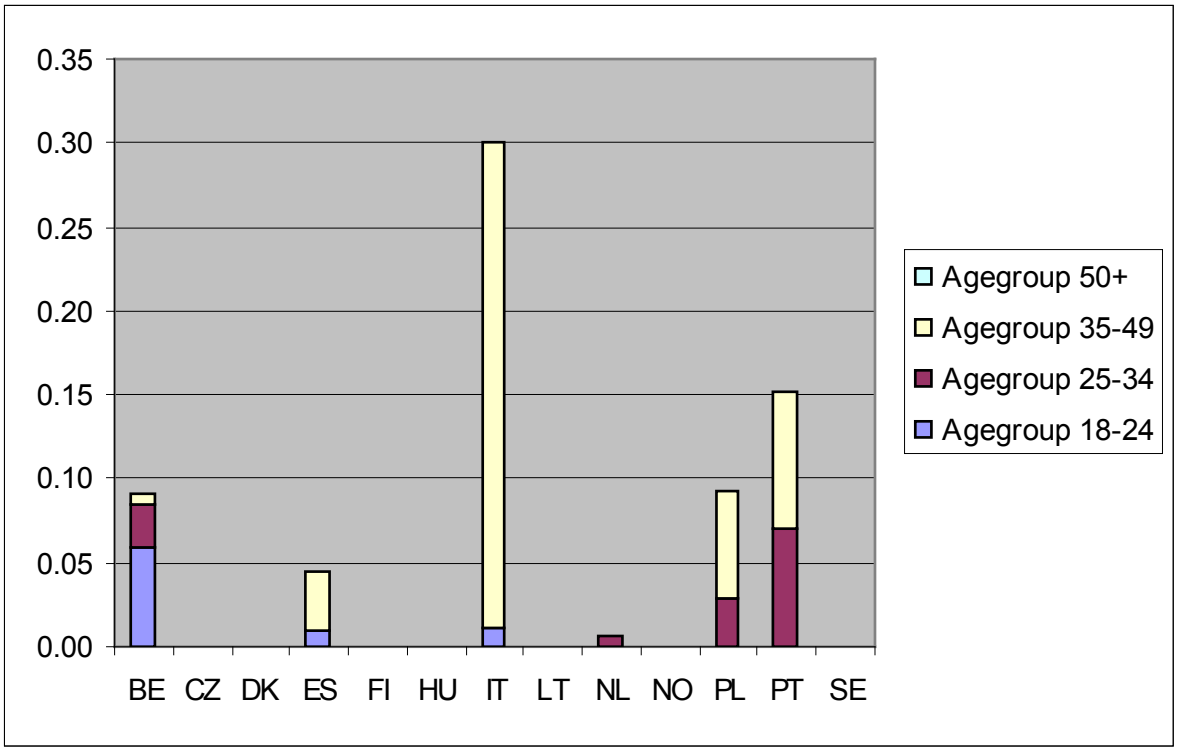

Figure 4.3.5.3. Distribution of the prevalence of illicit opiates alone among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Figure 4.3.5.4 provides an overview of the prevalence of illicit opiates by gender. It is clearly shown that illicit opiates are mainly used by male drivers.

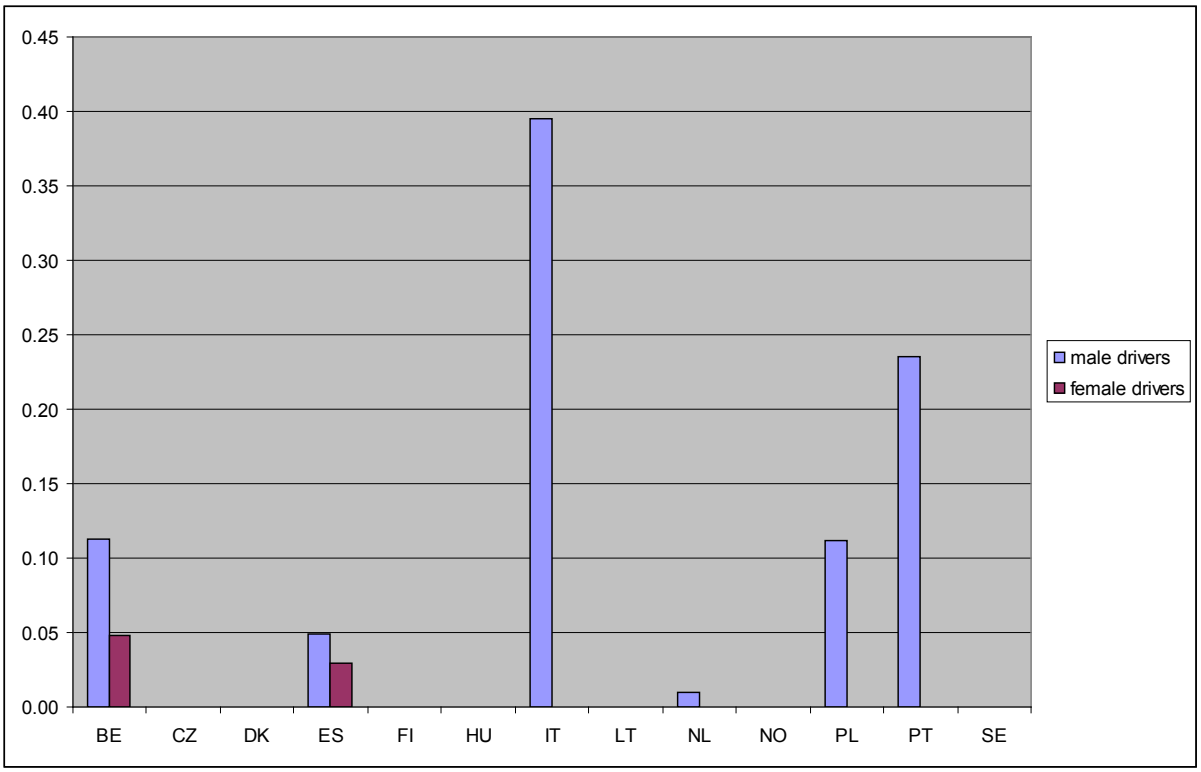

Figure 4.3.5.4. Prevalence of illicit opiates alone by gender; prevalence in percentages

Table 4.3.5.3 presents the use of illicit opiates among male drivers. The prevalence of Illicit opiates was very low or even absent among male drivers. Italy had the highest prevalence with almost 0.4% of the male drivers, followed by Portugal, Poland and Belgium.

Table 4.3.5.3. Prevalence of illicit opiates alone among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE (n=1957)	0.63 *0.12 - 3.15*	0.29 *0.05 - 1.55*	0.00 *0 - 0.52*	0.00 *0 - 0.57*	0.11 *0.03 - 0.39*
ES (n=2520)	0.00 *0 - 0.82*	0.00 *0 - 0.47*	0.15 *0.03 - 0.74*	0.00 *0 - 0.9*	0.05 *0.01 - 0.24*
IT (n=998)	0.04 *0 - 1.58*	0.00 *0 - 1.09*	1.08 *0.41 - 2.8*	0.00 *0 - 8.08*	0.39 *0.15 - 1.02*
NL (n=3363)	0.00 *0 - 1.08*	0.05 *0 - 0.61*	0.00 *0 - 0.33*	0.00 *0 - 0.34*	0.01 *0 - 0.13*
PL (n=3331)	0.00 *0 - 0.77*	0.11 *0.02 - 0.56*	0.25 *0.08 - 0.82*	0.00 *0 - 0.5*	0.11 *0.04 - 0.3*
PT (n=2541)	0.00 *0 - 1.2*	0.36 *0.11 - 1.15*	0.39 *0.14 - 1.11*	0.00 *0 - 0.54*	0.23 *0.11 - 0.51*

Figure 4.3.5.5 shows that most male drivers who used illicit opiates were 35-49 years old, except for Belgium and the Netherlands where all male drivers positive for illicit opiates as a single drug were younger than 35 years. In Portugal illicit opiates in traffic were used by male drivers aged 25-49.

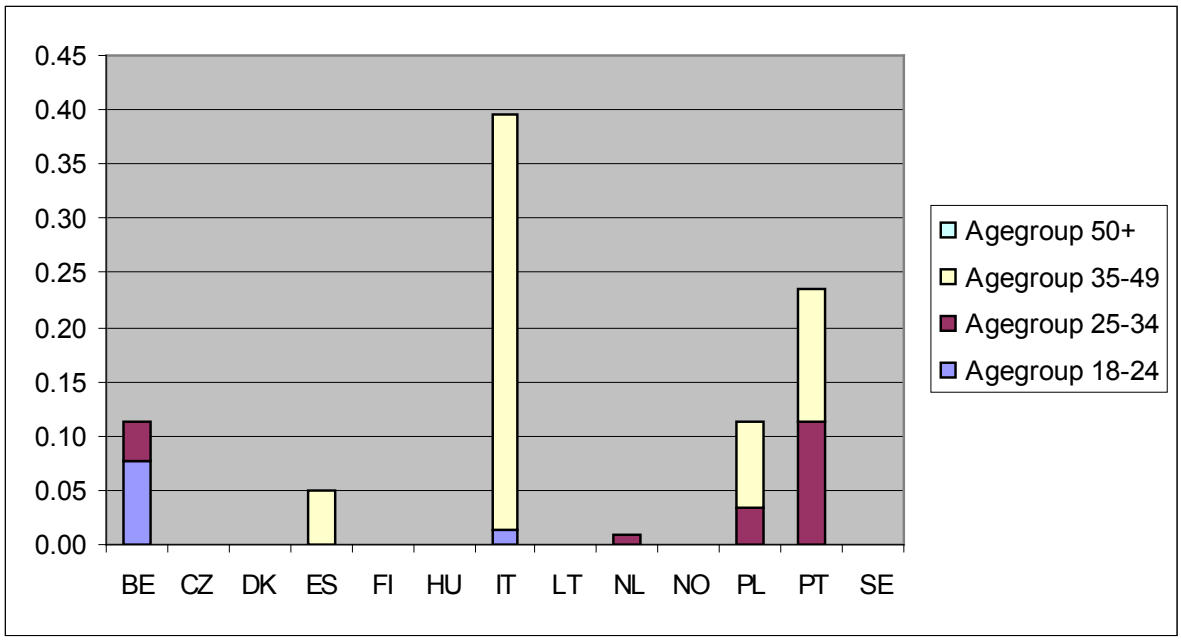

Figure 4.3.5.5. Distribution of the prevalence of illicit opiates alone among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.5.4 and figure 4.3.5.6 show that illicit opiates were only used by a very small share of 35-49 old female drivers in Belgium and by 18-24 old female drivers in Spain. In all other countries no illicit opiates were detected at all.

Table 4.3.5.4. Prevalence of illicit opiates alone among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE (n=971)	0.00 *0 - 3.37*	0.00 *0 - 1.52*	0.13 *0.01 - 1.27*	0.00 *0 - 1.55*	0.05 *0 - 0.48*
ES (n=605)	0.16 *0.01 - 3.45*	0.00 *0 - 1.68*	0.00 *0 - 1.91*	0.00 *0 - 5.56*	0.03 *0 - 0.67*
IT (n=313)	0.00 *0 - 5.82*	0.00 *0 - 4.35*	0.00 *0 - 2.65*	0.00 *0 - 13.07*	0.00 *0 - 1.21*
NL (n=1454)	0.00 *0 - 2.42*	0.00 *0 - 1.33*	0.00 *0 - 0.66*	0.00 *0 - 0.88*	0.00 *0 - 0.26*
PL (n=672)	0.00 *0 - 3.51*	0.00 *0 - 1.51*	0.00 *0 - 1.57*	0.00 *0 - 4.88*	0.00 *0 - 0.57*
PT (n=1342)	0.00 *0 - 1.79*	0.00 *0 - 0.77*	0.00 *0 - 0.81*	0.00 *0 - 2.21*	0.00 *0 - 0.28*

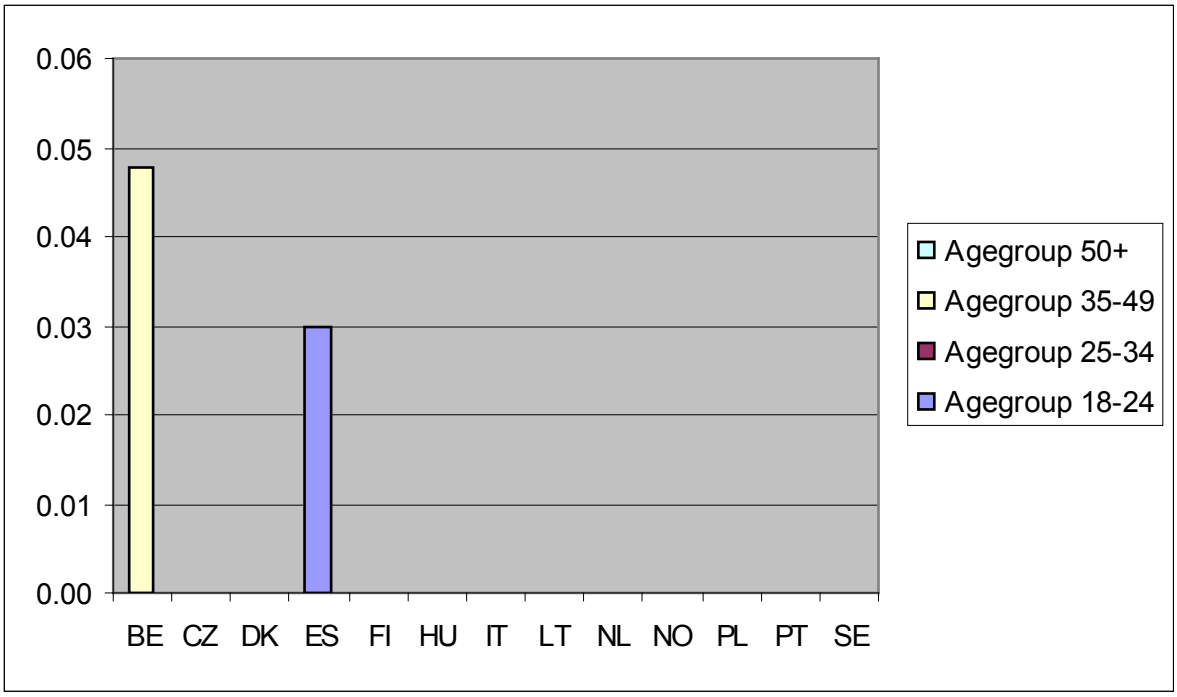

Figure 4.3.5.6. Distribution of the prevalence of illicit opiates alone among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.5.3 Illicit opiates use by time period

Table 4.3.5.5 presents an overview of the prevalence of illicit opiates by time period. The highest prevalence was found in Italy in the weekend at night time (0.58%) and during weekdays at day time (0.40%).

Table 4.3.5.5. Prevalence of illicit opiates alone by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE (n=2949)	0.06 *0.01 - 0.29*	0.00 *0 - 2.2*	0.23 *0.05 - 0.97*	0.00 *0 - 4.88*	0.09 *0.03 - 0.28*
ES (n=3174)	0.00 *0 - 0.18*	0.00 *0 - 2.94*	0.16 *0.03 - 0.76*	0.12 *0.01 - 2.59*	0.05 *0.01 - 0.2*
IT (n=1311)	0.40 *0.15 - 1.05*	0.00 *0 - 11.31*	0.00 *0 - 1.22*	0.58 *0.02 - 14.36*	0.30 *0.12 - 0.78*
NL (n=4822)	0.00 *0 - 0.11*	0.00 *0 - 2.59*	0.03 *0 - 0.42*	0.00 *0 - 2.87*	0.01 *0 - 0.09*
PL (n=4008)	0.13 *0.05 - 0.34*	0.00 *0 - 4*	0.00 *0 - 0.4*	0.00 *0 - 4.81*	0.09 *0.04 - 0.25*
PT (n=3965)	0.15 *0.06 - 0.38*	0.00 *0 - 4.98*	0.14 *0.03 - 0.68*	0.37 *0.02 - 5.56*	0.15 *0.07 - 0.33*

Figure 4.3.5.7 shows that in Italy and Portugal the largest share was during weekend nights, in Belgium, the Netherlands and Spain during weekend days and in Poland at weekdays during daytime. Illicit opiates were not found during weekday nights in any of the 13 countries.

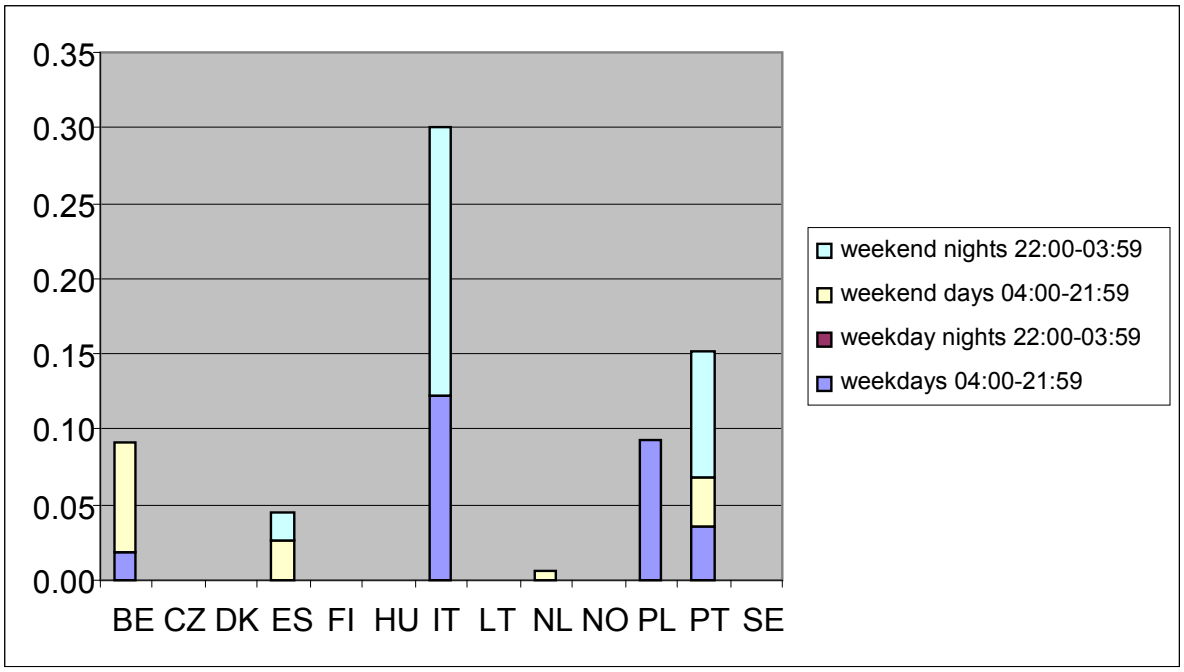

Figure 4.3.5.7. Distribution of the prevalence of illicit opiates alone among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

4.3.6 Benzodiazepines

Benzodiazepines are sedative medicinal drugs, mainly used to treat anxiety and insomnia problems.
The impairment effect of benzodiazepines is mainly present in the first two weeks of intake. Driving and simulator studies found impairment for different tasks such as steering, braking, reaction time and lane position (Kelly et al., 2004; Scheers et al., 2006; Steyvers and Brookhuis, 1996).
The results of the roadside surveys are presented for single use of benzodiazepines. The combination of benzodiazepines with a substance from an other substance group is regarded as combinational use. The share of combinational use in relation to single use is presented in table 4.3.6.1 and figure 4.3.6.2.
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.6.1. General results

The benzodiazepines group consists of diazepam, nordiazepam, oxazepam, lorazepam, alprazolam, flunitrazepam, and clonazepam. The cut-off levels for these benzodiazepines are presented in table 2.2.

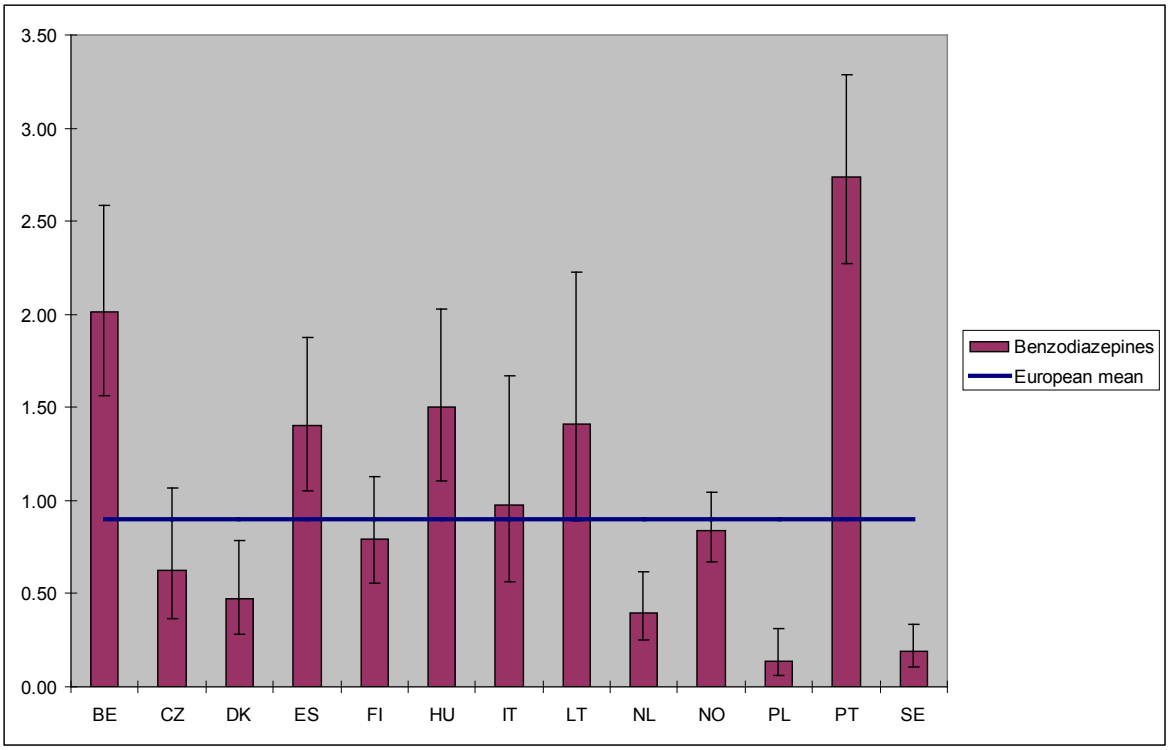

Figure 4.3.6.1. Prevalence benzodiazepines alone by country; prevalence in percentages

Figure 4.3.6.1 presents an overview of the use of benzodiazepines by country. Benzodiazepines were detected in all 13 countries. The highest prevalence was detected in Portugal (2.73%), followed by Belgium (2.01%), Hungary (1.50%), Lithuania (1.41%) and Spain (1.40%). The average use in Europe is 0.9%.

Table 4.3.6.1. Prevalence of benzodiazepines alone and benzodiazepines in combination with other psychoactive substances; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
Alone	2.01	0.62	0.47	1.40	0.79	1.50	0.97	1.41	0.40	0.84	0.14	2.73	0.19
Combi	0.27	0.04	0.04	0.32	0.29	0.25	0.75	0.03	0.04	0.20	-	0.22	0.02
Total	2.28	0.66	0.51	1.72	1.08	1.75	1.72	1.44	0.44	1.04	0.14	2.96	0.21
Share	12%	6%	8%	19%	27%	14%	44%	2%	9%	19%	0%	8%	10%

Table 4.3.6.1 and figure 4.3.6.2 provide an overview of the use of benzodiazepines among drivers either alone or in combination with other psychoactive substances. It shows that benzodiazepines were not often used in combination with other psychoactive substances. In most countries the share of combination use for benzodiazepines in relation to all benzodiazepine use was around 15%. However in Italy almost half of all benzodiazepines were used in combination.

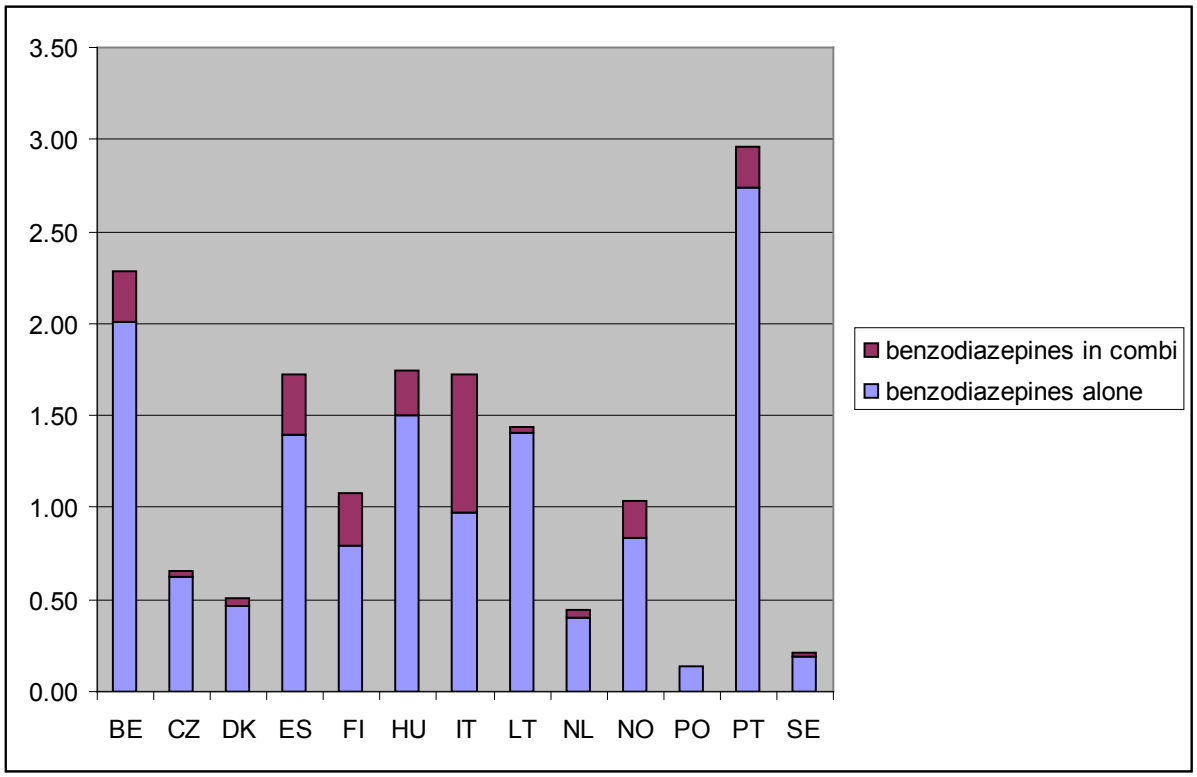

Figure 4.3.6.2. Prevalence of benzodiazepines alone and benzodiazepines in combination with other psychoactive substances; prevalence in percentages

4.3.6.2 Benzodiazepine use by gender and age

Table 4.3.6.2 gives an overview of the prevalence of benzodiazepines by age group. The prevalence was the highest among drivers aged 50 years and older in Lithuania (5.35%), Portugal (4.58%), Spain (3.84%), and Belgium (3.50%). In general benzodiazepine use is most prevalent in older age groups; The group of 50+ has the highest prevalence, and decreasing in age the lowest use was among the young drivers aged 18-24.

Table 4.3.6.2. Prevalence of benzodiazepines alone by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE (n=2949)	0.00 *0 - 1.28*	0.57 *0.21 - 1.55*	2.17 *1.46 - 3.21*	3.50 *2.49 - 4.91*	2.01 *1.57 - 2.59*
CZ (n=2037)	0.41 *0.07 - 2.3*	0.20 *0.04 - 1.04*	0.79 *0.35 - 1.74*	0.95 *0.4 - 2.22*	0.62 *0.36 - 1.07*
DK (n=3002)	0.46 *0.08 - 2.53*	0.06 *0 - 0.91*	0.53 *0.24 - 1.17*	0.59 *0.29 - 1.2*	0.47 *0.28 - 0.79*
ES (n=3174)	0.04 *0 - 0.72*	1.11 *0.63 - 1.96*	1.38 *0.82 - 2.3*	3.84 *2.47 - 5.94*	1.40 *1.05 - 1.87*
FI (n=3842)	0.35 *0.08 - 1.51*	0.80 *0.36 - 1.74*	0.48 *0.21 - 1.06*	1.17 *0.74 - 1.86*	0.79 *0.56 - 1.13*
HU (n=2741)	1.85 *0.77 - 4.35*	1.10 *0.59 - 2.02*	0.83 *0.42 - 1.64*	2.89 *1.85 - 4.48*	1.50 *1.11 - 2.03*
IT (n=1311)	3.12 *1.69 - 5.69*	0.35 *0.08 - 1.49*	0.30 *0.07 - 1.3*	0.00 *0 - 5.26*	0.97 *0.57 - 1.67*
LT (n=1267)	0.22 *0.02 - 2.57*	0.00 *0 - 1.18*	0.38 *0.1 - 1.48*	5.35 *3.31 - 8.53*	1.41 *0.9 - 2.23*
NL (n=4822)	0.00 *0 - 0.75*	0.15 *0.03 - 0.64*	0.66 *0.37 - 1.17*	0.39 *0.18 - 0.85*	0.40 *0.25 - 0.62*
NO (n=9236)	0.38 *0.14 - 1*	0.29 *0.12 - 0.69*	0.66 *0.44 - 1.01*	1.42 *1.07 - 1.88*	0.84 *0.67 - 1.05*
PL (n=4008)	0.31 *0.08 - 1.18*	0.00 *0 - 0.28*	0.29 *0.1 - 0.78*	0.02 *0 - 0.49*	0.14 *0.06 - 0.31*
PT (n=3965)	0.80 *0.32 - 1.98*	2.03 *1.37 - 3*	2.96 *2.16 - 4.03*	4.58 *3.38 - 6.17*	2.73 *2.27 - 3.29*
SE (n=6198)	0.00 *0 - 0.78*	0.06 *0.01 - 0.51*	0.27 *0.12 - 0.61*	0.21 *0.1 - 0.46*	0.19 *0.11 - 0.33*

Figure 4.3.6.3 shows that the largest shares for single benzodiazepine use were among drivers aged 35 years and older. However, in Italy most benzodiazepines were used by young drivers aged 18-24.

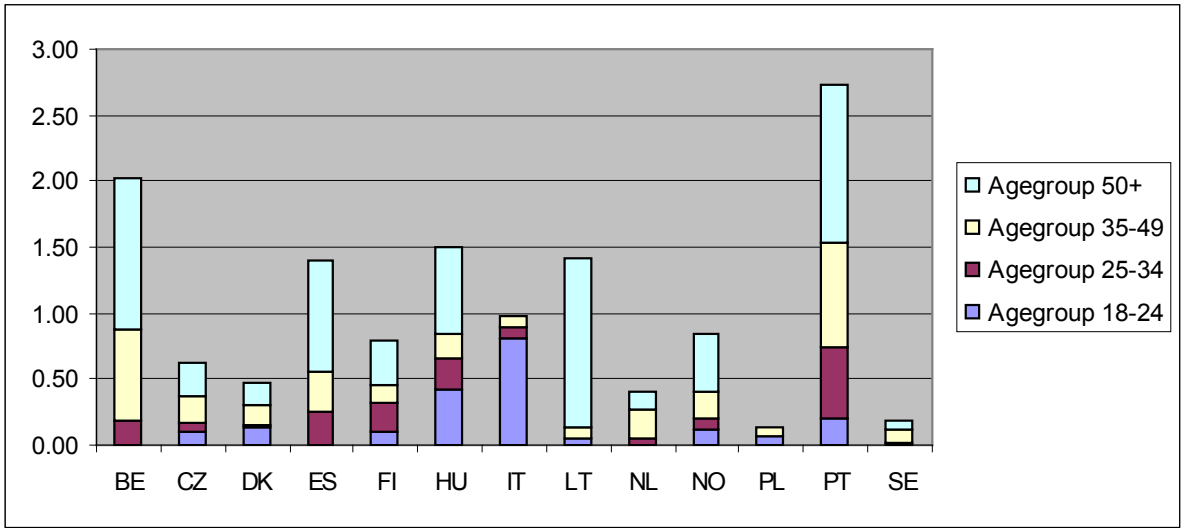

Figure 4.3.6.3. Distribution of the prevalence of benzodiazepines alone among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Unlike illicit drugs, benzodiazepine use is relatively more frequently detected among female drivers. Especially in Lithuania the share of female drivers was much higher than that of male drivers. However, in Denmark, Finland, and Poland the share of benzodiazepine use was higher among male drivers.

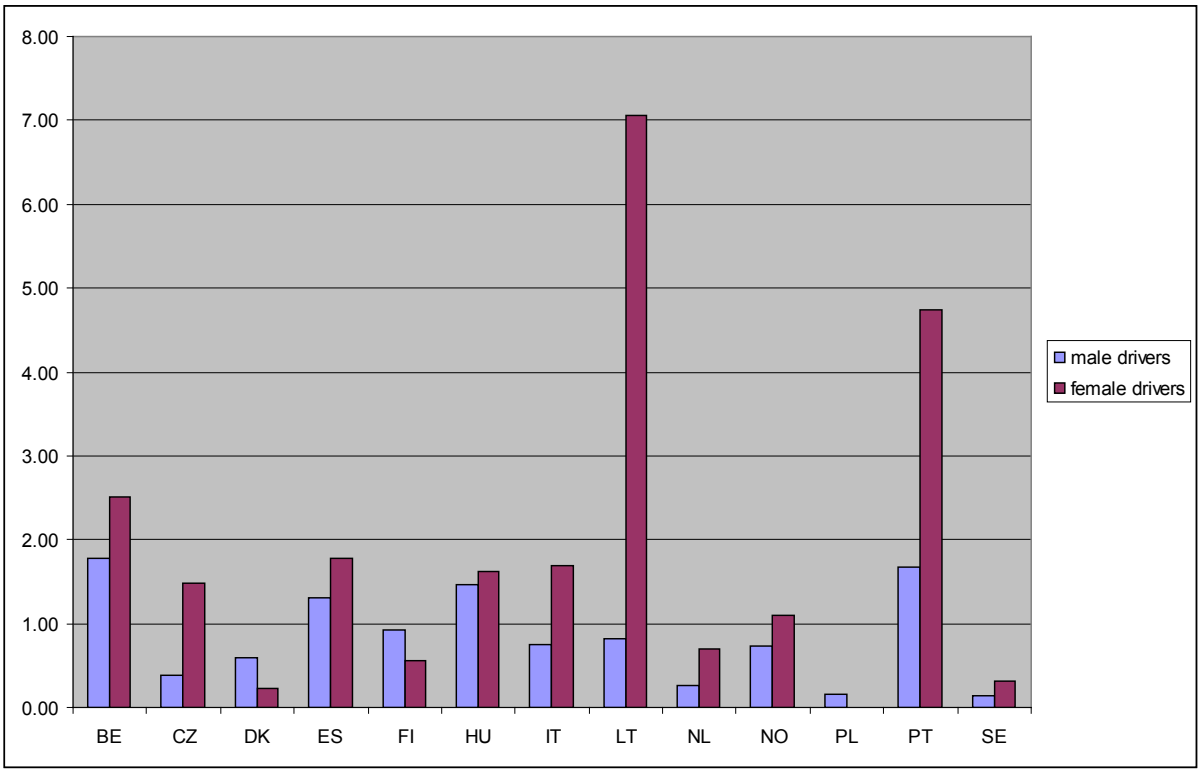

Figure 4.3.6.4. Prevalence of benzodiazepines alone by gender; prevalence in percentages

Table 4.3.6.3 gives an overview of the prevalence of benzodiazepines among male drivers by age group. Highest prevalence was found in the highest age groups (50+) for Portugal (3.07%), Hungary (3.06%) and Belgium (3.02%). High shares in lower age groups were found in Hungary and Italy with 2.61% and 2.38%, respectively, among drivers aged 18-24.

Table 4.3.6.3. Prevalence of benzodiazepines alone among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE (n=1957)	0.00 *0 - 2.03*	0.25 *0.04 - 1.49*	1.90 *1.14 - 3.17*	3.02 *1.96 - 4.61*	1.78 *1.28 - 2.46*
CZ (n=1589)	0.00 *0 - 2.39*	0.00 *0 - 0.91*	0.55 *0.19 - 1.58*	0.65 *0.22 - 1.91*	0.38 *0.17 - 0.82*
DK (n=1975)	0.69 *0.12 - 3.79*	0.10 *0.01 - 1.41*	0.62 *0.25 - 1.57*	0.75 *0.35 - 1.59*	0.60 *0.34 - 1.05*
ES (n=2520)	0.04 *0 - 0.9*	1.08 *0.56 - 2.06*	1.46 *0.83 - 2.53*	2.97 *1.73 - 5.05*	1.31 *0.94 - 1.83*
FI (n=2511)	0.33 *0.05 - 1.93*	1.24 *0.57 - 2.7*	0.39 *0.12 - 1.19*	1.27 *0.76 - 2.13*	0.92 *0.61 - 1.37*
HU (n=2062)	2.61 *1.09 - 6.12*	0.96 *0.45 - 2.05*	0.41 *0.14 - 1.23*	3.06 *1.9 - 4.9*	1.46 *1.02 - 2.07*
IT (n=998)	2.38 *1.1 - 5.11*	0.00 *0 - 1.09*	0.42 *0.1 - 1.81*	0.00 *0 - 8.08*	0.75 *0.37 - 1.5*
LT (n=1130)	0.24 *0.02 - 2.83*	0.00 *0 - 1.4*	0.21 *0.03 - 1.28*	2.91 *1.48 - 5.61*	0.82 *0.43 - 1.52*
NL (n=3363)	0.00 *0 - 1.08*	0.00 *0 - 0.52*	0.45 *0.19 - 1.03*	0.34 *0.13 - 0.88*	0.27 *0.14 - 0.5*
NO (n=6520)	0.55 *0.21 - 1.46*	0.39 *0.16 - 0.95*	0.56 *0.33 - 0.97*	1.09 *0.75 - 1.58*	0.73 *0.55 - 0.97*
PL (n=3331)	0.38 *0.1 - 1.43*	0.00 *0 - 0.35*	0.36 *0.13 - 0.97*	0.02 *0 - 0.53*	0.16 *0.07 - 0.37*
PT (n=2541)	0.67 *0.19 - 2.33*	0.93 *0.44 - 1.95*	1.53 *0.89 - 2.63*	3.07 *2.03 - 4.62*	1.68 *1.25 - 2.25*
SE (n=4352)	0.00 *0 - 1.12*	0.08 *0.01 - 0.76*	0.30 *0.12 - 0.79*	0.08 *0.02 - 0.32*	0.14 *0.06 - 0.3*

Figure 4.3.6.5 shows that benzodiazepines were mainly used by male drivers of 50 years and older. However, in Italy, Hungary, Denmark and Poland benzodiazepines were relatively frequently detected among young male drivers.

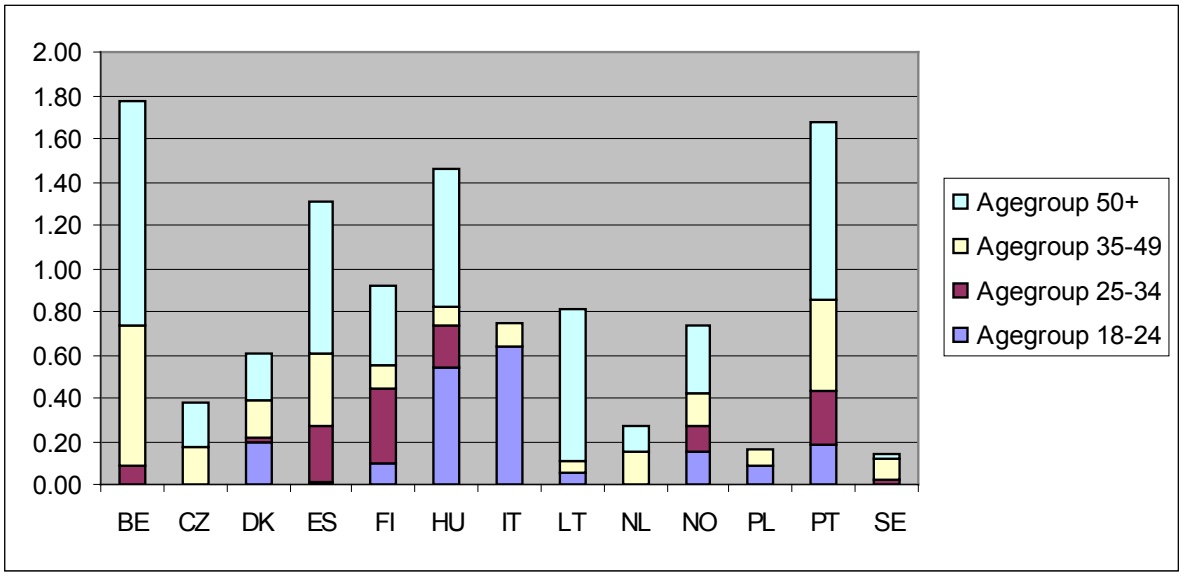

Figure 4.3.6.5. Distribution of the prevalence of benzodiazepines alone among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.6.4 gives an overview of the prevalence of benzodiazepines among female drivers by age group. The highest prevalence was found among female drivers aged 50+ in Lithuania. Almost half (45.02%) of them was positive for benzodiazepines. However, the number of tested female drivers was very low in Lithuania so that this extremely high outcome could have been caused by chance. Furthermore high prevalence was detected among female drivers aged 50 and over in Portugal (10.83%) and Spain (9.51%).

Table 4.3.6.4. Prevalence of benzodiazepines alone among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE	0.00	1.05	2.70	4.82	2.50
(n=971)	*0 - 3.37*	*0.33 - 3.25*	*1.47 - 4.91*	*2.77 - 8.27*	*1.69 - 3.69*
CZ	1.17	0.80	1.60	3.08	1.49
(n=448)	*0.21 - 6.36*	*0.15 - 4.14*	*0.51 - 4.93*	*0.84 - 10.65*	*0.71 - 3.09*
DK	0.00	0.00	0.37	0.21	0.22
(n=1015)	*0 - 4.97*	*0 - 2.15*	*0.09 - 1.59*	*0.03 - 1.43*	*0.06 - 0.75*
ES	0.00	1.24	1.06	9.51	1.78
(n=605)	*0 - 3.16*	*0.41 - 3.71*	*0.3 - 3.7*	*4.49 - 19.03*	*1 - 3.16*
FI	0.40	0.00	0.61	0.92	0.56
(n=1283)	*0.04 - 3.43*	*0 - 1.44*	*0.21 - 1.78*	*0.34 - 2.44*	*0.27 - 1.14*
HU	0.00	1.46	2.05	2.14	1.63
(n=679)	*0 - 4.9*	*0.54 - 3.89*	*0.87 - 4.72*	*0.68 - 6.56*	*0.91 - 2.89*
IT	6.11	1.77	0.00	0.00	1.69
(n=313)	*2.35 - 14.99*	*0.41 - 7.32*	*0 - 2.65*	*0 - 13.07*	*0.74 - 3.81*
LT	0.00	0.00	2.34	45.02	7.07
(n=121)	*0 - 19*	*0 - 7.06*	*0.38 - 13.23*	*24.6 - 67.26*	*3.7 - 13.06*
NL	0.00	0.53	1.09	0.55	0.70
(n=1454)	*0 - 2.42*	*0.12 - 2.25*	*0.51 - 2.31*	*0.17 - 1.8*	*0.38 - 1.28*
NO	0.00	0.09	0.88	2.37	1.10
(n=2709)	*0 - 1.21*	*0.01 - 0.91*	*0.47 - 1.66*	*1.54 - 3.62*	*0.77 - 1.57*
PL	0.00	0.00	0.00	0.00	0.00
(n=672)	*0 - 3.51*	*0 - 1.51*	*0 - 1.57*	*0 - 4.88*	*0 - 0.57*
PT	1.00	3.65	5.44	10.83	4.75
(n=1342)	*0.28 - 3.47*	*2.32 - 5.69*	*3.73 - 7.87*	*6.99 - 16.4*	*3.74 - 6*
SE	0.00	0.00	0.20	0.63	0.31
(n=1835)	*0 - 2.57*	*0 - 1.24*	*0.04 - 0.91*	*0.25 - 1.53*	*0.14 - 0.69*

Figure 4.3.6.6 indicates that among female drivers benzodiazepines were mostly detected among drivers aged 50+. In Italy benzodiazepines were most often used by young female drivers. The overall use of benzodiazepines was the highest in Lithuania followed by Portugal and Belgium. No benzodiazepines were detected among female drivers from Poland.

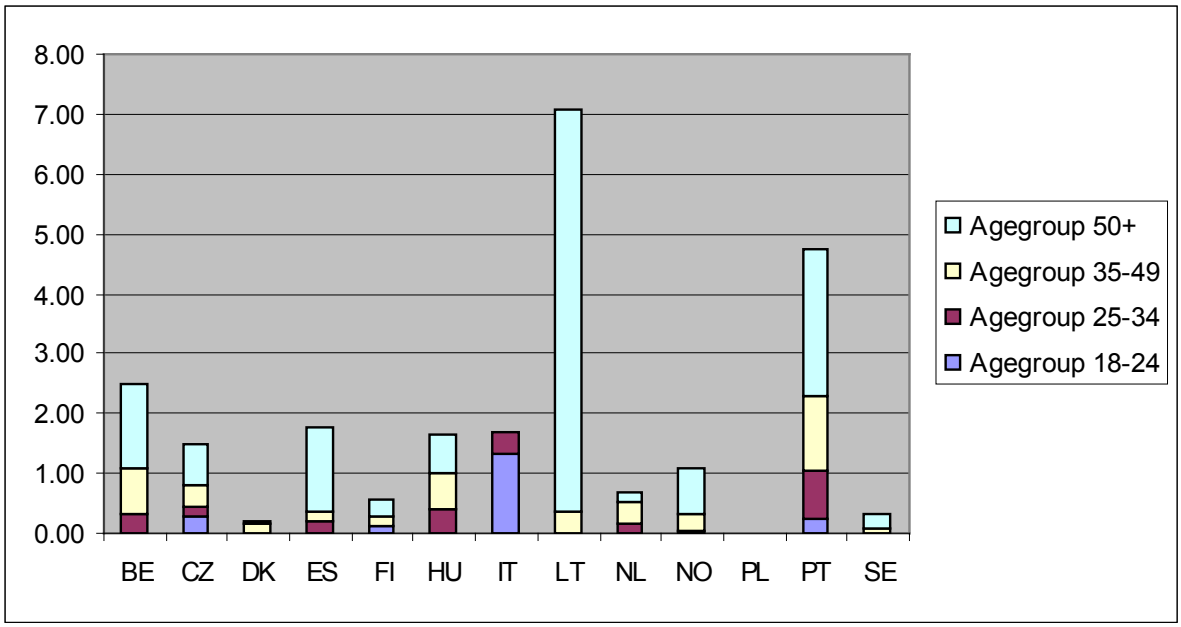

Figure 4.3.6.6. Distribution of the prevalence of benzodiazepines alone among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.6.3 Benzodiazepine use by time period

Table 4.3.6.5 provides an overview of the prevalence of benzodiazepines by time period. The highest prevalence was found in Portugal during weekdays, weeknights, and weekend days.

Table 4.3.6.5. Prevalence of benzodiazepines alone by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE	2.12	1.05	2.03	1.16	2.01
(n=2949)	*1.58 - 2.84*	*0.27 - 3.98*	*1.21 - 3.41*	*0.19 - 6.9*	*1.57 - 2.59*
CZ	0.79	0.00	0.32	0.62	0.62
(n=2037)	*0.44 - 1.43*	*0 - 8.62*	*0.09 - 1.13*	*0.02 - 16.88*	*0.36 - 1.07*
DK	0.48	0.00	0.49	0.41	0.47
(n=3002)	*0.26 - 0.88*	*0 - 5.06*	*0.19 - 1.3*	*0.03 - 5.62*	*0.28 - 0.79*
ES	1.36	0.49	1.77	0.82	1.40
(n=3174)	*0.95 - 1.96*	*0.06 - 3.83*	*1.06 - 2.95*	*0.17 - 3.79*	*1.05 - 1.87*
FI	0.91	0.36	0.57	0.71	0.79
(n=3842)	*0.61 - 1.35*	*0.03 - 3.6*	*0.26 - 1.23*	*0.08 - 6.03*	*0.56 - 1.13*
HU	1.69	2.06	0.99	0.00	1.50
(n=2741)	*1.21 - 2.36*	*0.44 - 9.2*	*0.47 - 2.09*	*0 - 6.88*	*1.11 - 2.03*
IT	1.03	0.00	0.96	0.00	0.97
(n=1311)	*0.56 - 1.91*	*0 - 11.31*	*0.33 - 2.79*	*0 - 13.37*	*0.57 - 1.67*
LT	1.81	0.00	0.29	0.00	1.41
(n=1267)	*1.14 - 2.88*	*0 - 11.28*	*0.04 - 1.96*	*0 - 13.37*	*0.9 - 2.23*
NL	0.48	0.00	0.21	0.16	0.40
(n=4822)	*0.3 - 0.77*	*0 - 2.59*	*0.06 - 0.72*	*0.01 - 3.17*	*0.25 - 0.62*
NO	1.02	0.13	0.49	0.99	0.84
(n=9236)	*0.8 - 1.31*	*0.02 - 0.94*	*0.27 - 0.88*	*0.41 - 2.38*	*0.67 - 1.05*
PL	0.13	0.57	0.13	0.00	0.14
(n=4008)	*0.05 - 0.34*	*0.06 - 5.04*	*0.03 - 0.63*	*0 - 4.81*	*0.06 - 0.31*
PT	2.73	4.58	2.71	1.56	2.73
(n=3965)	*2.19 - 3.38*	*1.66 - 12.02*	*1.84 - 3.99*	*0.31 - 7.54*	*2.27 - 3.29*
SE	0.19	0.00	0.21	0.00	0.19
(n=6198)	*0.1 - 0.37*	*0 - 3.01*	*0.07 - 0.6*	*0 - 3.01*	*0.11 - 0.33*

Figure 4.3.6.7 shows that benzodiazepines were most commonly detected during daytime in many of the countries. Only in Poland and Portugal relatively more drivers were positive for the use of benzodiazepines during night time hours.

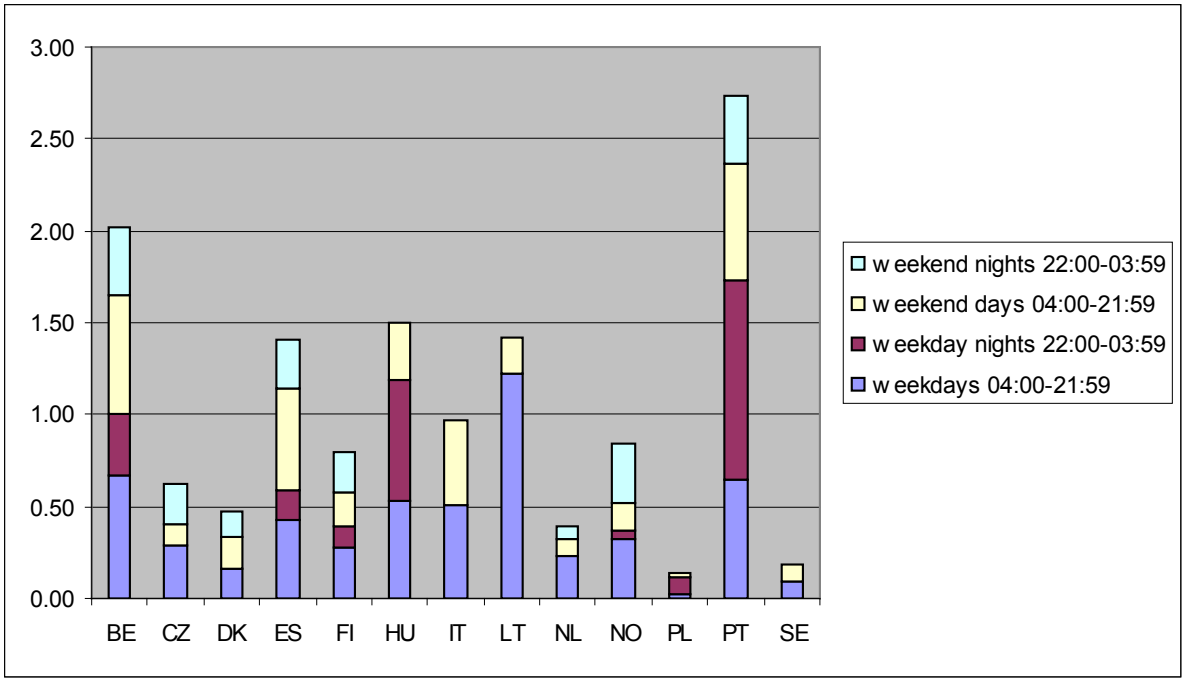

Figure 4.3.6.7. Distribution of the prevalence of benzodiazepines alone among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

4.3.7 Z-drugs

Z-drugs are hypnotic medicinal drugs, mainly used to treat insomnia problems. Z-drugs have effects similar to benzodiazepines, although they belong to a different pharmacological-chemical group.
Users are recommended to comply to the prescription which means that for zolpidem no higher doses should be taken and that a certain number of hours of uninterrupted sleep is needed before driving. zopiclone use has a larger effect on driving impairment (Verster et al., 2007).
The results of the roadside surveys are presented for single use of Z-drugs. The combination of Z-drugs with a substance from an other substance group is regarded as combinational use. The share of combinational use in relation to single use is presented in table 4.3.7.1 and figure 4.3.7.2.
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.7.1. General results

The Z-drugs group consists of zolpidem and zopiclone. The cut-off levels for these substances are presented in table 2.2.

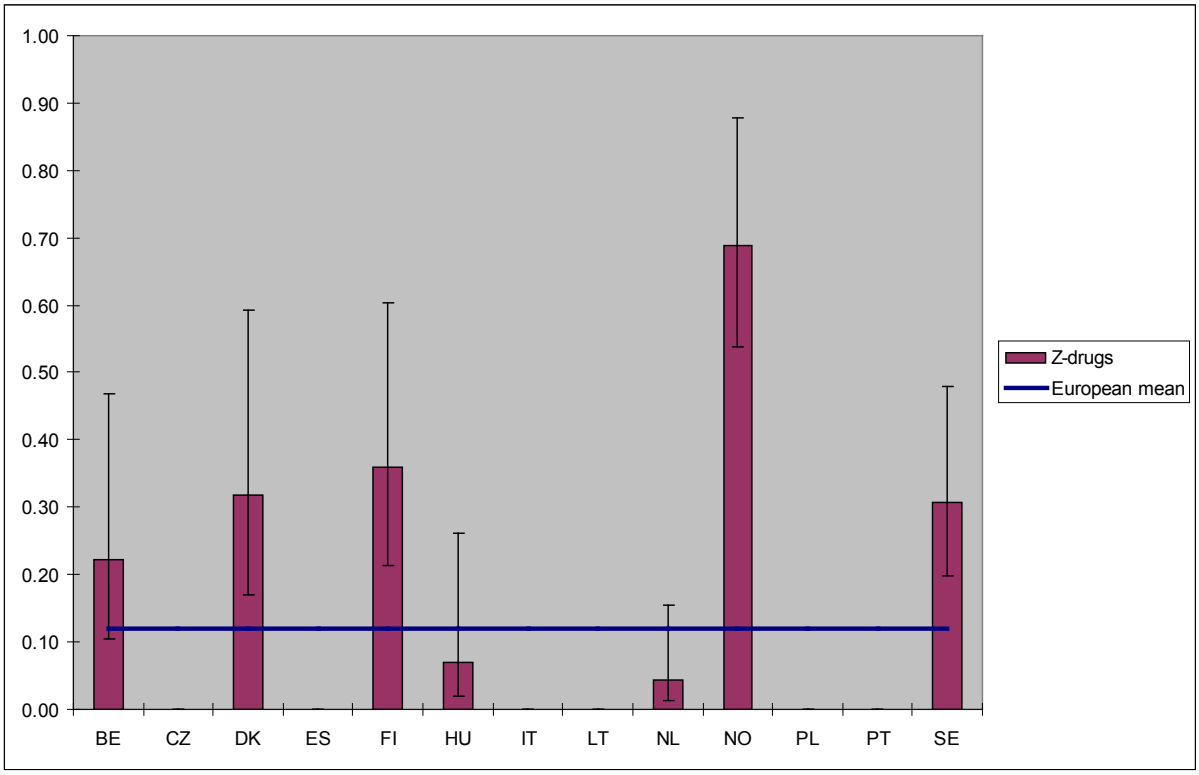

Figure 4.3.7.1. Prevalence Z-drugs alone by country

Figure 4.3.7.1 presents the prevalence of Z-drugs by country. Z-drugs are not commonly detected among European drivers. The prevalence is the highest in the Northern European countries, followed by Belgium, Hungary and the Netherlands. No single use of Z-drugs was detected among drivers in Czech Republic, Spain, Italy, Lithuania, Poland and Portugal. The average use of Z-drugs by drivers in Europe is 0.12%.

Table 4.3.7.1 and figure 4.3.7.2 show that Z-drugs were relatively often combined with other psychoactive substances in Finland and Hungary. In Denmark only single use of Z-drugs was detected. In Belgium, Norway, Sweden and the Netherlands the relative share of combinational use of Z-drugs varied between 9% and 26%.

Table 4.3.7.1. Prevalence of Z-drugs alone and Z-drugs in combination with other psychoactive substances; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
Z-drugs alone	0.22	-	0.32	-	0.36	0.07	-	-	0.04	0.69	-	-	0.31
Z-drugs in combi	0.07	-	-	-	0.22	0.08	-	-	0.01	0.07	-	-	0.11
Total	0.29	-	0.32	-	0.58	0.15	-	-	0.05	0.76	-	-	0.42
Share	24%	-	0%	-	38%	53%	-	-	19%	9%	-	-	26%

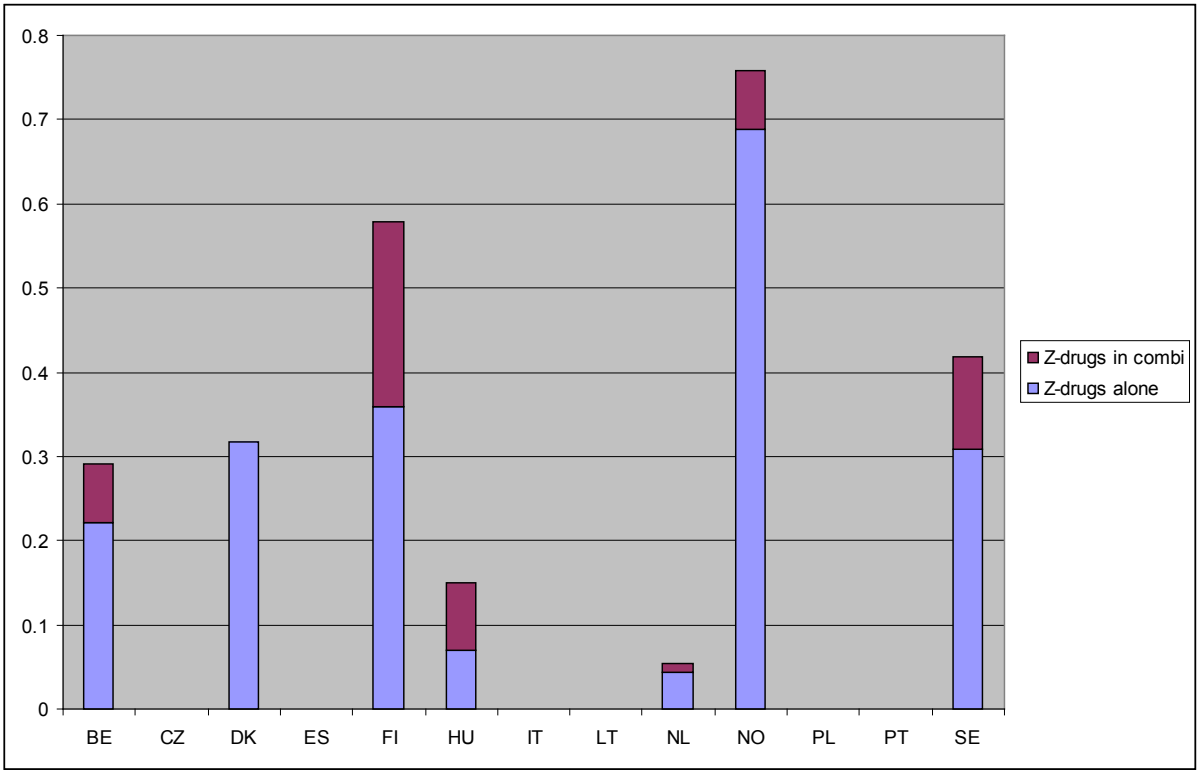

Figure 4.3.7.2. Prevalence of Z-drugs alone and Z-drugs in combination with other psychoactive substances; prevalence in percentages

4.3.7.2. Z-drugs by age and gender

Table 4.3.7.2 gives an overview of the prevalence of Z-drugs by age group. The prevalence was the highest among drivers aged 50 years and older in Norway (1.39%), Finland (0.73%), and Sweden (0.62%).

Table 4.3.7.2. Prevalence of Z-drugs alone by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE	0.00	0.00	0.18	0.50	0.22
(n=2949)	*0 - 1.28*	*0 - 0.62*	*0.05 - 0.65*	*0.21 - 1.22*	*0.1 - 0.47*
DK	0.00	0.00	0.22	0.59	0.32
(n=3002)	*0 - 1.71*	*0 - 0.78*	*0.07 - 0.73*	*0.29 - 1.21*	*0.17 - 0.59*
FI	0.00	0.12	0.17	0.73	0.36
(n=3842)	*0 - 0.9*	*0.02 - 0.74*	*0.05 - 0.62*	*0.41 - 1.31*	*0.21 - 0.6*
HU	0.00	0.22	0.00	0.00	0.07
(n=2741)	*0 - 1.49*	*0.06 - 0.8*	*0 - 0.41*	*0 - 0.59*	*0.02 - 0.26*
NL	0.00	0.00	0.02	0.11	0.04
(n=4822)	*0 - 0.75*	*0 - 0.38*	*0 - 0.26*	*0.03 - 0.44*	*0.01 - 0.15*
NO	0.00	0.34	0.35	1.39	0.69
(n=9236)	*0 - 0.39*	*0.15 - 0.76*	*0.2 - 0.62*	*1.05 - 1.85*	*0.54 - 0.88*
SE	0.00	0.06	0.06	0.62	0.31
(n=6198)	*0 - 0.78*	*0.01 - 0.51*	*0.01 - 0.3*	*0.39 - 0.98*	*0.2 - 0.48*

Figure 4.3.7.3 shows that most drivers positive for Z-drugs were 50 years and older, except for Hungary where all drivers were between 25 and 34 years old.

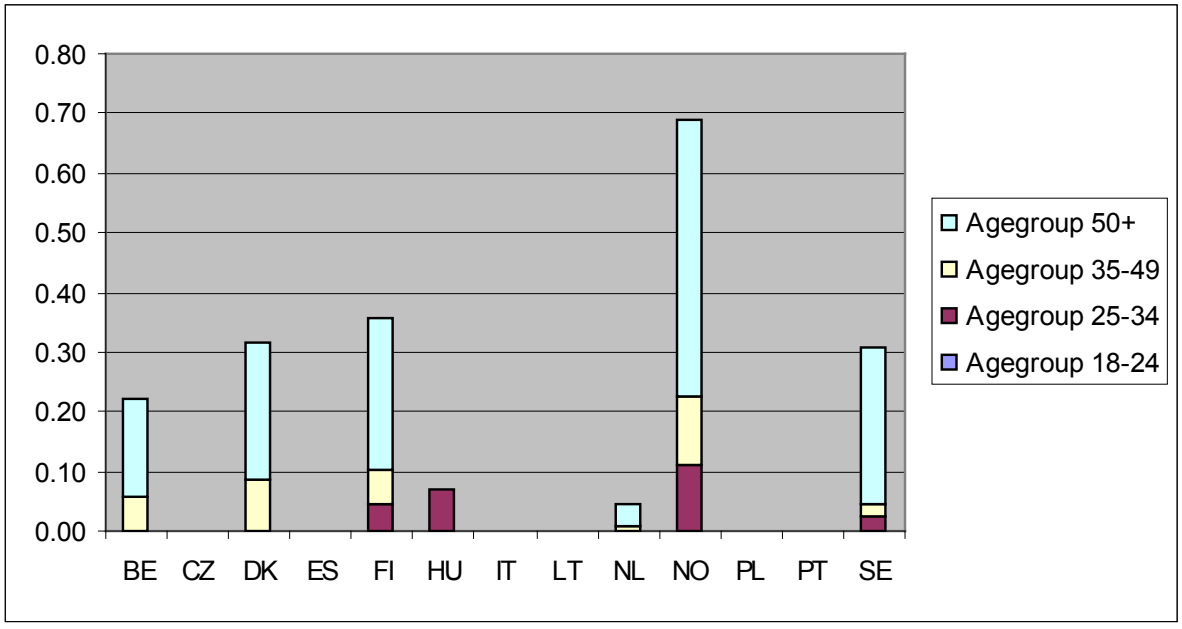

Figure 4.3.7.3. Distribution of the prevalence of Z-drugs alone among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

In general the share of female drivers who were positive for Z-drugs was higher than the share of male drivers. However, In the Netherlands only (a small share of) male drivers were positive for Z-drugs and in Sweden the share of Z-drugs users was a little bit higher among male drivers than among female drivers. In Hungary Z-drugs were only detected among female drivers.

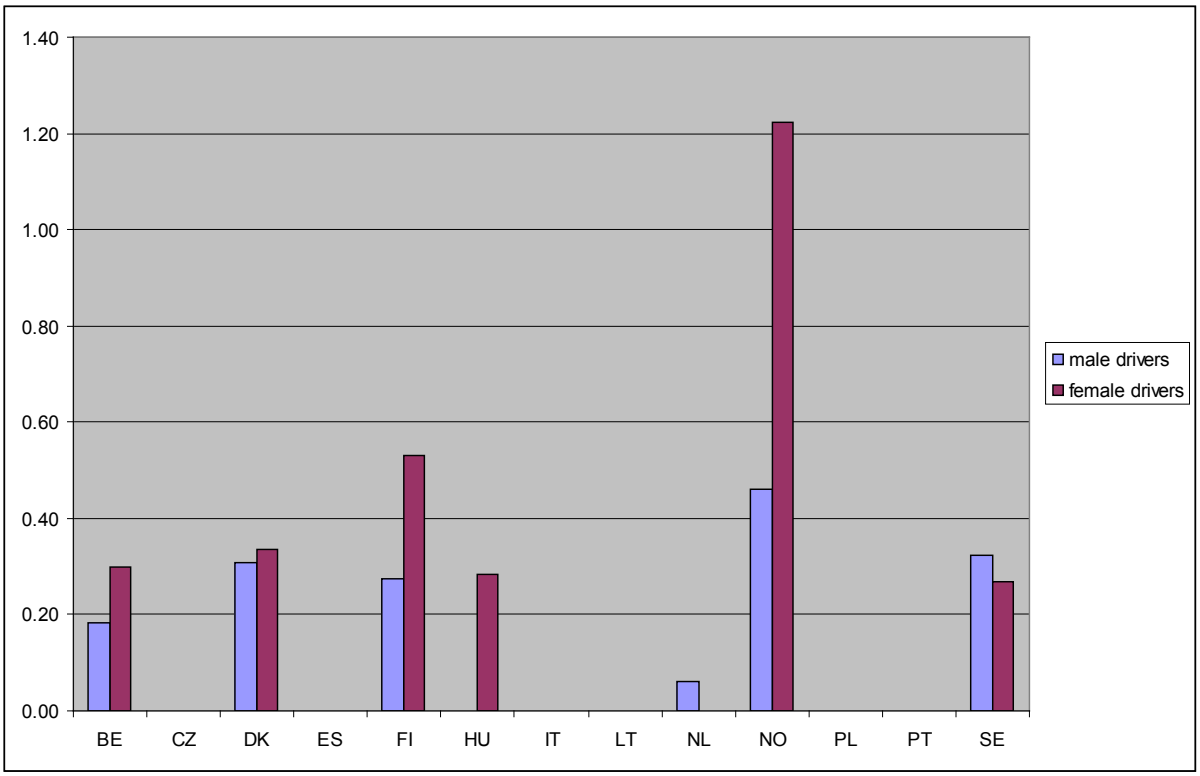

Figure 4.3.7.4. Prevalence of Z-drugs alone by gender; prevalence in percentages

Table 4.3.7.3 gives an overview of the prevalence of Z-drugs among male drivers by age group. The prevalence was the highest among drivers aged 50 years and older in Norway (0.95%), Sweden (0.64%), Denmark (0.60%) and Finland (0.56%).

Table 4.3.7.3. Prevalence of Z-drugs alone among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE (n=1957)	0.00 *0 - 2.03*	0.00 *0 - 1.03*	0.00 *0 - 0.52*	0.54 *0.2 - 1.45*	0.18 *0.07 - 0.49*
DK (n=1975)	0.00 *0 - 2.56*	0.00 *0 - 1.22*	0.15 *0.03 - 0.85*	0.60 *0.26 - 1.38*	0.31 *0.14 - 0.67*
FI (n=2511)	0.00 *0 - 1.35*	0.19 *0.03 - 1.15*	0.00 *0 - 0.55*	0.56 *0.26 - 1.21*	0.27 *0.13 - 0.56*
HU (n=2062)	0.00 *0 - 2.09*	0.00 *0 - 0.58*	0.00 *0 - 0.55*	0.00 *0 - 0.72*	0.00 *0 - 0.19*
NL (n=3363)	0.00 *0 - 1.08*	0.00 *0 - 0.52*	0.03 *0 - 0.39*	0.15 *0.04 - 0.61*	0.06 *0.02 - 0.22*
NO (n=6520)	0.00 *0 - 0.56*	0.22 *0.07 - 0.7*	0.17 *0.06 - 0.44*	0.95 *0.64 - 1.42*	0.46 *0.32 - 0.66*
SE (n=4352)	0.00 *0 - 1.12*	0.00 *0 - 0.61*	0.04 *0 - 0.38*	0.64 *0.38 - 1.08*	0.32 *0.19 - 0.54*

Figure 4.3.7.5 indicates that most male users were older than 50 years. Only in Finland and Norway male users were younger than 35 years. Contrary to benzodiazepines, no Z-drugs were found among young male drivers aged 18-24.

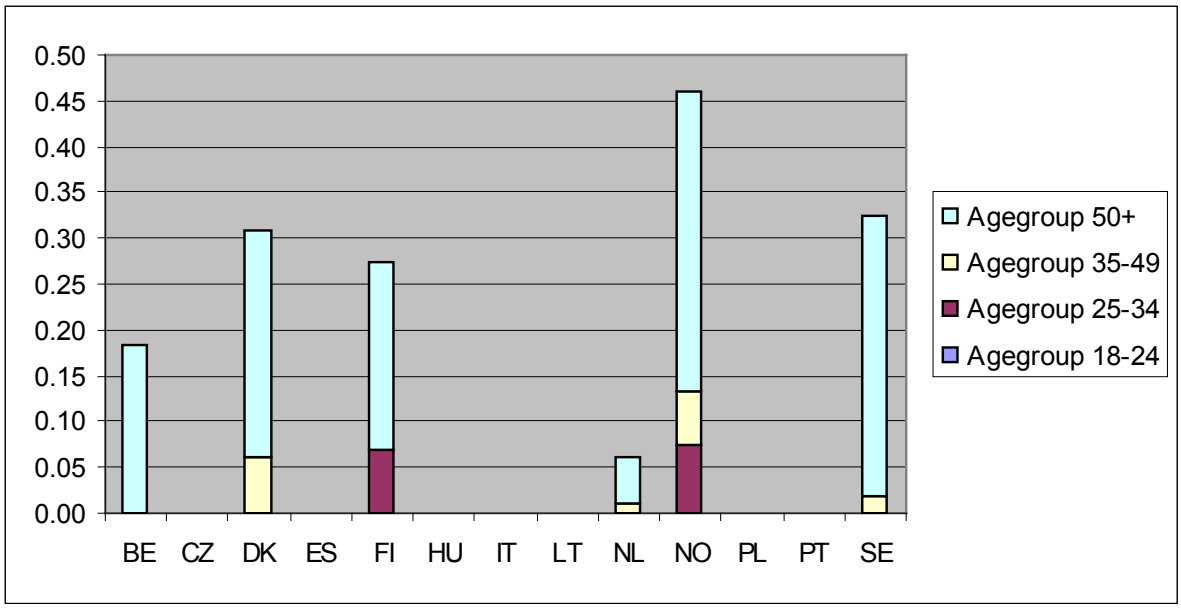

Figure 4.3.7.5. Distribution of the prevalence of Z-drugs alone among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.7.4 provides an overview of the prevalence of Z-drugs among female drivers by age group. The prevalence was the highest among drivers aged 50 years and older in Norway (2.62%), Finland (1.21%), Denmark (0.58%) and Sweden (0.55%).

Table 4.3.7.4. Prevalence of Z-drugs alone among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE (n=971)	0.00 *0 - 3.37*	0.00 *0 - 1.52*	0.53 *0.14 - 1.94*	0.40 *0.07 - 2.26*	0.30 *0.1 - 0.89*
DK (n=1015)	0.00 *0 - 4.97*	0.00 *0 - 2.15*	0.33 *0.07 - 1.53*	0.58 *0.16 - 2.03*	0.34 *0.12 - 0.92*
FI (n=1283)	0.00 *0 - 2.71*	0.00 *0 - 1.44*	0.42 *0.12 - 1.49*	1.21 *0.51 - 2.85*	0.53 *0.26 - 1.1*
HU (n=679)	0.00 *0 - 4.9*	0.80 *0.21 - 2.92*	0.00 *0 - 1.56*	0.00 *0 - 3.08*	0.28 *0.08 - 1.05*
NL (n=1454)	0.00 *0 - 2.42*	0.00 *0 - 1.33*	0.00 *0 - 0.66*	0.00 *0 - 0.88*	0.00 *0 - 0.26*
NO (n=2709)	0.00 *0 - 1.21*	0.61 *0.21 - 1.74*	0.74 *0.37 - 1.48*	2.62 *1.74 - 3.92*	1.22 *0.87 - 1.71*
SE (n=1835)	0.00 *0 - 2.57*	0.17 *0.02 - 1.56*	0.08 *0.01 - 0.71*	0.55 *0.21 - 1.43*	0.27 *0.11 - 0.63*

Figure 4.3.7.6 shows that most Z-drugs are used by older female drivers, and that Z-drugs are not used by the youngest drivers (18-24).

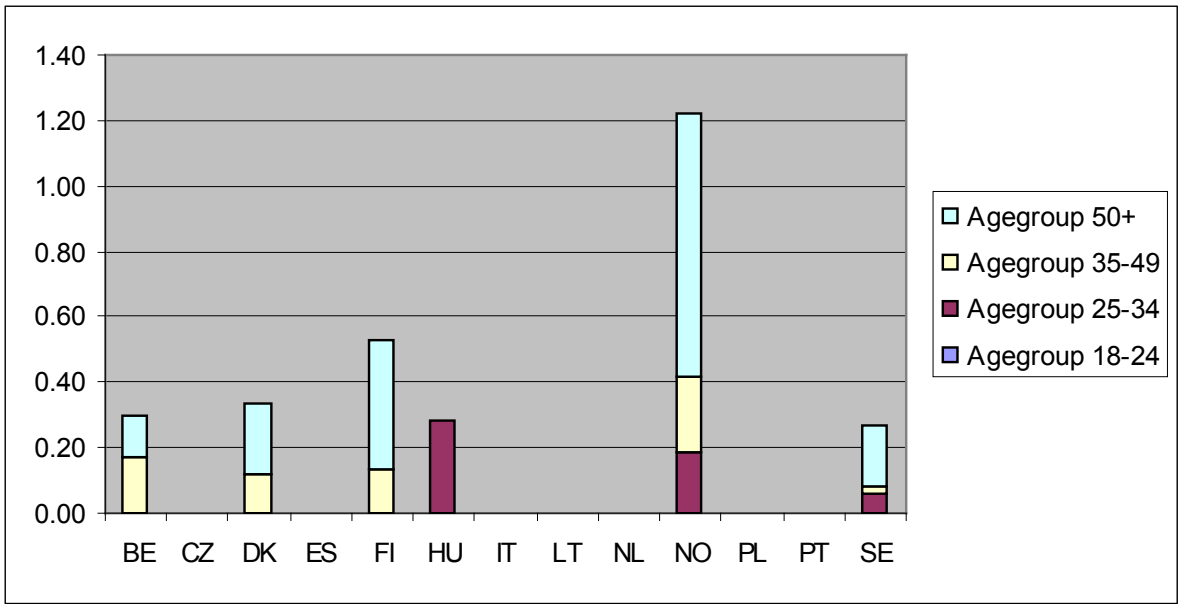

Figure 4.3.7.6 Distribution of the prevalence of Z-drugs alone among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.7.3. Z-drugs use by time period

Table 4.3.7.5 presents an overview of the prevalence of Z-drugs by time period. The prevalence was the highest at weekdays during daytime hours in Norway (0.92%) and in Finland (0.46%), in the weekend at daytime hours in Denmark (0.46%) and during weekday nights in Sweden (0.44%).

Table 4.3.7.5. Prevalence of Z-drugs alone by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE (n=2949)	0.30 *0.14 - 0.65*	0.00 *0 - 2.2*	0.07 *0.01 - 0.7*	0.00 *0 - 4.88*	0.22 *0.1 - 0.47*
DK (n=3002)	0.29 *0.13 - 0.63*	0.00 *0 - 5.06*	0.46 *0.17 - 1.26*	0.00 *0 - 4.87*	0.32 *0.17 - 0.59*
FI (n=3842)	0.46 *0.26 - 0.8*	0.36 *0.03 - 3.6*	0.15 *0.03 - 0.62*	0.00 *0 - 4.76*	0.36 *0.21 - 0.6*
HU (n=2741)	0.10 *0.03 - 0.36*	0.00 *0 - 5.75*	0.00 *0 - 0.59*	0.00 *0 - 6.88*	0.07 *0.02 - 0.26*
NL (n=4822)	0.05 *0.01 - 0.2*	0.00 *0 - 2.59*	0.03 *0 - 0.42*	0.00 *0 - 2.87*	0.04 *0.01 - 0.15*
NO (n=9236)	0.92 *0.71 - 1.19*	0.13 *0.02 - 0.94*	0.35 *0.18 - 0.7*	0.00 *0 - 0.83*	0.69 *0.54 - 0.88*
SE (n=6198)	0.39 *0.25 - 0.62*	0.44 *0.05 - 3.82*	0.08 *0.01 - 0.39*	0.00 *0 - 3.01*	0.31 *0.2 - 0.48*

Figure 4.3.7.7 shows that Z-drugs were most often used during daytime hours at weekdays. In Denmark however, most Z-drugs were detected during daytime hours in the weekend and in Sweden most Z-drugs were detected during night time hours at weekdays. In none of the countries Z-drugs were found in weekend nights.

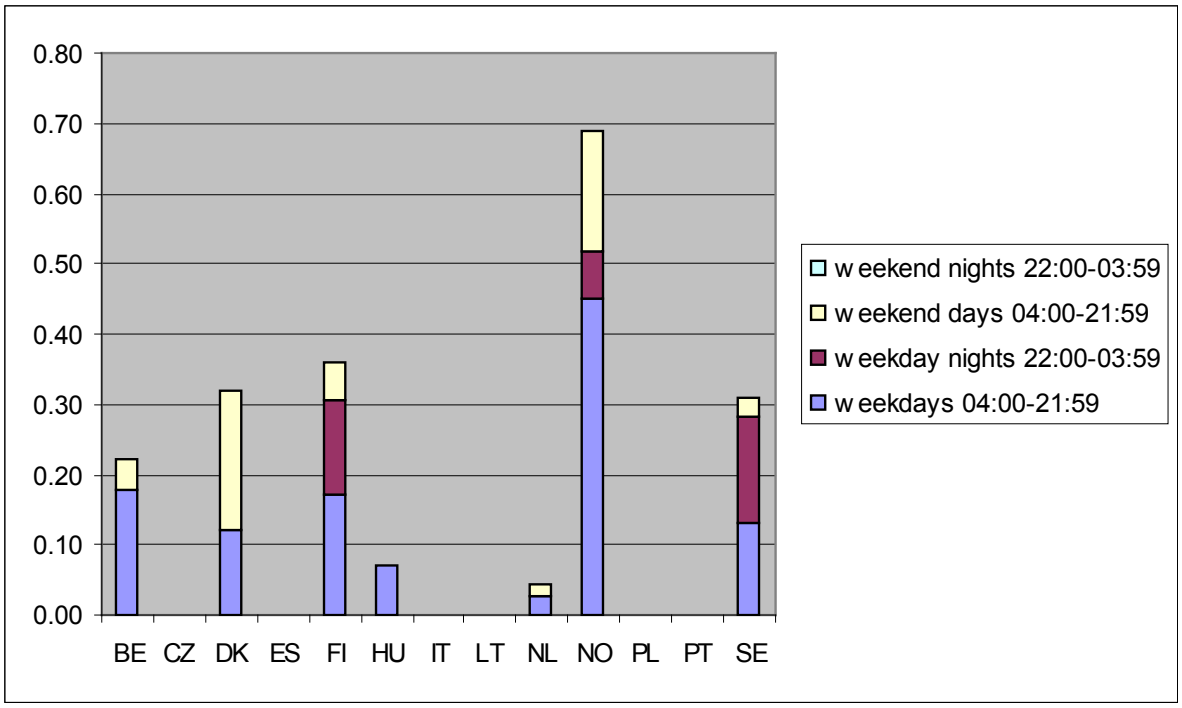

Figure 4.3.7.7. Distribution of the prevalence of Z-drugs alone among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

4.3.8 Medicinal opiates and opioids

Medicinal opiates and opioids are medicinal drugs that are used as antitussives or pain-killers. A user has in general feelings of sleepiness, drowsiness or calmness and has lower sense of pain. The depressant effect of opiates can be that heavy that drivers don't feel able or motivated to drive a vehicle. The effects of medicinal opiates and opioids vary per type of substance (Kelly et al., 2004; Scheers et al., 2006; Steyvers and Brookhuis, 1996).
The results of the roadside surveys are presented for single use of medicinal opiates and opioids. The combination of medicinal opiates and opioids with a substance from another substance group is regarded as combinational use. The share of combinational use in relation to single use is presented in table 4.3.8.1 and figure 4.3.8.2.
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.8.1. General results

The medicinal opiates and opioids group consists of morphine, codeine, methadone and tramadol. The cut-off levels for these substances are presented in table 2.2. As tramadol was originally not part of the core drugs, it was not measured in Finland and the Netherlands.

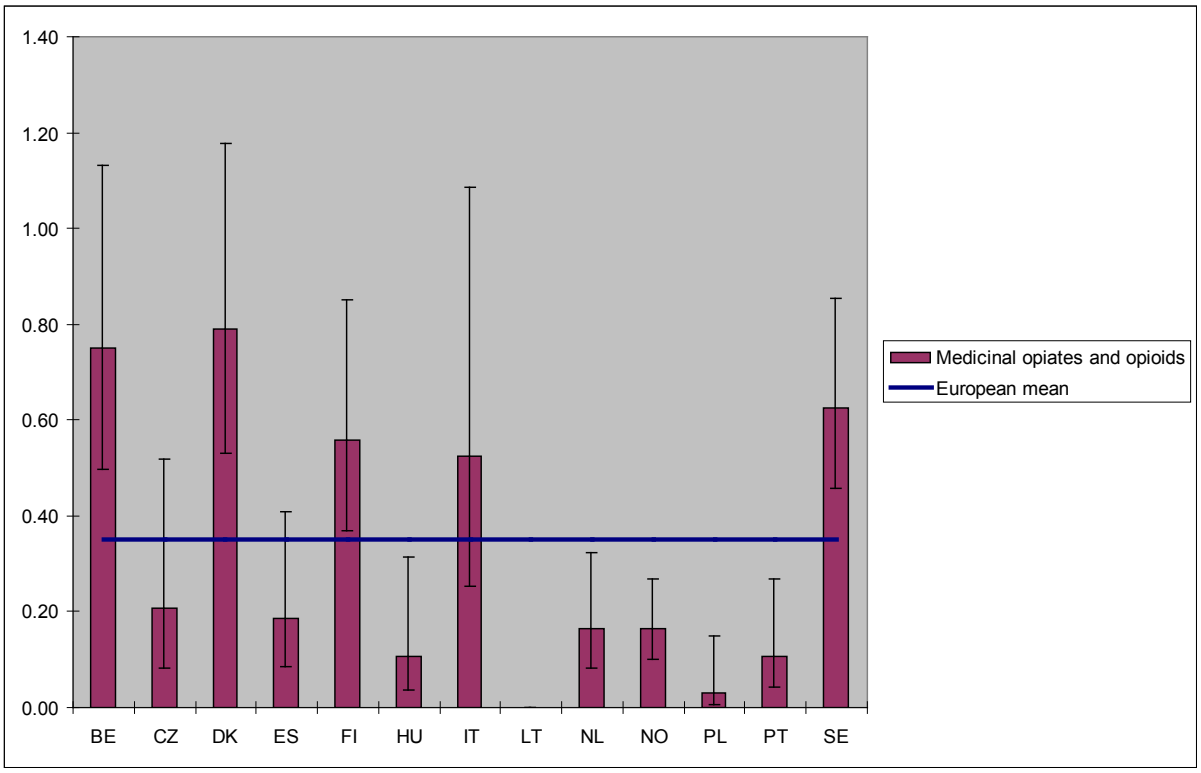

Figure 4.3.8.1. Prevalence of medicinal opiates and opioids alone by country; prevalence in percentages

Figure 4.3.8.1 presents the prevalence of medicinal opiates and opioids by country. The highest prevalence is found in Denmark, Belgium, Sweden, Finland and Italy. No medicinal opiates and opioids were detected among drivers in Lithuania. The average use of medicinal opiates and opioids by drivers in Europe is 0.35%.

Table 4.3.8.1 and figure 4.3.8.2 show that in Hungary, Italy and Portugal medicinal opiates and opioids are relatively often used in combination with other psychoactive substances. In Czech Republic, Spain, and Poland only single use was detected.

Table 4.3.8.1. Prevalence of medicinal opiates and opioids alone and medicinal opiates and opioids in combination with other psychoactive substances; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
Med. opiates and opioids alone	0.75	0.21	0.79	0.19	0.56	0.11	0.53	-	0.16	0.16	0.03	0.11	0.63
Med. opiates and opioids in combi	0.23	-	0.01	-	0.09	0.19	0.70	-	0.05	0.08	-	0.09	0.11
Total	0.98	0.21	0.80	0.19	0.65	0.30	1.23	-	0.21	0.24	0.03	0.19	0.74
Share	23%	0%	1%	0%	14%	63%	57%	-	24%	33%	0%	45%	15%

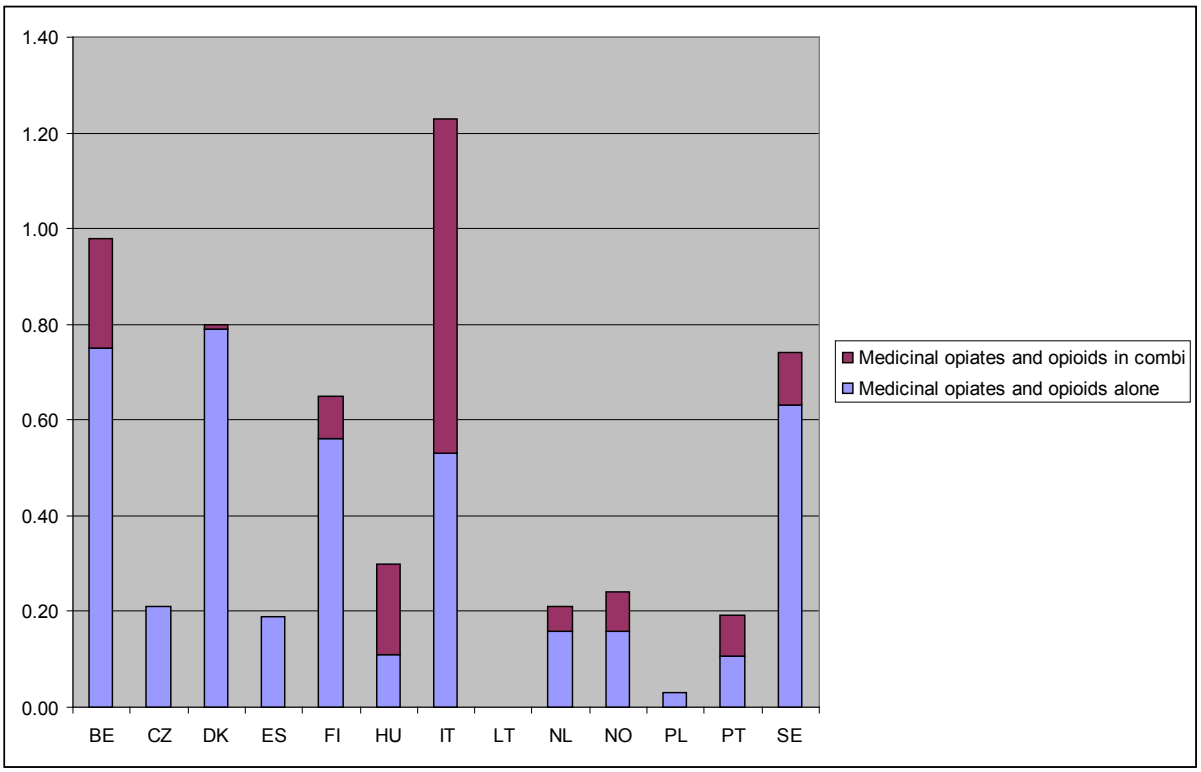

Figure 4.3.8.2. Prevalence of medicinal opiates and opioids alone and medicinal opiates and opioids in combination with other psychoactive substances; prevalence in percentages

4.3.8.2 Medicinal opiates and opioids use by gender and age

Table 4.3.8.2 provides an overview of the prevalence of medicinal opiates and opioids distributed by age. The highest prevalence was detected among drivers in Denmark and Finland aged 50+, 1.03% and 1.10% respectively, and for drivers in Belgium aged 34-49 years (0.96%).

Table 4.3.8.2. Prevalence of medicinal opiates and opioids alone by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE	0.72	0.00	0.96	0.79	0.75
(n=2949)	*0.21 - 2.5*	*0 - 0.62*	*0.53 - 1.73*	*0.39 - 1.61*	*0.5 - 1.13*
CZ	0.00	0.38	0.00	0.41	0.21
(n=2037)	*0 - 1.56*	*0.11 - 1.33*	*0 - 0.53*	*0.12 - 1.43*	*0.08 - 0.52*
DK	0.00	0.90	0.56	1.10	0.79
(n=3002)	*0 - 1.71*	*0.36 - 2.2*	*0.26 - 1.21*	*0.65 - 1.86*	*0.53 - 1.18*
ES	0.00	0.16	0.42	0.00	0.19
(n=3174)	*0 - 0.65*	*0.04 - 0.65*	*0.17 - 1.05*	*0 - 0.78*	*0.09 - 0.41*
FI	0.00	0.68	0.09	1.03	0.56
(n=3842)	*0 - 0.9*	*0.29 - 1.58*	*0.02 - 0.49*	*0.63 - 1.69*	*0.37 - 0.85*
HU	0.00	0.11	0.09	0.16	0.11
(n=2741)	*0 - 1.49*	*0.02 - 0.63*	*0.01 - 0.57*	*0.03 - 0.87*	*0.04 - 0.32*
IT	0.00	0.00	1.39	0.00	0.53
(n=1311)	*0 - 1.21*	*0 - 0.88*	*0.67 - 2.85*	*0 - 5.26*	*0.25 - 1.09*
NL	0.04	0.00	0.12	0.36	0.16
(n=4822)	*0 - 0.83*	*0 - 0.38*	*0.03 - 0.43*	*0.16 - 0.8*	*0.08 - 0.32*
NO	0.00	0.00	0.21	0.25	0.16
(n=9236)	*0 - 0.39*	*0 - 0.23*	*0.1 - 0.44*	*0.13 - 0.48*	*0.1 - 0.27*
PL	0.00	0.00	0.10	0.00	0.03
(n=4008)	*0 - 0.64*	*0 - 0.28*	*0.02 - 0.49*	*0 - 0.45*	*0.01 - 0.15*
PT	0.00	0.00	0.28	0.07	0.11
(n=3965)	*0 - 0.72*	*0 - 0.32*	*0.11 - 0.75*	*0.01 - 0.57*	*0.04 - 0.27*
SE	0.12	0.23	0.43	0.98	0.63
(n=6198)	*0.01 - 1*	*0.07 - 0.81*	*0.22 - 0.83*	*0.68 - 1.42*	*0.46 - 0.86*

Figure 4.3.8.3 shows that in all countries medicinal opiates and opioids were mainly detected among drivers of 35 years and older.

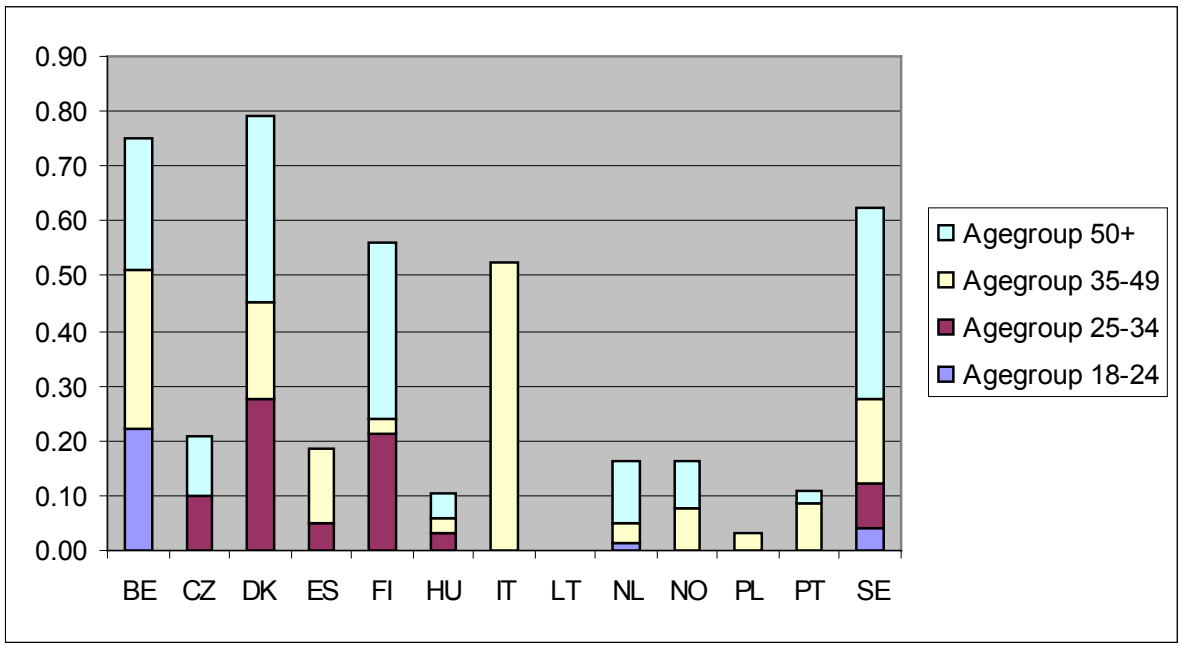

Figure 4.3.8.3. Distribution of the prevalence of medicinal opiates and opioids alone among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Figure 4.3.8.4 presents an overview of the prevalence of medicinal opiates and opioids by gender. In most countries the share of female drivers is larger, except for Spain, Finland, Norway and Portugal where the share of male drivers positive for medicinal opiates and opioids was larger.

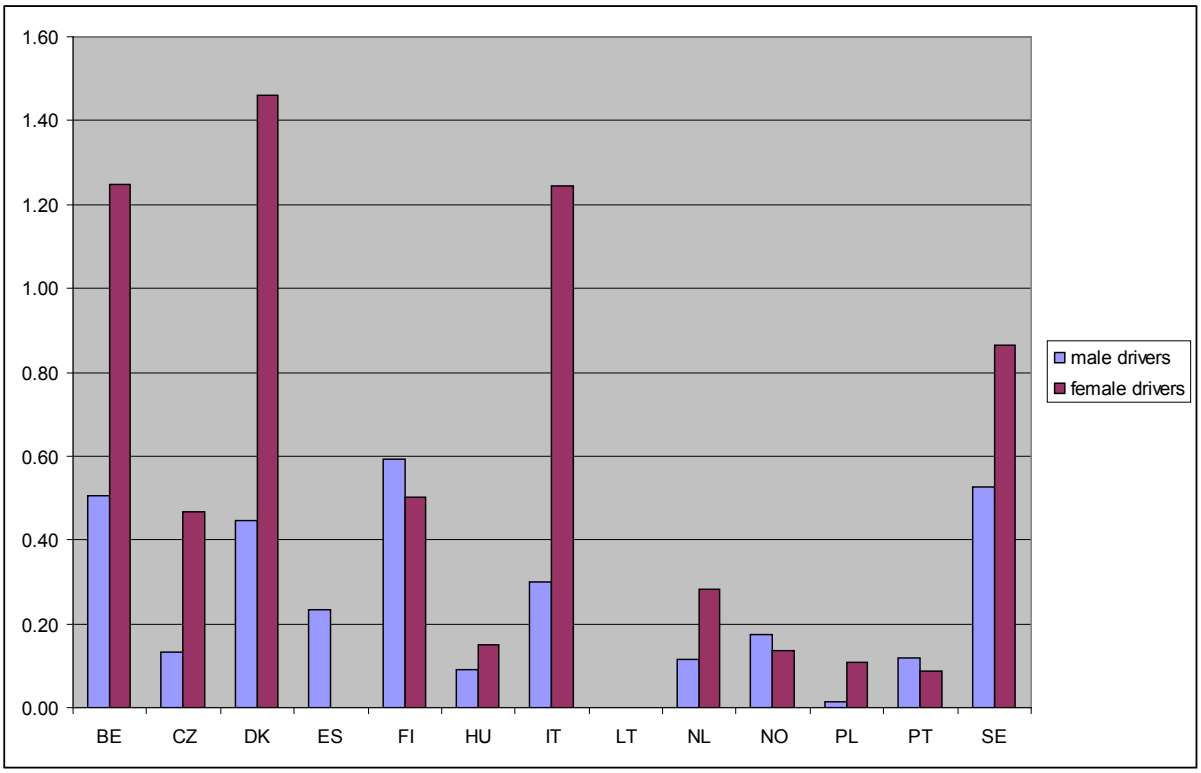

Figure 4.3.8.4. Prevalence of medicinal opiates and opioids alone by gender; prevalence in percentages

Table 4.3.8.3 provides an overview of the prevalence of medicinal opiates and opioids among male drivers distributed by age. The highest prevalence was detected among male drivers in Finland aged 25-34 years (1.06%), and for drivers in Denmark aged 50+ (1.00%).

Table 4.3.8.3. Prevalence of medicinal opiates and opioids alone among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE	0.63	0.00	0.61	0.32	0.51
(n=1957)	*0.12 - 3.15*	*0 - 1.03*	*0.25 - 1.49*	*0.09 - 1.12*	*0.28 - 0.93*
CZ	0.00	0.00	0.00	0.47	0.13
(n=1589)	*0 - 2.39*	*0 - 0.91*	*0 - 0.68*	*0.13 - 1.63*	*0.04 - 0.47*
DK	0.00	0.00	0.05	1.00	0.45
(n=1975)	*0 - 2.56*	*0 - 1.22*	*0 - 0.66*	*0.52 - 1.93*	*0.23 - 0.85*
ES	0.00	0.20	0.52	0.00	0.23
(n=2520)	*0 - 0.82*	*0.05 - 0.83*	*0.21 - 1.29*	*0 - 0.9*	*0.11 - 0.51*
FI	0.00	1.06	0.07	0.88	0.59
(n=2511)	*0 - 1.35*	*0.46 - 2.46*	*0.01 - 0.67*	*0.47 - 1.64*	*0.36 - 0.97*
HU	0.00	0.08	0.05	0.19	0.09
(n=2062)	*0 - 2.09*	*0.01 - 0.73*	*0 - 0.63*	*0.03 - 1.07*	*0.02 - 0.34*
IT	0.00	0.00	0.84	0.00	0.30
(n=998)	*0 - 1.51*	*0 - 1.09*	*0.29 - 2.45*	*0 - 8.08*	*0.1 - 0.88*
NL	0.06	0.00	0.00	0.32	0.11
(n=3363)	*0 - 1.2*	*0 - 0.52*	*0 - 0.33*	*0.12 - 0.85*	*0.04 - 0.3*
NO	0.00	0.00	0.26	0.23	0.18
(n=6520)	*0 - 0.56*	*0 - 0.34*	*0.12 - 0.58*	*0.1 - 0.5*	*0.1 - 0.31*
PL	0.00	0.00	0.05	0.00	0.01
(n=3331)	*0 - 0.77*	*0 - 0.35*	*0.01 - 0.48*	*0 - 0.5*	*0 - 0.14*
PT	0.00	0.00	0.30	0.09	0.12
(n=2541)	*0 - 1.2*	*0 - 0.54*	*0.09 - 0.97*	*0.01 - 0.71*	*0.04 - 0.35*
SE	0.00	0.09	0.28	0.89	0.53
(n=4352)	*0 - 1.12*	*0.01 - 0.77*	*0.1 - 0.75*	*0.57 - 1.39*	*0.35 - 0.79*

Figure 4.3.8.5 shows that only in Belgium and the Netherlands young male drivers were detected for medicinal opiates and opioids. In all other countries except for Finland, the largest shares were found for male drivers aged 35 and older.

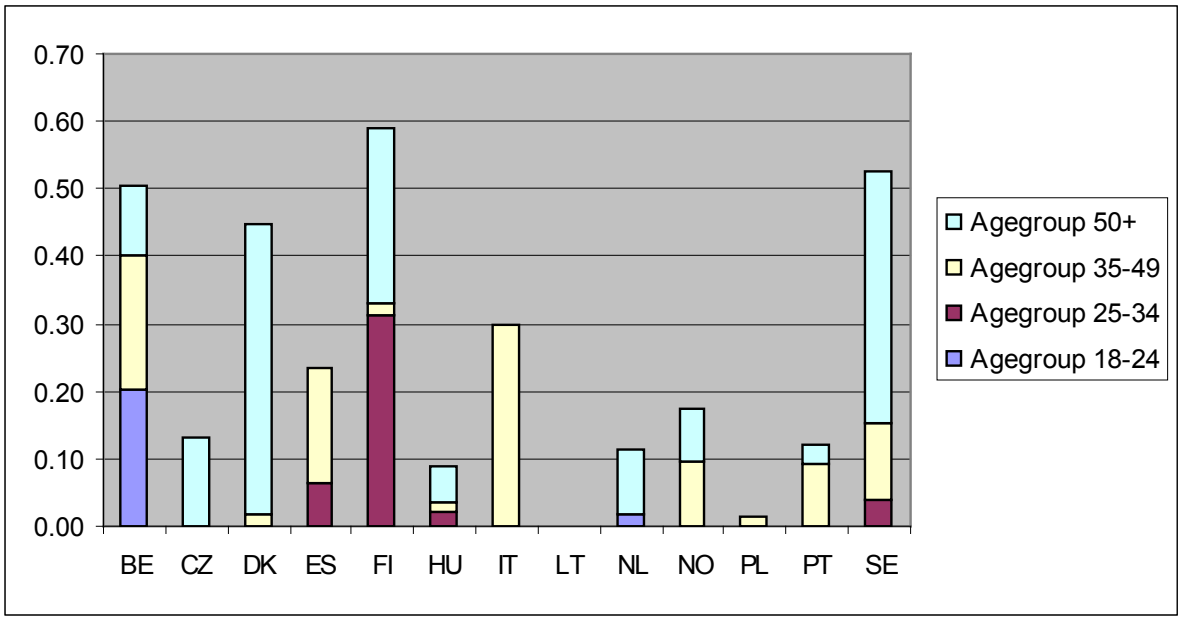

Figure 4.3.8.5. Distribution of the prevalence of medicinal opiates and opioids alone among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.8.4 presents an overview of the prevalence of medicinal opiates and opioids among female drivers distributed by age. The highest prevalence was detected among female drivers in Italy aged 35-49 (2.76%), in Denmark aged 25-34 years (2.50%), drivers in Belgium aged 50 years and older (2.06%).

Table 4.3.8.4. Prevalence of medicinal opiates and opioids alone among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE	0.88	0.00	1.66	2.06	1.25
(n=971)	*0.15 - 4.92*	*0 - 1.52*	*0.77 - 3.56*	*0.89 - 4.72*	*0.72 - 2.16*
CZ	0.00	1.53	0.00	0.00	0.47
(n=448)	*0 - 4.32*	*0.43 - 5.27*	*0 - 2.31*	*0 - 5.68*	*0.13 - 1.64*
DK	0.00	2.50	1.41	1.34	1.46
(n=1015)	*0 - 4.97*	*1.01 - 6.02*	*0.63 - 3.1*	*0.56 - 3.13*	*0.89 - 2.4*
ES	0.00	0.00	0.00	0.00	0.00
(n=605)	*0 - 3.16*	*0 - 1.68*	*0 - 1.91*	*0 - 5.56*	*0 - 0.61*
FI	0.00	0.00	0.14	1.46	0.50
(n=1283)	*0 - 2.71*	*0 - 1.44*	*0.02 - 1.03*	*0.66 - 3.2*	*0.24 - 1.06*
HU	0.00	0.21	0.21	0.00	0.15
(n=679)	*0 - 4.9*	*0.02 - 1.96*	*0.02 - 1.96*	*0 - 3.08*	*0.03 - 0.84*
IT	0.00	0.00	2.76	0.00	1.24
(n=313)	*0 - 5.82*	*0 - 4.35*	*1.07 - 6.96*	*0 - 13.07*	*0.48 - 3.19*
NL	0.00	0.00	0.35	0.47	0.28
(n=1454)	*0 - 2.42*	*0 - 1.33*	*0.1 - 1.26*	*0.13 - 1.68*	*0.11 - 0.71*
NO	0.00	0.00	0.10	0.30	0.13
(n=2709)	*0 - 1.21*	*0 - 0.75*	*0.02 - 0.56*	*0.09 - 0.95*	*0.05 - 0.36*
PL	0.00	0.00	0.30	0.00	0.11
(n=672)	*0 - 3.51*	*0 - 1.51*	*0.04 - 2.12*	*0 - 4.88*	*0.01 - 0.77*
PT	0.00	0.00	0.25	0.00	0.09
(n=1342)	*0 - 1.79*	*0 - 0.77*	*0.05 - 1.26*	*0 - 2.21*	*0.02 - 0.43*
SE	0.39	0.53	0.72	1.25	0.87
(n=1835)	*0.04 - 3.28*	*0.13 - 2.16*	*0.3 - 1.68*	*0.66 - 2.38*	*0.53 - 1.4*

Figure 4.3.8.6 shows that in Czech Republic all female drivers that had been detected using medicinal opiates and opioids were aged 25-34, whereas all positive men were aged 50 and older. In general the usage was most prevalent among female drivers aged 35 and older. However, in Czech Republic, Denmark, Sweden and Hungary the relative share of drivers aged below 35 years of age was large.

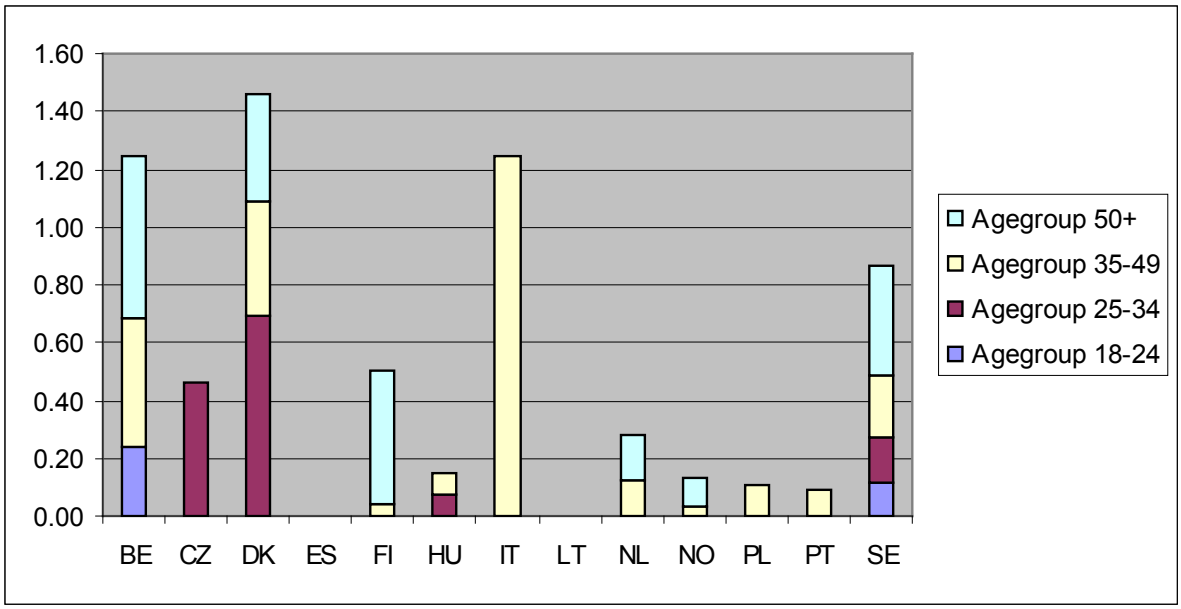

Figure 4.3.8.6. Distribution of the prevalence of medicinal opiates and opioids alone among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.8.3 Medicinal opiates and opioids use by time period

Table 4.3.8.5 provides an overview of the prevalence of medicinal opiates and opioids by time period. The highest prevalences by far were detected among drivers in Denmark during weekend nights (2.86%).

Table 4.3.8.5. Prevalence of medicinal opiates and opioids alone by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE	0.98	0.00	0.30	0.39	0.75
(n=2949)	*0.63 - 1.5*	*0 - 2.2*	*0.08 - 1.08*	*0.03 - 5.59*	*0.5 - 1.13*
CZ	0.07	0.00	0.51	0.00	0.21
(n=2037)	*0.01 - 0.41*	*0 - 8.62*	*0.18 - 1.42*	*0 - 15.86*	*0.08 - 0.52*
DK	0.72	0.49	0.81	2.86	0.79
(n=3002)	*0.44 - 1.18*	*0.04 - 5.96*	*0.37 - 1.74*	*0.82 - 9.49*	*0.53 - 1.18*
ES	0.14	0.16	0.32	0.23	0.19
(n=3174)	*0.05 - 0.41*	*0.01 - 3.25*	*0.1 - 1.01*	*0.02 - 2.8*	*0.09 - 0.41*
FI	0.69	0.72	0.27	0.00	0.56
(n=3842)	*0.43 - 1.09*	*0.12 - 4.21*	*0.09 - 0.82*	*0 - 4.76*	*0.37 - 0.85*
HU	0.13	0.52	0.00	0.00	0.11
(n=2741)	*0.04 - 0.41*	*0.04 - 6.69*	*0 - 0.59*	*0 - 6.88*	*0.04 - 0.32*
IT	0.73	0.00	0.00	0.00	0.53
(n=1311)	*0.35 - 1.51*	*0 - 11.31*	*0 - 1.22*	*0 - 13.37*	*0.25 - 1.09*
NL	0.20	0.15	0.08	0.00	0.16
(n=4822)	*0.09 - 0.41*	*0.01 - 2.87*	*0.01 - 0.51*	*0 - 2.87*	*0.08 - 0.32*
NO	0.21	0.00	0.11	0.00	0.16
(n=9236)	*0.12 - 0.36*	*0 - 0.69*	*0.03 - 0.35*	*0 - 0.83*	*0.1 - 0.27*
PL	0.00	0.00	0.13	0.00	0.03
(n=4008)	*0 - 0.13*	*0 - 4*	*0.03 - 0.63*	*0 - 4.81*	*0.01 - 0.15*
PT	0.08	0.00	0.20	0.00	0.11
(n=3965)	*0.03 - 0.27*	*0 - 4.98*	*0.05 - 0.77*	*0 - 4.89*	*0.04 - 0.27*
SE	0.68	0.00	0.56	0.00	0.63
(n=6198)	*0.48 - 0.97*	*0 - 3.01*	*0.29 - 1.08*	*0 - 3.01*	*0.46 - 0.86*

Figure 4.3.8.7 shows that the distribution over the four different DRUID time periods varies largely, but in general medicinal opiates and opiods were detected most often during daytime hours. However, in Denmark most medicinal opiates and opioids were detected in weekend nights and in Finland during weeknights.

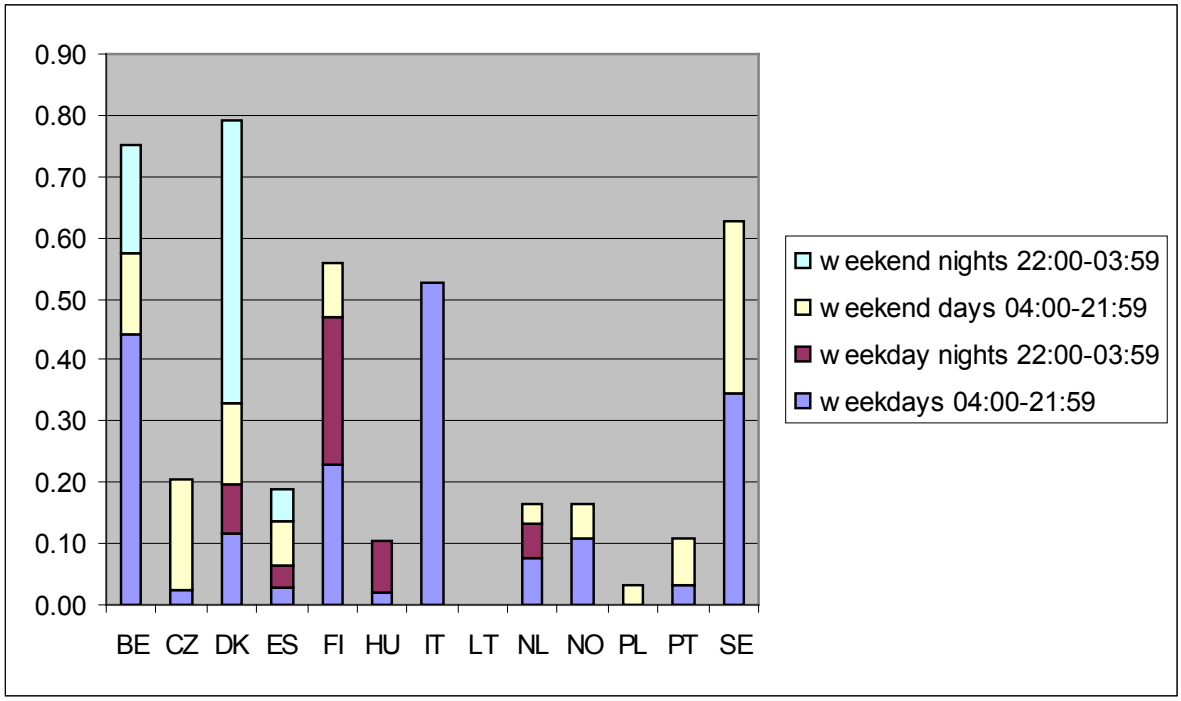

Figure 4.3.8.7. Distribution of the prevalence of medicinal opiates and opioids alone among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

4.3.9 Alcohol and drugs

In the previous sections we have provided an overview of the results for alcohol and drug use separately. In this section we will present the results of the use of alcohol and drugs in combination with each other. The combination of alcohol and drugs can cause larger impairing effects than one of the substances alone (Kelly et al., 2004; Scheers et al., 2006; Steyvers and Brookhuis, 1996).
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.9.1 General results

The group alcohol and drugs consist of alcohol ≥ 0.1 g/L in combination with one or more other psychoactive substances, excluding THC-COOH which is regarded as negative. The cut-off levels for the psychoactive substances are presented in table 2.2.

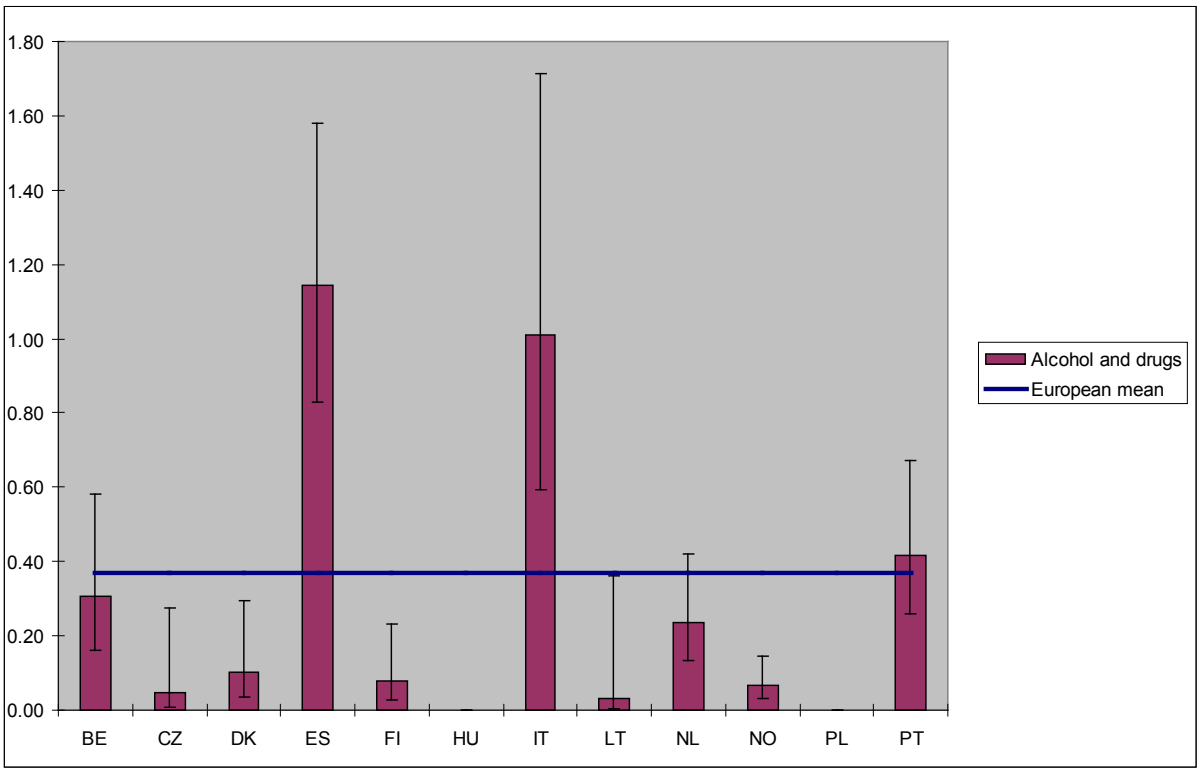

Figure 4.3.9.1. Combined use of alcohol and drugs by country

Figure 4.3.9.1 presents the prevalence of combined use of alcohol and drugs for 12 of the 13 countries, since no alcohol results were available for Sweden. The prevalence was the highest in Spain and Italy, followed by Portugal and Belgium. No combined use of alcohol and drugs was detected among drivers in Hungary and Poland. The average prevalence for alcohol-drug combinations in Europe is 0.37%.
No alcohol-drug combinations were encountered in Hungary, Poland and Sweden (the latter because no Swedish alcohol data were available).

4.3.9.2 Use of alcohol-drugs combinations by gender and age

Table 4.3.9.1 presents an overview of the prevalence of alcohol-drugs combinations among drivers by age. The highest prevalence was detected among drivers in Spain aged 18-24 (1.82%) and 25-34 years (1.52%), drivers in Italy aged 25-34 years (1.27%) and 35-49 years (1.49%), and drivers in Portugal aged 18-24 (1.22%).

Table 4.3.9.1. Prevalence of alcohol-drugs combinations by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE	0.83	0.22	0.11	0.43	0.31
(n=2949)	*0.26 - 2.67*	*0.05 - 1.01*	*0.02 - 0.55*	*0.17 - 1.11*	*0.16 - 0.58*
CZ	0.41	0.00	0.00	0.00	0.05
(n=2037)	*0.07 - 2.3*	*0 - 0.69*	*0 - 0.53*	*0 - 0.74*	*0.01 - 0.28*
DK	0.00	0.34	0.13	0.00	0.10
(n=3002)	*0 - 1.71*	*0.08 - 1.37*	*0.03 - 0.59*	*0 - 0.32*	*0.03 - 0.3*
ES	1.82	1.52	0.90	0.15	1.14
(n=3174)	*1.01 - 3.27*	*0.93 - 2.47*	*0.48 - 1.7*	*0.02 - 1.06*	*0.83 - 1.58*
FI	0.00	0.00	0.11	0.12	0.08
(n=3842)	*0 - 0.9*	*0 - 0.52*	*0.02 - 0.51*	*0.03 - 0.47*	*0.03 - 0.23*
IT	0.09	1.27	1.49	0.13	1.01
(n=1311)	*0.01 - 1.38*	*0.57 - 2.84*	*0.73 - 2.98*	*0 - 5.51*	*0.59 - 1.71*
LT	0.00	0.00	0.00	0.13	0.03
(n=1267)	*0 - 2.16*	*0 - 1.18*	*0 - 0.83*	*0.01 - 1.53*	*0 - 0.36*
NL	0.53	0.60	0.13	0.02	0.24
(n=4822)	*0.17 - 1.63*	*0.28 - 1.3*	*0.04 - 0.45*	*0 - 0.28*	*0.13 - 0.42*
NO	0.08	0.12	0.03	0.08	0.07
(n=9236)	*0.01 - 0.53*	*0.03 - 0.45*	*0 - 0.17*	*0.02 - 0.24*	*0.03 - 0.15*
PT	1.22	0.75	0.03	0.05	0.42
(n=3965)	*0.58 - 2.56*	*0.39 - 1.42*	*0 - 0.35*	*0 - 0.53*	*0.26 - 0.67*

Figure 4.3.9.2 shows that most drivers were younger than 35 years old, except for Italy, where the drugs-alcohol combination was relatively more prevalent among drivers over 35 years old.

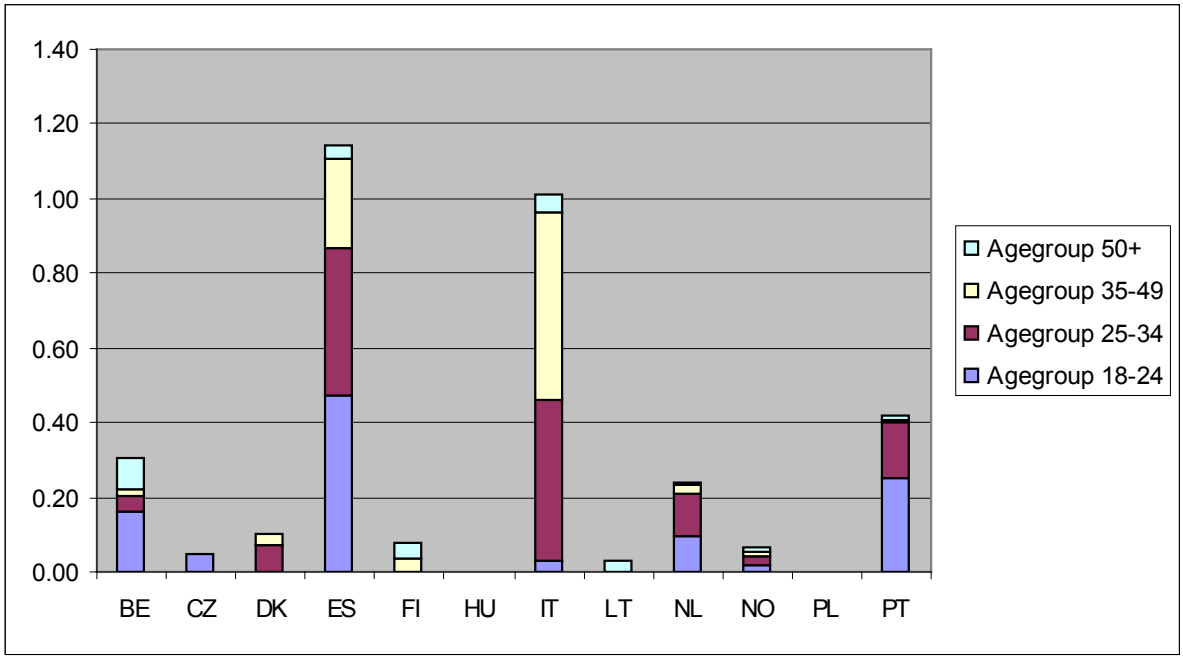

Figure 4.3.9.2. Distribution of the prevalence alcohol-drugs combinations among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Figure 4.3.9.3 presents the distribution of alcohol-drugs combinations among drivers by gender. In most countries the share of male drivers positive for alcohol-drugs combinations is much higher than the share of female drivers. However, in Italy the share is almost the same.

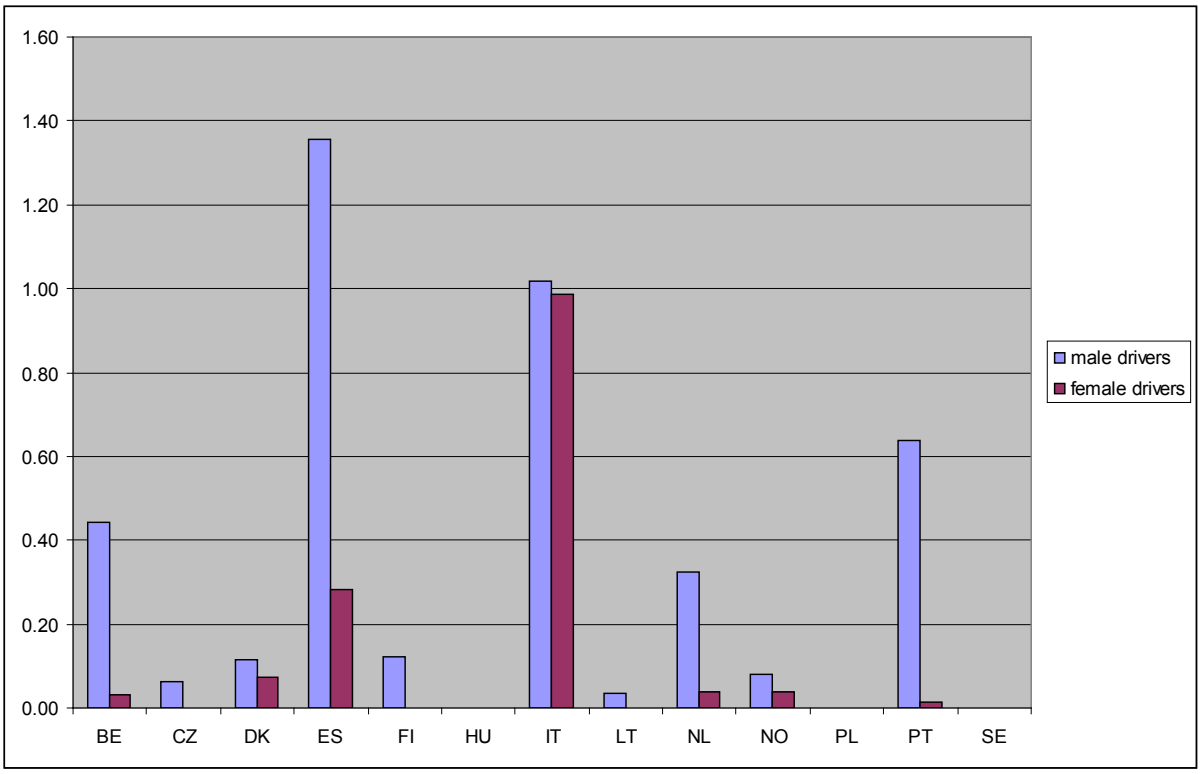

Figure 4.3.9.3. Alcohol-drugs combinations by gender

Table 4.3.9.2 presents an overview of the prevalence of alcohol-drug combinations among male drivers distributed by age group. The highest prevalence was detected among young males aged 18-24 in Spain (2.22%) and Portugal (2.05%). In Italy the prevalence was the highest among male drivers aged 25-34 (1.55%). In Hungary and Poland no male drivers were positive for alcohol-drugs combinations.

Table 4.3.9.2. Prevalence of alcohol-drugs combinations among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE (n=1957)	1.33 *0.41 - 4.22*	0.37 *0.08 - 1.69*	0.13 *0.02 - 0.75*	0.59 *0.23 - 1.52*	0.44 *0.23 - 0.85*
CZ (n=1589)	0.63 *0.11 - 3.51*	0.00 *0 - 0.91*	0.00 *0 - 0.68*	0.00 *0 - 0.84*	0.06 *0.01 - 0.35*
DK (n=1975)	0.00 *0 - 2.56*	0.53 *0.13 - 2.14*	0.10 *0.01 - 0.76*	0.00 *0 - 0.45*	0.12 *0.03 - 0.39*
ES (n=2520)	2.22 *1.22 - 3.99*	1.86 *1.13 - 3.04*	1.03 *0.53 - 1.99*	0.18 *0.03 - 1.22*	1.35 *0.97 - 1.88*
FI (n=2511)	0.00 *0 - 1.35*	0.00 *0 - 0.8*	0.18 *0.04 - 0.87*	0.17 *0.04 - 0.65*	0.12 *0.04 - 0.35*
IT (n=998)	0.11 *0.01 - 1.72*	1.55 *0.69 - 3.48*	1.24 *0.5 - 3.01*	0.21 *0 - 8.47*	1.02 *0.56 - 1.86*
LT (n=1130)	0.00 *0 - 2.38*	0.00 *0 - 1.4*	0.00 *0 - 0.9*	0.14 *0.01 - 1.62*	0.03 *0 - 0.4*
NL (n=3363)	0.67 *0.2 - 2.2*	0.81 *0.37 - 1.77*	0.20 *0.06 - 0.67*	0.03 *0 - 0.39*	0.32 *0.18 - 0.58*
NO (n=6520)	0.11 *0.02 - 0.77*	0.18 *0.05 - 0.64*	0.04 *0.01 - 0.25*	0.06 *0.01 - 0.26*	0.08 *0.03 - 0.18*
PT (n=2541)	2.05 *0.97 - 4.28*	1.28 *0.68 - 2.42*	0.04 *0 - 0.54*	0.03 *0 - 0.61*	0.64 *0.39 - 1.03*

Figure 4.3.9.4. shows that alcohol-drugs combinations are especially prevalent among drivers aged 18-34 from Southern European countries. In Finland and Lithuania, most drivers positive for these combinations were 35 years and older.

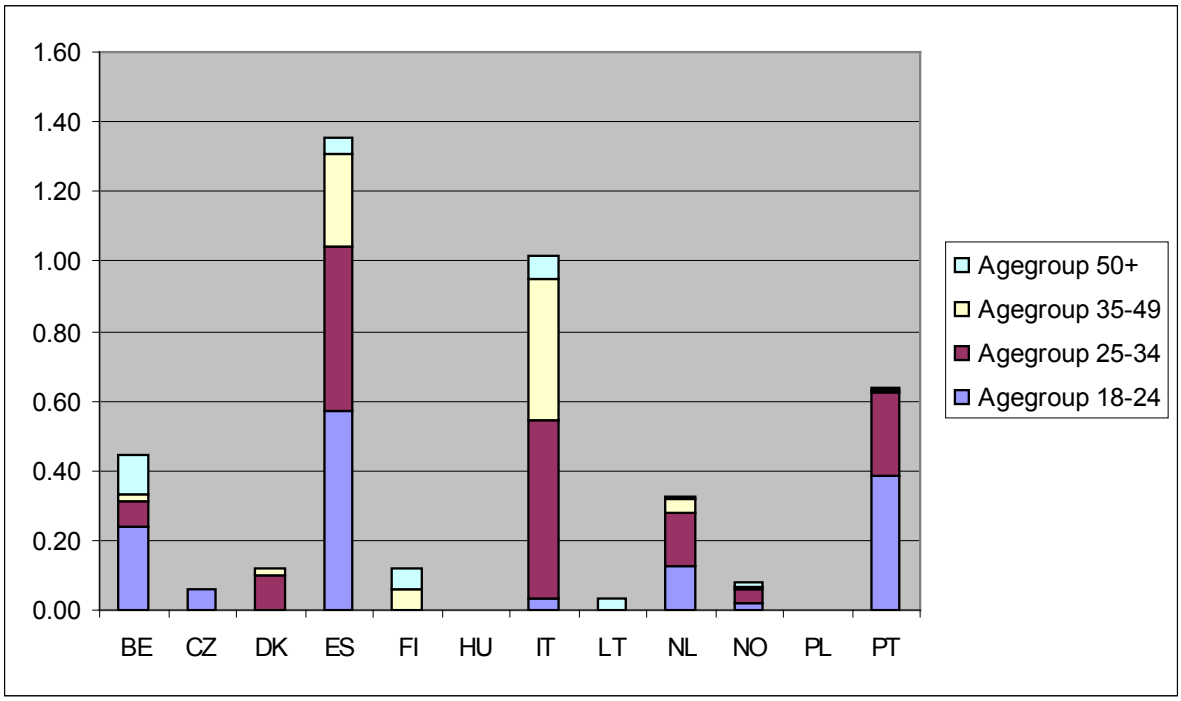

Figure 4.3.9.4. Distribution of the prevalence alcohol-drugs combinations among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.9.3 presents an overview of the prevalence of alcohol-drugs combinations among female drivers distributed by age. The highest prevalence by far was detected among female drivers in Italy aged 35-49 (2.12%).

Table 4.3.9.3. Prevalence of alcohol-drugs combinations among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE (n=971)	0.00 *0 - 3.37*	0.00 *0 - 1.52*	0.08 *0.01 - 1.19*	0.00 *0 - 1.55*	0.03 *0 - 0.45*
CZ (n=448)	0.00 *0 - 4.32*	0.00 *0 - 2.73*	0.00 *0 - 2.31*	0.00 *0 - 5.68*	0.00 *0 - 0.85*
DK (n=1015)	0.00 *0 - 4.97*	0.00 *0 - 2.15*	0.19 *0.03 - 1.28*	0.00 *0 - 1.05*	0.07 *0.01 - 0.51*
ES (n=605)	0.28 *0.02 - 3.68*	0.31 *0.04 - 2.25*	0.37 *0.05 - 2.58*	0.00 *0 - 5.56*	0.28 *0.07 - 1.1*
FI (n=1283)	0.00 *0 - 2.71*	0.00 *0 - 1.44*	0.00 *0 - 0.78*	0.00 *0 - 0.96*	0.00 *0 - 0.3*
IT (n=313)	0.00 *0 - 5.82*	0.11 *0 - 4.56*	2.12 *0.72 - 6.05*	0.00 *0 - 13.07*	0.99 *0.34 - 2.82*
LT (n=121)	0.00 *0 - 19*	0.00 *0 - 7.06*	0.00 *0 - 9.35*	0.00 *0 - 18.35*	0.00 *0 - 3.07*
NL (n=1454)	0.21 *0.02 - 2.82*	0.08 *0 - 1.47*	0.00 *0 - 0.66*	0.00 *0 - 0.88*	0.04 *0 - 0.33*
NO (n=2709)	0.00 *0 - 1.21*	0.00 *0 - 0.75*	0.00 *0 - 0.37*	0.13 *0.02 - 0.67*	0.04 *0.01 - 0.21*
PT (n=1342)	0.00 *0 - 1.79*	0.00 *0 - 0.77*	0.00 *0 - 0.81*	0.11 *0.01 - 2.43*	0.01 *0 - 0.31*

Figure 4.3.9.5 shows that the share of drugs-alcohol combinations is relatively large among female drivers of 35 years and older.

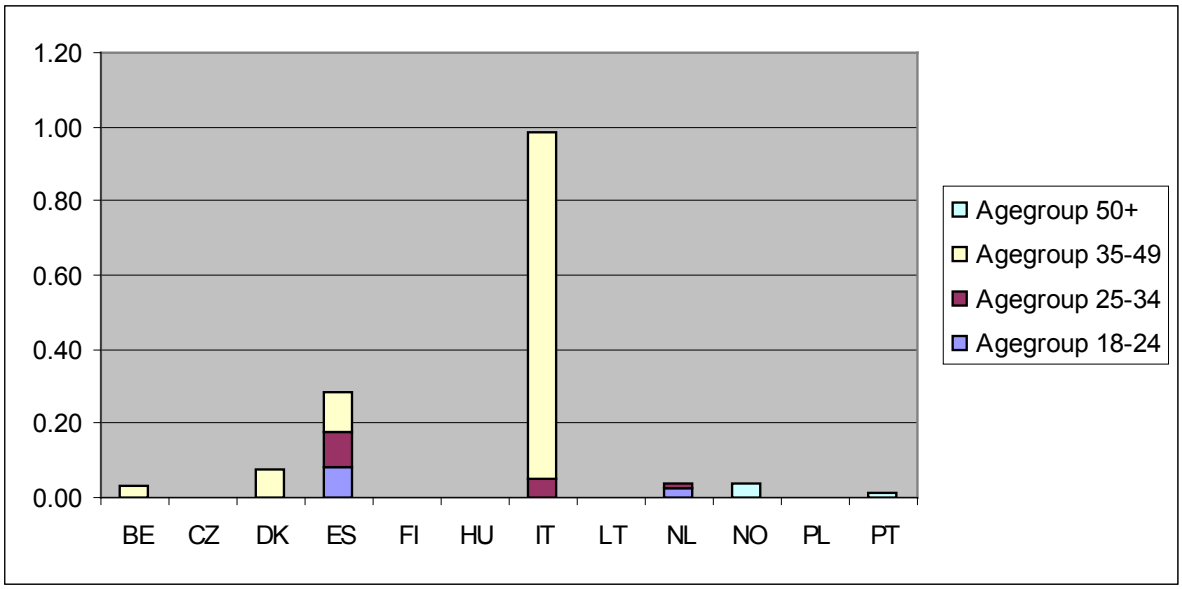

Figure 4.3.9.5. Distribution of the prevalence alcohol-drugs combinations among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.9.3 Use of alcohol-drugs combinations by time period

Table 4.3.9.4 presents an overview of the prevalence of drugs-alcohol combinations by time period. The highest prevalence was detected during night time hours in Spain (4.11% in weekday nights and 4.10% in weekend nights), and in night time hours in Italy (1.82% in weekday nights and 2.13% in weekend nights).

Table 4.3.9.4. Prevalence of alcohol-drugs combinations by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE (n=2949)	0.14 *0.05 - 0.43*	0.00 *0 - 2.2*	0.78 *0.34 - 1.79*	1.16 *0.19 - 6.9*	0.31 *0.16 - 0.58*
CZ (n=2037)	0.07 *0.01 - 0.42*	0.00 *0 - 8.62*	0.00 *0 - 0.59*	0.00 *0 - 15.86*	0.05 *0.01 - 0.28*
DK (n=3002)	0.06 *0.01 - 0.3*	0.49 *0.04 - 5.96*	0.10 *0.01 - 0.69*	0.82 *0.1 - 6.32*	0.10 *0.03 - 0.3*
ES (n=3174)	0.66 *0.39 - 1.1*	4.11 *1.8 - 9.12*	1.37 *0.76 - 2.44*	4.10 *1.95 - 8.42*	1.14 *0.83 - 1.58*
FI (n=3842)	0.12 *0.04 - 0.35*	0.00 *0 - 2.94*	0.00 *0 - 0.36*	0.00 *0 - 4.76*	0.08 *0.03 - 0.23*
IT (n=1311)	1.03 *0.56 - 1.91*	1.82 *0.21 - 14.34*	0.77 *0.23 - 2.5*	2.13 *0.23 - 16.82*	1.01 *0.59 - 1.71*
LT (n=1267)	0.00 *0 - 0.4*	0.00 *0 - 11.28*	0.15 *0.01 - 1.7*	0.00 *0 - 13.37*	0.03 *0 - 0.36*
NL (n=4822)	0.19 *0.09 - 0.4*	0.74 *0.14 - 3.89*	0.24 *0.07 - 0.76*	0.95 *0.19 - 4.52*	0.24 *0.13 - 0.42*
NO (n=9236)	0.06 *0.02 - 0.17*	0.13 *0.02 - 0.94*	0.04 *0.01 - 0.25*	0.20 *0.03 - 1.19*	0.07 *0.03 - 0.15*
PT (n=3965)	0.45 *0.26 - 0.76*	0.51 *0.04 - 5.9*	0.31 *0.1 - 0.94*	0.50 *0.04 - 5.8*	0.42 *0.26 - 0.67*

Figure 4.3.9.6 shows that the combined use of alcohol and drugs was mainly detected during night time hours. However, in Finland, Czech Republic and Belgium relatively large shares were found during daytime hours as well.

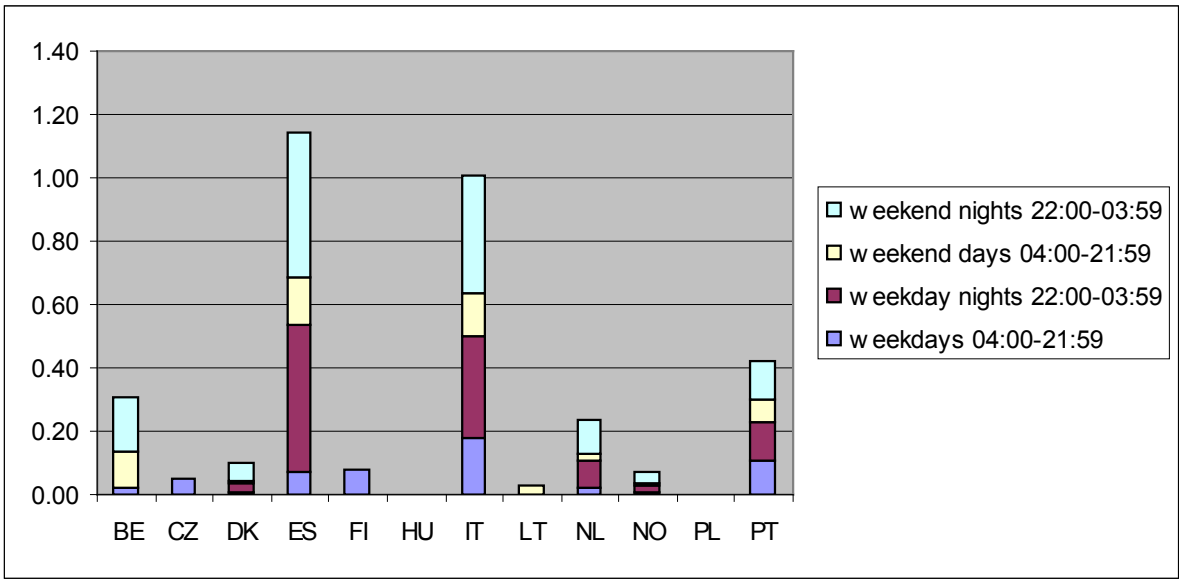

Figure 4.3.9.6. Distribution of the prevalence alcohol-drugs combinations among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

4.3.10 Drug-drug combinations

In the previous sections we have provided an overview of the results for drug use separately. In this section we will present the results of the multiple drug use. The effect of drug-drug combinations differs per the substances included and can cause larger impairing effects than one of the substances alone (Kelly et al., 2004; Scheers et al., 2006; Steyvers and Brookhuis, 1996).
The 95% confidence intervals can vary between countries and within countries for the different disaggregations. Therefore, differences between the participating countries should be interpreted with care, especially the differences for disaggregations by gender, age and time period.

4.3.10.1 General results

The group drug-drug combinations consist of the combination of two or more other psychoactive substances other than alcohol from at least two different groups of drugs, excluding THC-COOH which is regarded as negative. The cut-off levels for the psychoactive substances are presented in table 2.2.
Figure 4.3.10.1 presents the prevalence of multiple drug use for the 13 countries. The prevalence was the highest in Italy and Spain, which were the only two countries with a prevalence that was higher than the European mean of 0.39%. Most commonly used drugs in drug-drug combinations are THC, cocaine, and benzodiazepines.

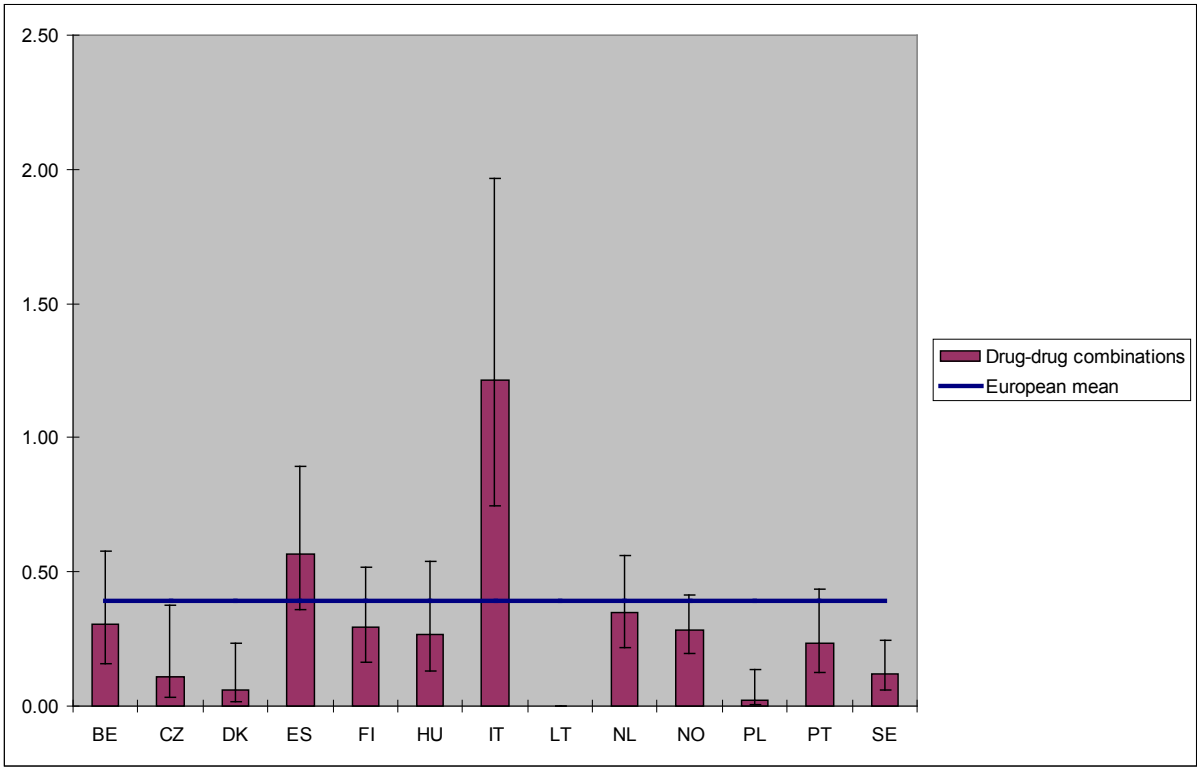

Figure 4.3.10.1. Prevalence of drug-drug combinations by country; prevalence in percentages

Table 4.3.10.1 and figure 4.3.10.2 give an overview of single drug use by drivers in comparison to multi-drug use. The share of multi-drug use is on average around 10% of all drug use. Italy has the highest share of multi-drug use: in 22% of the drivers that solely used drugs (and not alcohol and drugs) 2 or more drugs were detected.

Table 4.3.10.1. Prevalence of single drug use and drug-drug combinations; prevalence in percentages

	BE	CZ	DK	ES	FI	HU	IT	LT	NL	NO	PL	PT	SE
Drugs alone	3.62	1.65	1.80	9.23	1.83	1.91	4.19	1.63	2.77	2.27	0.88	4.41	1.23
Drugs in combi	0.30	0.11	0.06	0.57	0.29	0.27	1.22	-	0.35	0.28	0.02	0.23	0.12
Total	3.92	1.76	1.86	9.80	2.12	2.18	5.41	1.63	3.12	2.55	0.90	4.64	1.35
Share	8%	6%	3%	6%	14%	12%	22%	-	11%	11%	2%	5%	9%

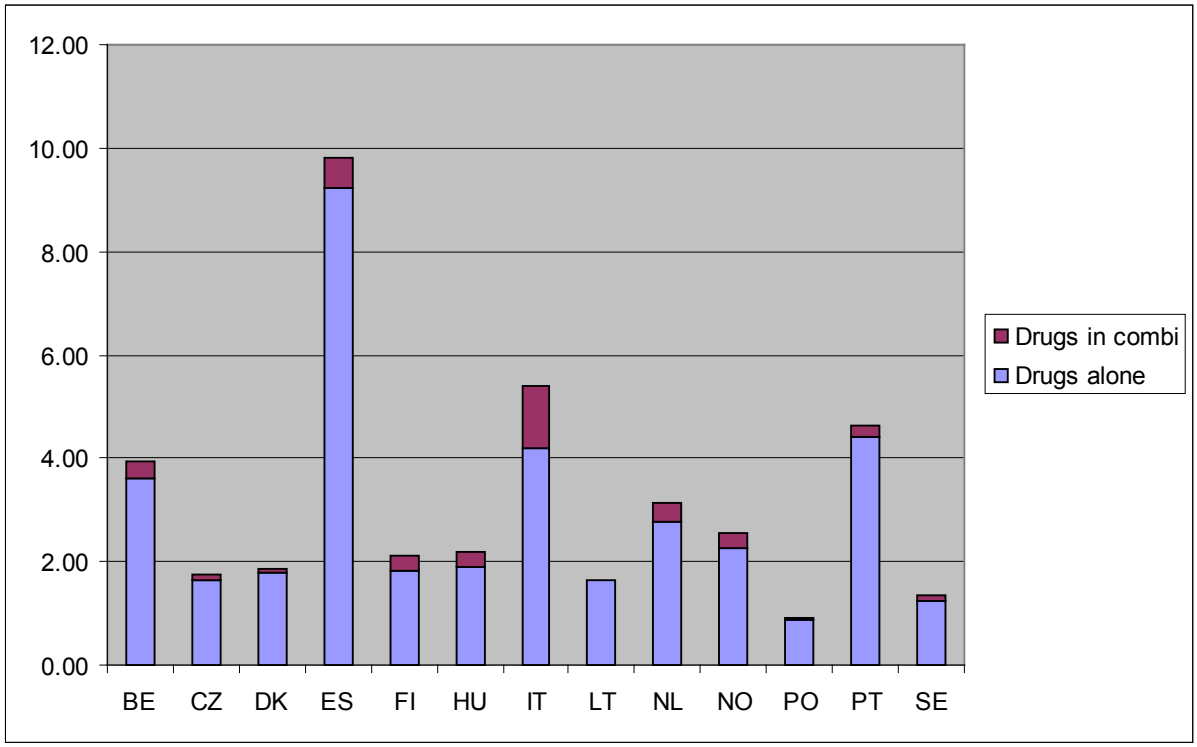

Figure 4.3.10.2. Prevalence of single drug use and drug-drug combinations; prevalence in percentages

4.3.10.2 Use of drug-drug combinations by gender and age

Table 4.3.10.2 presents an overview of the prevalence of drug-drug combinations by age. The highest prevalence was detected among drivers in Italy aged 18-49 (between 1.21 and 1.34% for the three age groups), and in the Netherlands by drivers aged 25-34 (0.96%).

Table 4.3.10.2. Prevalence of drug-drug combinations by age group; prevalence in percentages; 95% confidence intervals in italics

Total	18-24	25-34	35-49	50+	All ages
BE (n=2949)	0.85 *0.27 - 2.7*	0.43 *0.14 - 1.33*	0.00 *0 - 0.35*	0.42 *0.16 - 1.1*	0.30 *0.16 - 0.58*
CZ (n=2037)	0.05 *0 - 1.66*	0.38 *0.11 - 1.34*	0.00 *0 - 0.53*	0.00 *0 - 0.74*	0.11 *0.03 - 0.38*
DK (n=3002)	0.62 *0.14 - 2.8*	0.00 *0 - 0.78*	0.05 *0 - 0.44*	0.00 *0 - 0.32*	0.06 *0.02 - 0.24*
ES (n=3174)	0.54 *0.19 - 1.54*	0.62 *0.29 - 1.31*	0.80 *0.41 - 1.57*	0.04 *0 - 0.85*	0.57 *0.36 - 0.89*
FI (n=3842)	0.00 *0 - 0.9*	0.28 *0.08 - 1*	0.29 *0.11 - 0.8*	0.38 *0.17 - 0.84*	0.29 *0.16 - 0.52*
HU (n=2741)	0.00 *0 - 1.49*	0.54 *0.23 - 1.28*	0.26 *0.08 - 0.84*	0.00 *0 - 0.59*	0.27 *0.13 - 0.54*
IT (n=1311)	1.21 *0.46 - 3.15*	1.34 *0.61 - 2.93*	1.28 *0.6 - 2.71*	0.00 *0 - 5.26*	1.22 *0.75 - 1.97*
NL (n=4822)	0.42 *0.12 - 1.47*	0.96 *0.52 - 1.77*	0.16 *0.05 - 0.49*	0.15 *0.04 - 0.49*	0.35 *0.22 - 0.56*
NO (n=9236)	0.33 *0.12 - 0.93*	0.44 *0.22 - 0.89*	0.25 *0.13 - 0.49*	0.23 *0.11 - 0.46*	0.28 *0.19 - 0.42*
PL (n=4008)	0.12 *0.02 - 0.86*	0.01 *0 - 0.3*	0.00 *0 - 0.31*	0.00 *0 - 0.45*	0.02 *0 - 0.14*
PT (n=3965)	0.64 *0.23 - 1.76*	0.06 *0.01 - 0.43*	0.31 *0.12 - 0.79*	0.01 *0 - 0.45*	0.23 *0.12 - 0.44*
SE (n=6198)	0.00 *0 - 0.78*	0.25 *0.08 - 0.84*	0.03 *0 - 0.25*	0.17 *0.07 - 0.4*	0.12 *0.06 - 0.25*

Figure 4.3.10.3 shows that multi-drug combinations are used mostly by drivers younger than 50 years. The distribution over the four age groups varies largely between the different countries.

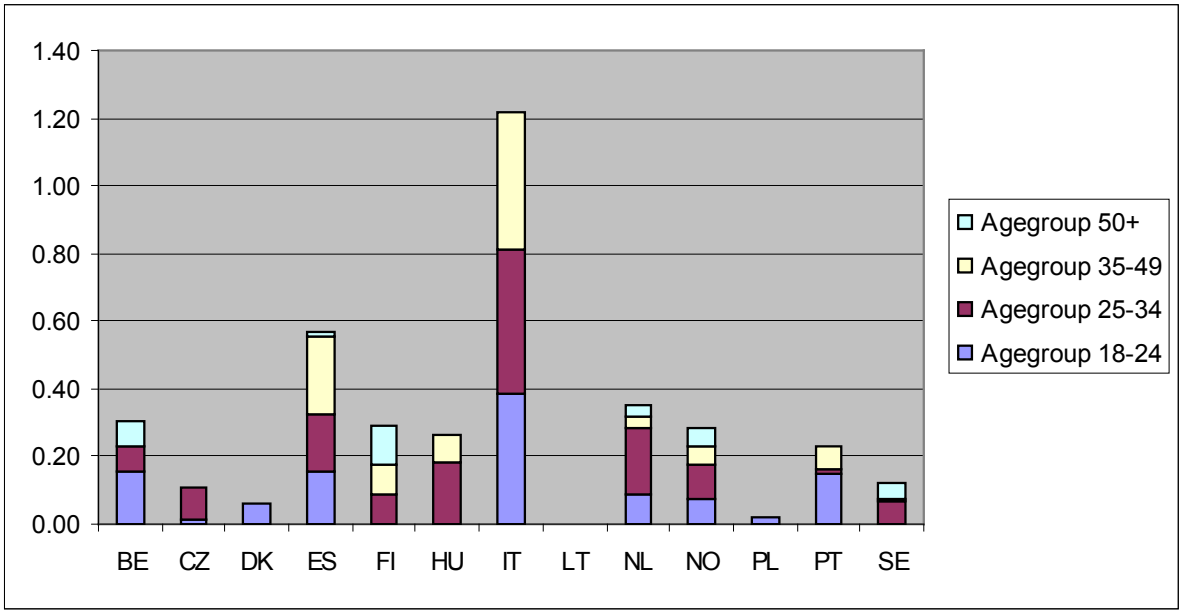

Figure 4.3.10.3. Distribution of the prevalence drug-drug combinations among the age groups; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Figure 4.3.10.4 shows that in general multi-drug use is more common among male than among female drivers. However, in Czech Republic, Sweden and especially in Hungary, the share of female users is larger.

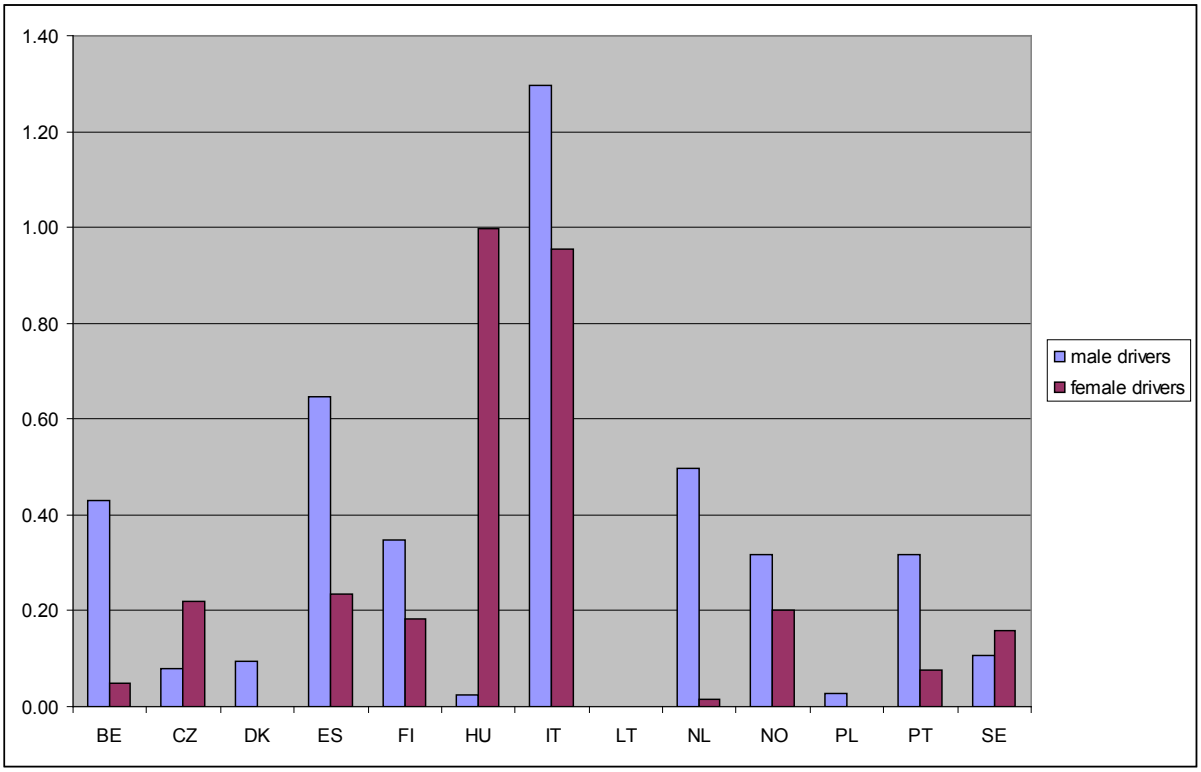

Figure 4.3.10.4. Prevalence of drug-drug combinations by gender; prevalence in percentages

Table 4.3.10.3 provides an overview of the prevalence of drug-drug combinations among male drivers distributed by age. The highest prevalence was detected among male drivers in Italy aged 18-24 (1.51%) and 25-34 (1.66%), in Belgium aged 18-24 years (1.36%), and among drivers in the Netherlands aged 25-34 (1.30%).

Table 4.3.10.3. Prevalence of drug-drug combinations among male drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Male	18-24	25-34	35-49	50+	All ages
BE (n=1957)	1.36 *0.42 - 4.27*	0.72 *0.23 - 2.23*	0.00 *0 - 0.52*	0.51 *0.18 - 1.4*	0.43 *0.22 - 0.83*
CZ (n=1589)	0.08 *0 - 2.55*	0.27 *0.05 - 1.39*	0.00 *0 - 0.68*	0.00 *0 - 0.84*	0.08 *0.02 - 0.38*
DK (n=1975)	0.94 *0.21 - 4.19*	0.00 *0 - 1.22*	0.07 *0.01 - 0.71*	0.00 *0 - 0.45*	0.09 *0.02 - 0.36*
ES (n=2520)	0.37 *0.09 - 1.46*	0.79 *0.37 - 1.67*	1.00 *0.51 - 1.94*	0.04 *0 - 0.98*	0.65 *0.4 - 1.04*
FI (n=2511)	0.00 *0 - 1.35*	0.44 *0.12 - 1.55*	0.30 *0.08 - 1.05*	0.44 *0.18 - 1.04*	0.35 *0.18 - 0.66*
HU (n=2062)	0.00 *0 - 2.09*	0.08 *0.01 - 0.73*	0.00 *0 - 0.55*	0.00 *0 - 0.72*	0.02 *0 - 0.23*
IT (n=998)	1.51 *0.58 - 3.91*	1.66 *0.75 - 3.63*	0.95 *0.34 - 2.6*	0.00 *0 - 8.08*	1.30 *0.76 - 2.21*
NL (n=3363)	0.61 *0.17 - 2.11*	1.30 *0.7 - 2.42*	0.24 *0.08 - 0.74*	0.20 *0.06 - 0.68*	0.50 *0.31 - 0.8*
NO (n=6520)	0.49 *0.17 - 1.36*	0.49 *0.22 - 1.1*	0.33 *0.16 - 0.67*	0.18 *0.08 - 0.44*	0.32 *0.21 - 0.49*
PL (n=3331)	0.15 *0.02 - 1.05*	0.01 *0 - 0.37*	0.00 *0 - 0.39*	0.00 *0 - 0.5*	0.03 *0 - 0.16*
PT (n=2541)	1.08 *0.39 - 2.94*	0.11 *0.02 - 0.74*	0.49 *0.19 - 1.25*	0.01 *0 - 0.56*	0.32 *0.16 - 0.62*
SE (n=4352)	0.00 *0 - 1.12*	0.00 *0 - 0.61*	0.04 *0 - 0.38*	0.20 *0.08 - 0.49*	0.11 *0.04 - 0.26*

Figure 4.3.10.5 shows that drug-drug combinations are used mostly by male drivers younger than 50 years, except for Sweden. The distribution over the three lower age groups varies largely between the different countries.

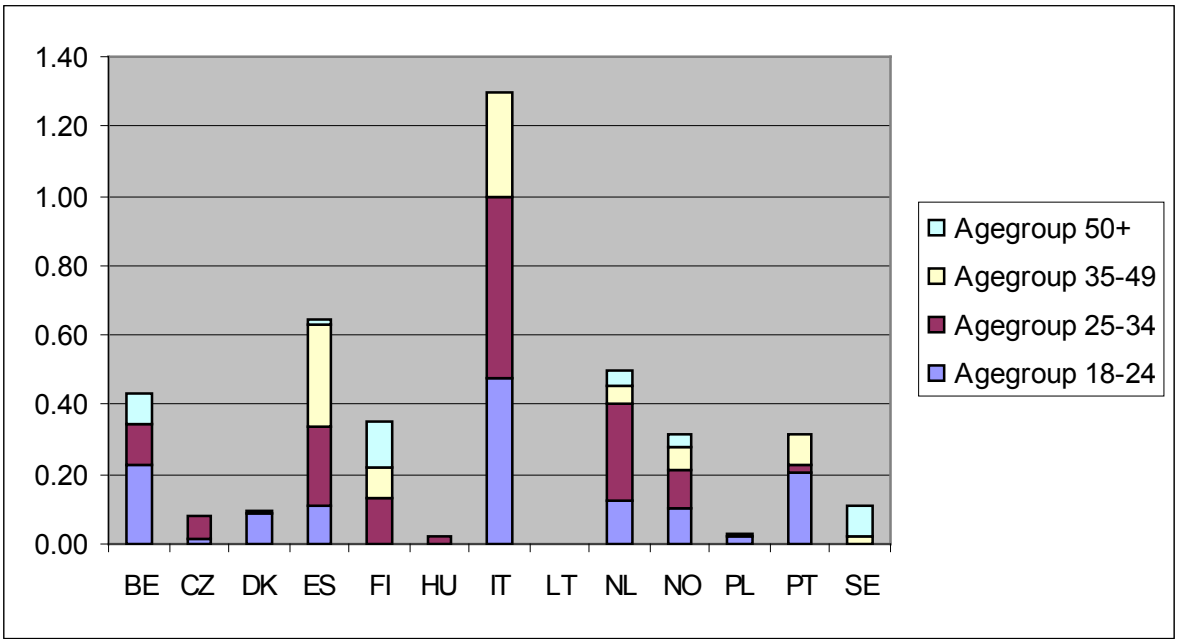

Figure 4.3.10.5. Distribution of the prevalence drug-drug combinations among the age groups for male drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

Table 4.3.10.4 presents an overview of the prevalence of drug-drug combinations among female drivers distributed by age. The highest prevalence was detected among female drivers in Italy aged 35-49 (2.12%), and in Hungary among female drivers aged 25-34 (1.79%).

Table 4.3.10.4. Prevalence of drug-drug combinations among female drivers by age group; prevalence in percentages; 95% confidence intervals in italics

Female	18-24	25-34	35-49	50+	All ages
BE	0.00	0.00	0.00	0.19	0.05
(n=971)	*0 - 3.37*	*0 - 1.52*	*0 - 1.04*	*0.02 - 1.9*	*0 - 0.48*
CZ	0.00	0.72	0.00	0.00	0.22
(n=448)	*0 - 4.32*	*0.13 - 4.01*	*0 - 2.31*	*0 - 5.68*	*0.04 - 1.25*
DK	0.00	0.00	0.00	0.00	0.00
(n=1015)	*0 - 4.97*	*0 - 2.15*	*0 - 0.94*	*0 - 1.05*	*0 - 0.38*
ES	1.24	0.00	0.00	0.00	0.23
(n=605)	*0.28 - 5.27*	*0 - 1.68*	*0 - 1.91*	*0 - 5.56*	*0.05 - 1.03*
FI	0.00	0.00	0.29	0.23	0.18
(n=1283)	*0 - 2.71*	*0 - 1.44*	*0.07 - 1.29*	*0.04 - 1.38*	*0.05 - 0.61*
HU	0.00	1.79	1.01	0.00	1.00
(n=679)	*0 - 4.9*	*0.73 - 4.37*	*0.31 - 3.24*	*0 - 3.08*	*0.48 - 2.07*
IT	0.00	0.00	2.12	0.00	0.95
(n=313)	*0 - 5.82*	*0 - 4.35*	*0.72 - 6.05*	*0 - 13.07*	*0.32 - 2.77*
NL	0.00	0.07	0.00	0.00	0.01
(n=1454)	*0 - 2.42*	*0 - 1.46*	*0 - 0.66*	*0 - 0.88*	*0 - 0.29*
NO	0.00	0.31	0.07	0.36	0.20
(n=2709)	*0 - 1.21*	*0.08 - 1.29*	*0.01 - 0.5*	*0.13 - 1.04*	*0.09 - 0.45*
PL	0.00	0.00	0.00	0.00	0.00
(n=672)	*0 - 3.51*	*0 - 1.51*	*0 - 1.57*	*0 - 4.88*	*0 - 0.57*
PT	0.00	0.00	0.00	0.00	0.08
(n=1342)	*0 - 1.79*	*0 - 0.77*	*0 - 0.81*	*0 - 2.21*	*0.01 - 0.42*
SE	0.00	0.78	0.00	0.07	0.16
(n=1835)	*0 - 2.57*	*0.24 - 2.55*	*0 - 0.56*	*0.01 - 0.68*	*0.05 - 0.47*

Figure 4.3.10.6 shows that Spain was the only country in which drug-drug combinations were detected among young women aged 18-24.

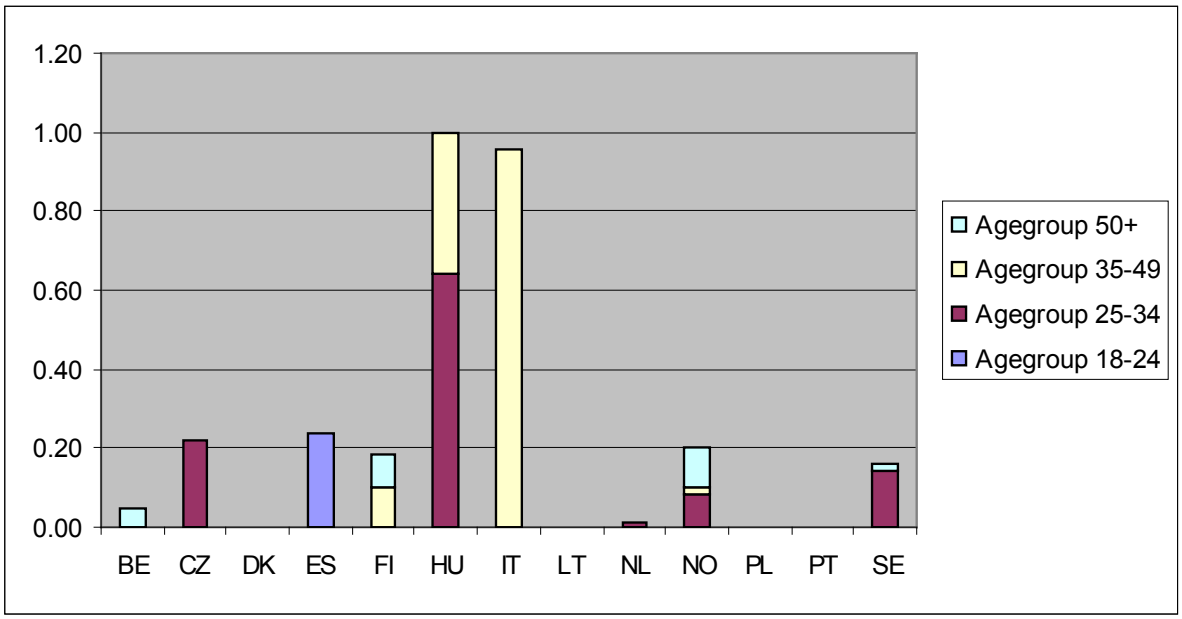

Figure 4.3.10.6. Distribution of the prevalence drug-drug combinations among the age groups for female drivers; overall prevalences in percentages per country, the figure shows the relative contributions of the various age groups

4.3.10.3 Use of drug-drug combinations by time period

Table 4.3.10.5 presents an overview of the prevalence of drug-drug combinations by time period. The highest prevalence was detected in weekend nights in the Czech Republic (1.85%), in Spain during weekday nights (1.64%), and in Italy at weekdays during daytime hours (1.44%).

Table 4.3.10.5. Prevalence of drug-drug combinations by time period; prevalence in percentages; 95% confidence intervals in italics

Time period	Weekdays 04.00-21.59	Weekday nights 22.00-03.59	Weekend days 04.00-21.59	Weekend nights 22.00-03.59	All time periods
BE	0.31	0.00	0.37	0.39	0.30
(n=2949)	*0.14 - 0.66*	*0 - 2.2*	*0.11 - 1.19*	*0.03 - 5.59*	*0.16 - 0.58*
CZ	0.14	0.00	0.00	1.85	0.11
(n=2037)	*0.04 - 0.53*	*0 - 8.62*	*0 - 0.59*	*0.15 - 18.82*	*0.03 - 0.38*
DK	0.00	0.00	0.25	0.00	0.06
(n=3002)	*0 - 0.18*	*0 - 5.06*	*0.07 - 0.93*	*0 - 4.87*	*0.02 - 0.24*
ES	0.38	1.64	0.84	0.70	0.57
(n=3174)	*0.2 - 0.75*	*0.46 - 5.67*	*0.4 - 1.76*	*0.13 - 3.6*	*0.36 - 0.89*
FI	0.20	0.00	0.52	0.68	0.29
(n=3842)	*0.09 - 0.46*	*0 - 2.94*	*0.23 - 1.17*	*0.07 - 5.97*	*0.16 - 0.52*
HU	0.37	0.00	0.00	0.00	0.27
(n=2741)	*0.18 - 0.75*	*0 - 5.75*	*0 - 0.59*	*0 - 6.88*	*0.13 - 0.54*
IT	1.44	0.91	0.62	0.58	1.22
(n=1311)	*0.85 - 2.42*	*0.06 - 12.87*	*0.17 - 2.28*	*0.02 - 14.36*	*0.75 - 1.97*
NL	0.32	0.15	0.33	1.42	0.35
(n=4822)	*0.18 - 0.58*	*0.01 - 2.87*	*0.12 - 0.9*	*0.37 - 5.26*	*0.22 - 0.56*
NO	0.23	0.80	0.33	0.20	0.28
(n=9236)	*0.13 - 0.38*	*0.33 - 1.96*	*0.16 - 0.67*	*0.03 - 1.19*	*0.19 - 0.42*
PL	0.00	0.14	0.08	0.00	0.02
(n=4008)	*0 - 0.13*	*0 - 4.27*	*0.01 - 0.54*	*0 - 4.81*	*0 - 0.14*
PT	0.23	0.53	0.19	0.43	0.23
(n=3965)	*0.11 - 0.49*	*0.05 - 5.95*	*0.05 - 0.74*	*0.03 - 5.67*	*0.12 - 0.44*
SE	0.10	0.00	0.22	0.00	0.12
(n=6198)	*0.04 - 0.24*	*0 - 3.01*	*0.08 - 0.61*	*0 - 3.01*	*0.06 - 0.25*

Figure 4.3.10.7 shows that the distribution of drug-drug combinations by time period varies considerable between the different countries.
In Southern European countries and in Norway drug-drug combinations were relatively often detected during night time hours at weekdays. During daytime hours at weekdays the largest shares were found in Italy and Hungary.

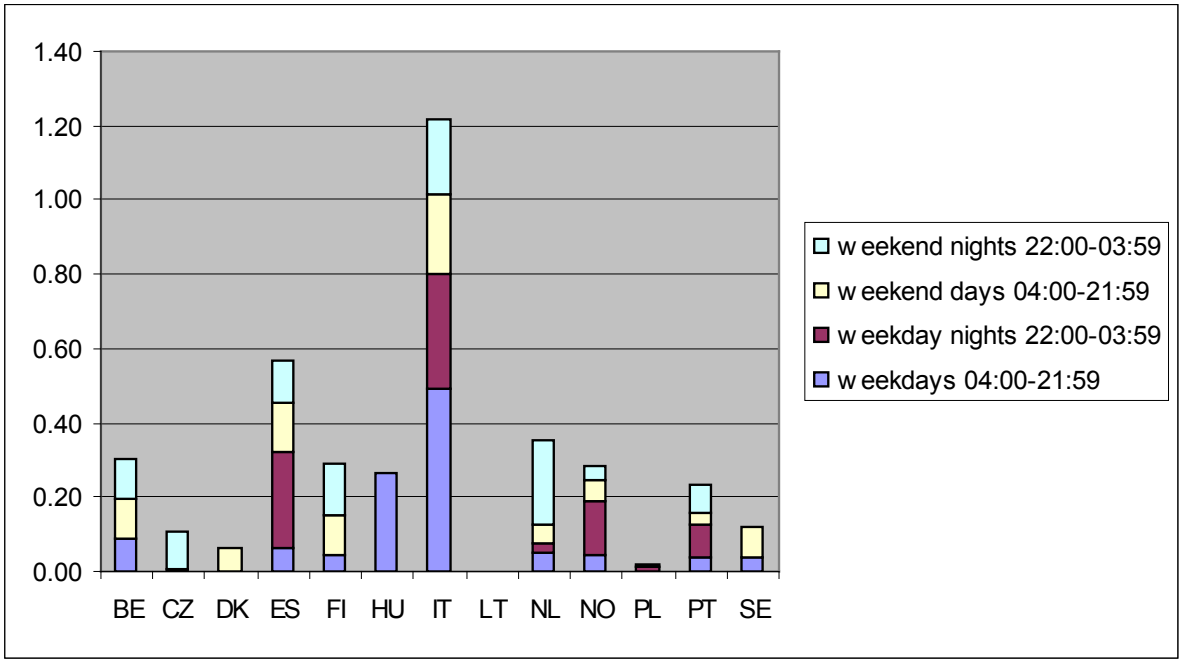

Figure 4.3.10.7. Distribution of the prevalence drug-drug combinations among the time periods; overall prevalences in percentages per country, the figure shows the relative contributions of the various time periods

5. Influencing factors: The effects of time, age, gender and country on prevalence

The aim of this chapter is to reveal the underlying factors that are of influence on the prevalence of the various substances in the driving population. In this chapter, we assess which factors influence the occurrence of positive cases for alcohol, cocaine, THC benzodiazepines, medicinal opioids, alcohol-drug in combination and multiple drugs across all collected data (i.e. across countries), in order to reveal general prevalence patterns across countries. For example: Is use of alcohol or benzodiazepines higher in certain time periods, or not? And what is the influence of age or gender on the prevalence?

These questions were investigated by applying the logistic regression method. Logistic regression is a method that reveals (significant) relations between given explanatory variables (quantitative or qualitative) such as time period, age, gender and a binary response variable; in this case: positive or negative cases. Cf. annex 5 for further details on the modelling procedure.

Logistic regression models were constructed to describe differences in independent variables explaining prevalence. The models were to include all countries where samples had been taken so that prevalence patterns across countries could be revealed. Prevalence of the various substance groups was related to time, age, driver gender, country and interactions of these variables.

Time was divided into the eight time periods that were selected in the road side surveys, as indicated in table 5.1, see also section 3.1.

Table 5.1. DRUID time periods

Weekdays			Weekend		
1	Monday – Friday	04:00 - 09:59	5	Saturday and Sunday	04:00 - 09:59
2	Monday – Friday	10:00 - 15:59	6	Saturday and Sunday	10:00 - 15:59
3	Monday –Thursday	16:00 - 21:59	7	Friday – Sunday	16:00 - 21:59
4	Monday – Thursday Tuesday - Friday	22:00 - 00:00 00:00 - 03:59	8	Friday – Sunday Saturday – Monday	22:00 - 00:00 00:00 - 03:59

Age of the driver was a semi quantitative variable divided into the four groups that were decided upon for the prevalence calculations based on the road side surveys, as indicated in table 5.2:

Table 5.2. DRUID age groups

Age group	
1	18-24 years
2	25-34 years
3	35-49 years
4	50+ years

Driver gender and country were qualitative variables.

Models were constructed for all substance groups except amphetamine, THCCOOH, illicit opiates and z-drugs because of too few positive observations in these groups. Furthermore, it was not possible to include all countries in all the models because of missing data in one or more cells or lack of positive observations.

5.1 Factors influencing the prevalence of alcohol at and above 0.1 g/L

To determine which factors influenced the prevalence of alcohol in the driving population across Europe a logistic regression model was constructed.

Two different models were constructed for alcohol. In the first one a sample was considered positive if the alcohol level was above or equal to 0.1 g/L which is the analytical cut off value.

Sweden was not included in the model since the information of alcohol level for the test persons was not available. *Hungary* had only four positive samples and *Lithuania* had too many time periods without samples, which is why these countries could not be included in the model either.

The total number of observations is 37,991 with 1,168 positive. The logistic regression was performed on the remaining countries and it was found that the following interactions: *age group* × *gender* and *gender* × *country* were not significant and therefore removed from the model. Hence the final model included the significant independent variables and interactions as shown in table 5.1.

The model included the data of the following countries: *Belgium, Czech Republic, Denmark, Spain, Finland, Italy, Norway, the Netherlands, Poland* and *Portugal.*

In table 5.1.1 the independent variables are shown in the left column. The coefficient estimates in the next column relate to the various levels of the independent variable in question; a minus sign means that prevalence is lower at that level than at the reference level (which always is set to zero), a positive sign means the opposite. The P-value in the right column shows the significance of the effect in explaining a part of the variation in the prevalence when adjusting for the other effects in the model.

Table 5.1.1 Logistic regression model for the prevalence of alcohol at and above 0.1 g/L. The left column shows the effects that have been included in the model, coefficient estimates scale the different levels of the effects and P indicates the significance level of the effect when correcting for all other effects in the model.

Effect	Coefficient estimates	DF	Wald Chi-square	P
Time period	1: -0.3393 2: -1.0737 3: -1.0275 4: -0.6267 5: -0.9295 6: -1.4286 7: -0.7387 8: Reference	7	80.85	<0.0001
Age group	18-24: 0.1901 25-34: 0.2983 35-49: 0.4277 50+: reference	3	1.03	0.7935
Gender	Men: 0.1641 Women: reference	1	50.45	<0.0001
Country	BE: 1.1172 CZ: -0.8082 DK: -1.0765 ES: 0.9969 FI: -1.3092 IT: -0.5617 NO: -2.1848 NL: -0.0378 PL: -3.3302 PT: reference	9	230.52	<0.0001
Time period × Age group	18-24 / 25-34 / 35-49 / 50+ 1: 1.1604 / 0.5639 / -0.3349 / reference 2: -1.2355 / -1.8799 / -0.7977 / reference 3: -1.0751 / -0.9324 / -0.4580 / reference 4: -0.3302 / -0.0995 / -0.3026 / reference 5: 2.2138 / 1.5244 / 0.6572 / reference 6: -0.1082 / -0.1934 / -0.2281 / reference	21	112.17	<0.0001

Effect	Coefficient estimates					DF	Wald Chi-square	P
	7: -1.8487	-1.1306	-0.8311	reference				
	8: reference	reference	reference	reference				
Time period × Gender		Men	women			7	33.61	<0.0001
	1:	0.3065	reference					
	2:	0.6901	reference					
	3:	1.1242	reference					
	4:	-0.2085	reference					
	5:	0.0404	reference					
	6:	1.0189	reference					
	7:	0.8940	reference					
	8:	reference	reference					
Time period × Country		BE	CZ	DK	ES	FI	63	185.96	<0.0001
	1:	-2.2166	-0.9969	-1.0936	-1.1201	-1.1407			
	2:	-0.5582	-0.7045	0.6084	-1.6069	-0.3735			
	3:	-0.6806	-1.3356	1.1854	-1.3901	-1.0940			
	4:	1.2534	-0.0808	0.9397	0.5776	0.3189			
	5:	-1.0686	-1.3765	-0.2445	-0.6857	-0.4258			
	6:	-0.1423	-0.5101	1.0080	-0.4472	-0.4111			
	7:	0.1153	-0.0980	1.0818	-0.1693	-0.1014			
	8:	reference	reference	reference	reference	reference			
		IT	NO	NL	PL	PT			
	1:	-1.4639	-0.2136	-1.5199	1.2065	reference			
	2:	1.6529	-0.3235	-1.0322	0.6422	reference			
	3:	1.2130	-0.7232	-0.7509	0.4866	reference			
	4:	1.1853	-11.9950	1.2863	1.6939	reference			
	5:	-0.7517	-0.5563	-0.6198	-0.5385	reference			
	6:	0.5441	0.6563	-2.7471	1.7218	reference			
	7:	1.5298	-12.2713	0.3042	1.4187	reference			
	8:	reference	reference	reference	reference	reference			
Age group × Country		BE	CZ	DK	ES	FI	27	55.74	0.0009
	18-24:	-0.3782	-0.3529	-0.0685	-1.2114	-0.2698			
	25-34:	-0.2935	-0.8755	-0.4805	-0.5182	0.1209			
	35-49:	-0.4485	0.2021	-0.1828	-0.4804	-0.5778			
	50+:	reference	reference	reference	reference	reference			
		IT	NO	NL	PL	PT			
	18-24:	1.0420	0.1208	-0.8545	0.9478	reference			
	25-34:	0.8428	-0.5197	-0.2178	0.9760	reference			
	35-49:	-0.0346	-0.4692	-0.0145	1.1441	reference			
	50+:	reference	reference	reference	reference	reference			

As table 5.1.1 shows, several factors had a significant influence on the prevalence of alcohol across countries.

Alcohol prevalence was significantly different in different time periods. As expected, the highest prevalence was on weekend nights (time period 8, i.e. Friday to Sunday 22:00-03:59), the lowest was on weekend days (time period 6, i.e. Saturday and Sunday 10:00-15:59).

As expected, prevalence was significantly higher for male drivers than for female drivers.

Prevalence differed significantly among countries with Belgium and Spain having the highest prevalence and Norway and Poland the lowest (besides Hungary where prevalence was too low to be modeled, and Sweden where information on alcohol prevalence was not available).
Even when corrected for time period and age group there was a significant interaction between these two variables.

The main effect age group is insignificant but it is a part of the interaction *time period* × *age group* and is therefore included in the final model.

Not surprisingly, prevalence was highest among 18-24 year old drivers on weekend mornings, (time period 5, i.e. Saturday and Sunday 04:00-09:59). The lowest alcohol prevalence was found among 25-34 year old drivers on weekdays (time period 2, i.e. Monday to Friday 10:00-15:59). There was a significant interaction between time period and gender, also when correcting for the two variables separately. The lowest alcohol prevalence was found among female drivers in time period 4, i.e.

weekday nights (22:00-03:59). Surprisingly, the highest prevalence was also found among female drivers, at weekdays 16:00-21:59.

When correcting for the differences in alcohol prevalence in time periods and countries, there was a significant effect of the interaction term between the two. Amazingly low was alcohol prevalence in Norway in time period 7, i.e. Friday, Saturday and Sunday 16:00-21:59. The highest prevalence was found in Poland in time period 6, i.e. Saturday and Sunday 10:00-15:59. The interaction term between age group and country was significant even when correcting for the two single variables. Young drivers in Spain (18-24 years of age) had the lowest alcohol prevalence, whereas mature drivers (aged 35-49) in Poland had the highest.

5.2 Model for the prevalence of alcohol at and above 0.5 g/L

In order to clarify if other factors determine prevalence of higher alcohol concentrations than prevalence of higher and lower alcohol concentrations together, prevalence of higher concentrations of alcohol was tested.

In the second model for alcohol prevalence, the cut-off for alcohol concentration was set to 0.5 g/L, which is the legal limit in most countries. Due to a low number of positive samples, time periods 1, 2 and 3 were merged, 4 remained, 5, 6 and 7 were merged and 8 remained. This way, time periods were: 1, 2 and 3: weekday, daytime; 4: weekday, nighttime; 5, 6 and 7: weekend, daytime; 8: weekend, nighttime, forming the variable *time period new*.

A model was constructed including *Belgium, Denmark, Spain, Italy, Lithuania, the Netherlands and Portugal*. *Sweden and Hungary* could not be included in the model for the same reasons as described under the model for alcohol concentrations at and above 0.1 g/L. Furthermore, the positive samples for *Czech Republic and Poland* were very unequally distributed by age and gender whereas *Finland and Norway* had too few positive samples.

It was found that the interactions *gender* × *country, age group* × *gender* and *age group* × *time period new* were insignificant. Consequently, these interactions were removed from the model. By making the assumption that these interactions were not significant for *Czech Republic* and *Poland* either, it was possible to include them in the model.

The logistic regression procedure was run and here it was found that – unlike the model for the prevalence of alcohol at and above 0.1 g/L – the interaction *age group* × *country* and the main effect *age group* were insignificant. The total number of observations was 26,421 with 449 positive. Hence the final model included the significant independent variables and interactions as shown in table 5.2.1.

The model included the following countries: *Belgium, Czech Republic, Denmark, Spain, Italy, Lithuania, the Netherlands, Poland* and *Portugal.*

Table 5.2.1 Logistic regression model for the prevalence of alcohol at and above 0.5 g/L. The left column shows the effects that have been included in the model, coefficient estimates scale the different levels of the effects and P indicates the significance level of the effect when correcting for all other effects in the model.

Effect	Coefficient estimates	DF	Wald Chi-square	P
Time period new	1-3: -0.5203 4: -1.0101 5-7: -0.8354 8: reference	3	3.14	0.3712
Gender	Men: 0.3683 Women: reference	1	14.61	0.0001
Country	BE: 1.6858 CZ: -0.3541 DK: -1.4221 ES: 0.9157 IT: 1.5150 LT: -10.6601 NL: -0.3023	8	210.63	<0.0001

	PL: -1.6595 PT: reference			

Time period new ×Country		BE	CZ	DK	ES	IT	3	12.70	0.0053
	1-3:	-1.7902	-0.8015	0.00094	-1.0952	-0.2110			
	4:	1.0906	1.4742	2.2730	0.9388	1.5839			
	5-7:	-0.7376	-0.2911	1.6599	-0.3790	0.2029			
	8:	reference	reference	reference	reference	reference			
		LT	NL	PL	PT				
	1-3:	11.5426	-0.7965	-0.0405	reference				
	4:	0.4818	2.1274	2.0189	reference				
	5-7:	10.9727	-0.0634	0.8580	reference				
	8:	reference	reference	reference	reference				
Time period new × Gender		men	women				24	54.34	0.0004
	1-3:	0.4839	reference						
	4:	-0.5863	reference						
	5-7:	0.6659	reference						
	8:	reference	reference						

A priori one would expect the same maxima/minima prevalence groups as the previous analysis for alcohol prevalence equal to and above 0.1 g/L. However, the present model reveals exclusively that higher alcohol concentrations (equal to and above 0.5 g/l) are not necessarily prevalent in the same groups as the lower and higher concentrations together (concentrations equal to and above 0.1 g/L).

Like for the alcohol concentrations equal to and above 0.1 g/L, the higher concentrations are significantly more prevalent in male than in female drivers. There were significant differences in prevalence of alcohol concentrations at and above 0.5 g/L among countries; Belgium having the highest prevalence (as for concentrations equal to and above 0.1 g/L) and Lithuania having the lowest prevalence.

When corrected for the variations in time period and country, the interaction term of these two variables was significant. The highest prevalence was found in Lithuania and the lowest in Belgium. Both were found in time period 1-3; i.e. weekdays 04:00-21:59.

The interaction term between time period and gender was significant even when correcting for the two variables separately. Contrary to the model that also included lower alcohol concentrations, both the highest and the lowest prevalence of alcohol concentrations equal to and above 0.5 g/l were for male drivers; the former being in time period 5-7 (weekend days 04:00-21:59) and the latter in time period 4 (weekday nights, i.e. Monday through Friday 22:00-03:59).

The clearest difference between prevalence of all concentrations of alcohol and the high concentrations of alcohol is that the difference in prevalence between the genders is larger in the latter case. Thus, prevalence of alcohol is in any case higher in male than in female drivers, but for high concentrations of alcohol, the difference in prevalence is larger than for all concentrations put together.

Surprisingly, there was no difference in prevalence of high concentrations of alcohol over the various time periods. This is in contrast to prevalence of all concentrations of alcohol that showed a clear pattern being most prevalent on weekend nights and least prevalent on weekend days.

5.3 Factors influencing the prevalence of cocaine

To determine which factors influenced the prevalence of cocaine a logistic regression model was constructed.

Because of very few positive samples for female drivers, this model was constructed for male drivers only. Time periods 1, 2 and 3 were merged to one, 4 remained, 5, 6 and 7 were merged and 8 remained, forming the variable *time period new*.

A model was built including the data of *Spain, Italy* and *the Netherlands* that were the only countries with a sufficient number of positive samples for male drivers to run the complete model. It was

assumed that *time period new x age group* was insignificant. The logistic regression procedure was run and it was found that the interaction terms *time period new x country* and *age group x country* was insignificant. Furthermore, the main effect *time period new* was found insignificant.

Here it was also necessary to exclude the six interactions from the model and only make a model were the four main effects are included. From the logistic procedure it was found that the main effects *time period* and *gender* was not significant and therefore removed. By assuming that the above conclusion is true for the excluded countries as well, it was possible to include four more countries to the final model (*Belgium, Norway, Hungary, and Portugal).* The remaining six countries *(Czech Republic, Denmark, Finland, Lithuania, Poland and Sweden)* could not be included in the final model because there were no positive samples for male drivers. The final model included the significant independent variables as shown in table 5.3.1.

Table 5.3.1 Logistic regression model for the prevalence of cocaine. The left column shows the effects that have been included in the model, coefficient estimates scale the different levels of the effects and P indicates the significance level of the effect when correcting for all other effects in the model.

Effect	Coefficient estimates	DF	Wald Chi-square	P
Age group	18-24: 1.3887 25-34: 1.8967 35-49: 1.6046 50+: reference	3	14.14	0.0027
Country	BE: 1.3484 ES: 3.2402 HU: 0.2625 IT: 2.6456 NO: 0.2049 NL: 2.0020 PT: reference	6	84.52	<0.0001

The total number of observations was 20,111 with 94 positive. Countries included in the model for cocaine: *Belgium, Spain, Hungary, Italy, Norway, the Netherlands* and *Portugal.*

The general prevalence of cocaine for male drivers was very low. It varied significantly with age and among countries, being most prevalent among male drivers aged 25-34 years and in Spain and Italy. The lowest prevalence was found in the 50+ age group and in Portugal, Norway and Hungary.

5.4 Factors influencing the prevalence of THC

To determine which factors influenced the prevalence of THC a logistic regression model was constructed. A model was constructed including the data of four countries: *Spain, Norway, the Netherlands* and *Portugal* that were the only countries with a sufficient number of positive samples to run the complete model. The logistic regression procedure was run and it was found that no interactions were significant (*age group × gender, time period × age group, time period × gender, time period × country, gender × country* and *age group × country*). Consequently, they were excluded.

By assuming that the above conclusion is true for the excluded countries as well, it was possible to include eight of the excluded countries to the final model. However, as there were no positive samples in *Lithuania*, this country could not be included in the final model.

The total number of observations is 46,937 with 485 samples positive for THC. The final model included the significant independent variables as shown in table 5.4.1.

The following twelve countries were included in the THC model: *Belgium, Denmark, Czech Republic, Finland, Hungary, Italy, Sweden, the Netherlands, Norway, Poland, Portugal* and *Spain*.

Table 5.4.1 Logistic regression model for the prevalence of THC. The left column shows the effects that have been included in the model, coefficient estimates scale the different levels of the effects and P indicates the significance level of the effect when correcting for all other effects in the model.

Effect	Coefficient estimates	DF	Wald Chi-square	P
Time period	1: -0.1370 2: -0.4363 3: -0.1142 4: 0.0566 5: -0.0227 6: -0.5716 7: 0.1481 8: reference	7	17.36	0.0152
Age group	18-24: 3.0586 25-34: 2.5873 35-49: 1.5984 50+: reference	3	197.14	<0.0001
Gender	Men: 1.5984 Women: reference	1	79.03	<0.0001
Country	BE: 1.8900 CZ: 1.7897 DK: 1.2486 ES: 3.8041 FI: -0.2938 HU: 0.4969 IT: 1.8794 NO: 1.9204 NL: 3.2061 PL: 1.8885 PT: 2.7146 S: reference	9	335.12	<0.0001

THC seems to be a weekend drug mainly used by young male drivers. There is a significant difference in its prevalence in different time periods; in period 7 (Saturday and Sunday 16:00-21:59) it was most prevalent and in period 6 (Saturday and Sunday 10:00-15:59) it was least prevalent.

THC was most prevalent in 18-24 year olds, significantly more prevalent than in the 50+ group where it was least prevalent. THC was significantly more prevalent in male than in female drivers.

The prevalence of THC was significantly different among countries with a tentative north-south gradient; it was most prevalent in Spain, Portugal and the Netherlands and least prevalent in Sweden, Denmark and Hungary.

5.5 Factors influencing the prevalence of benzodiazepines

Due the low number of positive observations in the age group 18-24, age group 18-24 and age group 25-34 were merged, 35-49 remained and 50+ remained, thus forming the new variable *age group new.*

The following six countries were included in the model: *Belgium, Spain, Hungary, Finland, Norway* and *Portugal*. For the remaining seven countries, the positive samples were very unequally distributed by time period, age and gender to be included in the complete model.

With logistic regression it was found that the following interactions were not significant: *time period* × *age group new, time period* × *country* and *age group new* × *country*. It was now possible to add the original age groups. The logistic regression procedure was run again and it was found that the interaction terms *age group* × *gender* and *time period* × *gender* were not significant.

By assuming that the above conclusions are true for the excluded countries as well, it was possible to include the following four countries: *Denmark, the Netherlands, Sweden* and *Czech Republic. But Italy, Lithuania and Poland* had still too few positive samples to be included in the final model. Hence the final model included the significant independent variables and interaction, as shown in table 5.5.1.

The total number of observations is 41,715 with 383 positive. This model included the following ten countries: *Belgium, Czech Republic, Denmark, Finland, Hungary, the Netherlands, Norway, Portugal, Spain* and *Sweden*.

Table 5.5.1 Logistic regression model for the prevalence of benzodiazepines. The left column shows the effects that have been included in the model, coefficient estimates scale the different levels of the effects and P indicates the significance level of the effect when correcting for all other effects in the model.

Effect	Coefficient estimates	DF	Wald Chi-square	P
Time period	1: 0.1892 2: 0.4702 3: -0.0284 4: -0.1097 5: 0.1700 6: -0.0867 7: 0.3048 8: Reference	7	17.39	0.0150
Age group	18-24: -1.8326 25-34: -1.0884 35-49: -0.5638 50+: reference	3	80.58	<0.0001
Gender	Men: -0.7897 Women: reference	1	18.12	<0.0001
Country	BE: 2.3795 CZ: 2.1308 DK: 0.0390 ES: 2.2200 FI: 0.7178 HU: 1.7913 NO: 1.4080 NL: 0.8343 PT: 3.1136 S: reference	9	206.78	<0.0001
Country ×Gender	Men / Women BE: 0.1363 / reference CZ: -1.1651 / reference DK: 1.3779 / reference ES: 0.3263 / reference FI: 1.2151 / reference HU: 0.5904 / reference NO: 0.2389 / reference NL: -0.5757 / reference PT: -0.3621 / reference S: reference / reference	9	24.11	0.0041

In contrast to THC, benzodiazepines are drugs occurring in traffic mainly in mature female drivers and during daytime. Thus, prevalence was significantly different over the time periods; it was most prevalent in time period 2, i.e. Monday through Friday 10:00-15:59 and least prevalent in period 4, i.e. Monday through Friday 22:00-03:59.

Benzodiazepines were most prevalent in drivers aged 50+; significantly more prevalent than in the youngest age group (18-24) where they were least prevalent.

As for THC, there was a tentative north-south gradient in prevalence, benzodiazepines being most prevalent in Spain, Portugal, Czech Republic and Belgium and least prevalent in Denmark, Finland and Sweden.

5.6 Factors influencing the prevalence of medicinal opioids

Due to a small number of positives, the three youngest age groups were merged resulting in two new age groups *18-49 and 50+*. This formed the variable *age group new2*.

Furthermore, due to a low number of positive samples, time periods 1, 2 and 3 were merged to one, 4 remained, 5, 6 and 7 were merged and 8 remained (variable *time period new*). The procedure was run for *Belgium, Denmark*, *Finland, Norway* and *Sweden.* There were no positive samples for *Lithuania,*

and for the other seven countries the positive samples were too few and too unequally distributed by time period, gender and age to run the complete model.

The model was run, but no estimates could be calculated. However, the P values for the various main effects and interactions could be calculated. Based on the P values, the assumption was made that the interactions *time period new* × *country* and *time period new* × *gender* were not significant, i.e. the interactions with the highest P values.

The model was run again under these assumptions. It was found that the remaining four interactions were not significant: time period new × *age group new2, age group new2* × *gender, age group new2* × *country* and *gender* × *country*. Moreover, the main effect *time period new* was insignificant.

By making the assumptions that these effects were insignificant for the rest of the countries with positive samples, it was possible to include *Czech Republic, the Netherlands*, *Hungary*, *Spain, Poland, Italy* and *Portugal* into the model. Finally it was possible to include the original variable *age group* in the model. Hence the final model included the significant independent variables, as shown in table 5.6.1.

The total number of observations is 47,053 with 165 positives. This model included the following twelve countries: *Belgium, Denmark, Czech Republic, Finland, Hungary, Italy, the Netherlands, Norway, Spain, Poland, Portugal* and *Sweden.*

Table 5.6.1 Logistic regression model for the prevalence of medicinal opioids. The left column shows the effects that have been included in the model, coefficient estimates scale the different levels of the effects and P indicates the significance level of the effect when correcting for all other effects in the model.

Effect	Coefficient estimates	DF	Wald Chi-square	P
Age group	18-24: -1.9167 25-34: -0.9974 35-49: -0.4682 50+: reference	3	27.32	<0.0001
Gender	Men: -0.5578 Women: reference	1	12.10	0.0005
Country	BE: 0.0343 CZ: -1.4068 DK: 0.1206 ES: -0.9136 FI: -0.2512 HU: -0.7456 IT: -1.7997 NO: -1.4956 NL: -1.5357 PL: -2.3602 PT: -1.7624 S: reference	11	67.23	<0.0001

Medicinal opioids are drugs similar in distribution to benzodiazepines: their prevalence differed significantly with age, being most prevalent in the 50+ age group and least prevalent in the youngest age group (18-24). Like benzodiazepines, they were significantly more prevalent by female than by male drivers.

Prevalence of medicinal opioids was significantly differently distributed among countries, but the tentative gradient was the opposite as for benzodiazepines: Medicinal opioids were most prevalent in Belgium and the northern countries (Denmark, Sweden) and least prevalent in Poland and the southern countries (Italy, Portugal). There was no significant difference in prevalence of medicinal opioids over the time periods.

5.7 Factors influencing prevalence of alcohol in combination with drugs

This model was constructed exclusively for male drivers due to a very small number of positive female drivers. Moreover, due to a low number of positive samples, time periods 1, 2 and 3 were merged, 4 remained, 5, 6 and 7 were merged and 8 remained (variable *time period new*). A model was run including *Belgium*, *Spain*, *Italy*, *Norway, the Netherlands* and *Portugal*. There were no positive samples for male drivers in *Hungary, Poland and Sweden,* so these countries could not be included, and for the remaining four countries (*Czech Republic, Denmark, Finland and Lithuania*) the positive samples for male drivers were too few and too unequally distributed by time period and age to run the complete model.

The following interaction terms turned out to be insignificant: *age group x country*, *time period new x country* and were consequently removed from the model. Under the assumption that the same interaction terms were not significantly explaining alcohol-drug prevalence for male drivers in *Denmark*, *Czech Republic*, *Finland* and *Lithuania*, these four countries were included in the model. Hence the final model included the significant independent variables and interaction, as shown in table 5.7.1.

The final model contained 25,466 observations with 161 positives. The model predicts prevalence in male drivers only. It includes the following ten countries: *Belgium*, *Czech Republic*, *Denmark*, *Finland*, *Lithuania*, *Spain*, *Italy*, *Norway, the Netherlands* and *Portugal.*

Table 5.7.1 Logistic regression model for the prevalence of alcohol in combination with drugs. The left column shows the effects that have been included in the model, coefficient estimates scale the different levels of the effects and P indicates the significance level of the effect when correcting for all other effects in the model.

Effect	Coefficient estimates					DF	Wald Chi-square	P
Time period new	1-3: -0.1098 4: 1.1223 5-7: 0.8193 8: reference					3	16.12	0.0011
Age group	18-24: 1.1159 25-34: 2.1274 35-49: 1.8743 50+: reference					3	18.18	0.0004
Country	BE: 0.1226 CZ: -2.0512 DK: -0.8557 ES: 1.2655 FI: -1.3898 IT: 0.6802 LT: -1.7766 NO: -1.7086 NL: -0.0690 PT: reference					9	102.95	<0.0001
Time period new× Age group		18-24:	25-34:	35-49:	50+:	9	19.94	0.0183
	1-3:	0.1177	-1.2156	-1.9904	reference			
	4:	-0-6058	-1-6406	-1-3277	reference			
	5-7:	-0.8201	-1.1826	-2.9136	reference			
	8:	reference	reference	reference	reference			

The combination of alcohol, drug(s) and driving is typically a male driver phenomenon, since there were too few positive samples for female drivers to include them in the prevalence model.

There was a significant difference in prevalence over the time periods; thus the combination of alcohol and drug(s) was most prevalent in time period 5-7, i.e. Saturday and Sunday during daytime, and least prevalent in period 1-3, i.e. Monday through Friday during daytime.

Prevalence was significantly different among age groups; the age group of 25-34 years had the highest prevalence and the 50+ year olds the lowest.

There was no clear gradient in the country prevalence, although the prevalence of alcohol in combination with drug(s) differed significantly among countries. Prevalence was highest in Spain and lowest in Czech Republic, Lithuania and Norway.

5.8 Factors influencing the prevalence of multiple drugs

If a person was tested positive for more than one drug, but negative for alcohol, the sample was considered positive for multiple drugs.

This model was constructed exclusively for male drivers due to a very small number of positive female drivers. Moreover, due to a low number of positive samples, time periods 1, 2 and 3 were merged to one, 4 remained, 5, 6 and 7 were merged and 8 remained (variable *time period new*). A model was run including *Spain, Norway* and *the Netherlands. Lithuania* could not be included because there were no positive samples for multiple drugs. For the remaining nine countries, the positive samples were too few and too unequally distributed by time period new and age to run the complete model.

The logistic regression was run and it was found that the interactions *time period new* × *age group, age group* × *country* and *time period new* × *country* were insignificant. It was now possible to import gender in the model. The procedure was run again for the same three countries and it was now found that the interaction terms *time period new* × *gender, age group* × *gender* and *gender* × *country* were insignificant. Furthermore, the main effect *time period new* was found insignificant.

Hereafter all the remaining countries with positive samples for multiple drugs, that is *Belgium, Denmark, Czech Republic, Hungary, Poland, Finland, Sweden, Italy* and *Portugal* could be included in the model under the assumptions that all the abovementioned interactions and the main effect were not significant for these countries either. Hence the final model includes the significant independent variables, as shown in table 5.8.1.

In the final model, the total number of observations is 47,062 with 139 positive. This model included all countries except *Lithuania*, that is *Belgium*, *Czech Republic, Denmark, Spain, Finland, Hungary, Italy, Norway, the Netherlands, Poland, Portugal and Sweden.*

Table 5.8.1 Logistic regression model for the prevalence of multiple drugs. The left column shows the effects that have been included in the model, coefficient estimates scale the different levels of the effects and P indicates the significance level of the effect when correcting for all other effects in the model.

Effect	Coefficient estimates	DF	Wald Chi-square	P
Age group	18-24: 0.7576 25-34: 0.7550 35-49: 0.2040 50+: reference	3	13.43	0.0038
Gender	Men: 1.0220 Women: reference	1	15.41	<0.0001
Country	BE: 1.4554 CZ: 1.2228 DK: -0.2158 ES: 1.9676 FI: 1.1140 HU: 0.0845 IT: 2.0807 NO: 1.2383 NL: 1.6815 PL: -0.8190 PT: 0.8472 S: reference	11	48.76	<0.0001

Multiple drugs were prevalent in both male and female drivers, although significantly more prevalent in male than in female drivers. There was a clear age gradient in multiple drug prevalence: the older the driver, the smaller the prevalence.

Multiple drug prevalence was significantly different among countries; it was most prevalent in Spain and Italy and least prevalent in Denmark, Poland and Sweden. There was no significant difference in prevalence over time periods.

5.9 Conclusion

There are two opposing prevalence patterns represented in this sample:

1. The first one applies to alcohol, THC, alcohol and drugs in combination and drugs in combination with other drugs. In this group, prevalence was highest in young male drivers in the weekend and lowest in female drivers during daytime. For THC there was an age gradient: the younger the driver, the higher the prevalence. Both alcohol, cocaine, THC, alcohol in combination with drug and multiple drugs were highly prevalent in Spain. Alcohol was highly prevalent in Belgium and sparse in Norway, Poland, Lithuania and Hungary.

2. The second pattern applies to benzodiazepines and medicinal opioids. These drugs are most prevalent in female drivers, their prevalence is higher the older the driver, and they are most prevalent during daytime and least during nighttime. The prevalence of benzodiazepines showed a clear north-south gradient in that these drugs were most prevalent in Czech Republic, Belgium and southern countries (Spain, Portugal) and least prevalent in Denmark, Finland and Sweden. The prevalence of medicinal opioids showed the opposite being highest in Denmark, Sweden and Belgium and lowest in Italy, Poland and Portugal.

6. Discussion and conclusions

The main aim of this study was to obtain more insight in the use of psychoactive substances among drivers in European traffic. Thirteen countries participated in this study by conducting roadside surveys according to a general design. In total almost 50,000 randomly selected drivers participated between January 2007 and July 2009.

6.1 Main findings

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- Alcohol is still by far the number one psychoactive substance on European roads, followed by illicit drugs and medicinal drugs.
- On a European level alcohol is estimated to be used by 3.48% of the drivers, illicit drugs by 1.90% of the drivers, medicinal drugs by 1.36% of the drivers, drug-drug combinations by 0.39% of the drivers and alcohol-drug combinations by 0.37% of the drivers.
- For illicit drugs THC is the most frequently detected drug in traffic, followed by cocaine. Amphetamines and illicit opiates were less frequently detected.
- Illicit drugs were in general mainly detected among young male drivers, during all times of the day but mainly in the weekend
- Medicinal drugs were in general mainly detected among older female drivers during daytime hours.
- Benzodiazepines were the most prevalent medicinal drug in traffic, Z-drugs were less prevalent. However, considerable differences between countries were present.
- The use of substances among drivers in the general driving population in Europe (prevalence) varies very much per country, but general patterns can be distinguished on the level of European regions:
    - The medicinal drugs Z-drugs and medicinal opiates and opioids were in general relatively frequently detected in Northern European countries.
    - Illicit drugs, alcohol and benzodiazepines are relatively frequently detected in Southern European countries.
    - In Eastern Europe the prevalence of alcohol and drugs was relatively low compared to the other European regions.
    - In Western Europe, drug use is more or less on the European average.

6.2 General results

Tables 6.1- 6.3 provide an overview of the main results per substance. Information is provided on the average European prevalence, the rank of the substance in European traffic and the country in which the highest prevalence was detected. Furthermore, information is presented on the European region in which the substance use was dominant and the gender, age and time period for which the highest prevalence was predominantly found.
The estimated average of psychoactive use in European traffic was calculated by means weighted distributions over the European subregions.

6.2.1 Illicit drugs

Illicit drugs were most frequently detected in Southern and Western Europe. Especially in Spain the prevalence of illicit drugs was very high. More than 8% of all drivers (approximately 1 in 12) were positive for one or more illicit drugs. In Northern and Eastern Europe the prevalence of illicit drugs was on average below 1%.

Table 6.1 Overview of general results for illicit drugs

	Amphetamines	**Cocaine**	**THC**	**Illicit opiates**
Mean prevalence:	0.08%	0.42%	1.32%	0.07%
Prevalence ranking:	#9	#4	#2	#10
Highest prevalence:	Czech Republic (0.38%)	Spain (1.49%)	Spain (5.99%)	Italy (0.3%)
Main European region:	No specific region	Southern Europe	Southern Europe	Southern Europe
Main gender effect:	Differs per country	Male drivers	Male drivers	Male drivers
Main age effect:	Young drivers (18-34)	Drivers 18-49	Young drivers (18-34)	Drivers 35-49
Main time period effect	Differs per country	Differs per country	Differs per country	Differs per country

Amphetamines
Amphetamines were far less frequently detected than THC and cocaine. The prevalence of amphetamines is very low in most of the 13 countries. The Czech Republic has the highest share with 0.38% which is almost the double of the share of the countries that are ranked second and third: Lithuania and The Netherlands with 0.22% and 0.19% respectively. Most countries have a prevalence which is lower than 0.10%.
In general amphetamines are equally often detected alone as in combinations.
Amphetamines are mainly used by drivers younger than 35 years old. It is in some countries more prevalent among male drivers and in other countries more among female drivers. In Lithuania the prevalence of amphetamines among female drivers was almost 20 times higher than for male drivers. This large difference between male and female drivers could partially be caused by the small sample size of female drivers (n = 121).
The distribution of amphetamines by time period differs per country. In the Netherlands, Norway and Poland amphetamine is mainly used in night time periods. In Sweden it is detected during night times as well, but only on weekdays. In Denmark and Finland amphetamine use was only detected during weekend days and in Czech Republic and Spain it was detected primarily in the weekend both during the day and during the night. In Lithuania amphetamines were only detected in traffic during weekday hours.

Cocaine
The second most frequently detected illicit drug among drivers was cocaine. The highest prevalence for cocaine was found in Spain and Italy.

Cocaine was often used in combination with other psychoactive substances. On average around half of the cocaine was detected in combination with other substances. Only in Finland and Hungary cocaine was solely detected in single drug use.
Almost all cocaine users were younger than 50 and predominantly male. However, it should be taken into account that female drivers in Spain have a higher prevalence for cocaine than most male users in other countries.
Cocaine was detected during all time periods. However, large differences in the distribution by time period exist on a country level. In Finland and Hungary cocaine was only detected at weekdays during daytime hours. In Spain it was frequently detected during all time periods. In Italy it was detected frequently in all time periods except in the weekend at daytime hours. In the Netherlands single cocaine use was primarily detected during weekend nights, while in Belgium it was more frequently detected during weekday nights.
The results of the logistic regression as presented in chapter 5 based on the data of Belgium, Norway, Hungary and Portugal suggest that the highest prevalence would be found among the age group 25-34.

THC
THC was the most frequently detected illicit drug in traffic. It was mainly used in Spain where the prevalence was almost four times higher than in that of the second ranked country: the Netherlands. On average between 20% and 30% of THC use was in combination with other psychoactive substances. Combinational THC use was the highest in the Southern European countries (Italy, Spain, Portugal) and the Netherlands. In general drivers who had been using THC were males younger than 35 years.
THC was prevalent at all days of the week during all hours of the week in most countries. However, in Belgium, Czech Republic, Denmark, Italy and Hungary, single THC use was mainly detected during the weekend.
The trend of THC use in weekends by young male drivers was confirmed by the logistic regression analysis (see chapter 5).

Illicit opiates
Illicit opiates are barely prevalent in European traffic. Italy has the highest share with 0.3%. In the Northern European counties no illicit opiates were detected among drivers. In the Eastern European countries Illicit opiates were only detected in Poland.
Illicit opiates were relatively frequently used in combination with other psychoactive substances. In Italy the prevalence of illicit opiates in combination with other substances was 0.71% which was far higher than the single use (0.3%).
Most users of illicit opiates are between 35 and 49 years old, except for Belgium where most users were younger than 25. Illicit opiate use was not detected among drivers from Northern European countries (Denmark, Finland, Norway and Sweden) and from Czech Republic, Lithuania, and Hungary. Illicit opiates are mainly used by male drivers.
Illicit opiates were not found during weekday nights in any of the 13 countries. In Italy and Portugal the prevalence was the highest during weekend nights, in Belgium, the Netherlands and Spain during weekend days and in Poland at weekdays during daytime.

6.2.2 Medicinal drugs

Medicinal drugs were detected most frequently in Belgium and Portugal with prevalence just below 3%. Most countries had a prevalence rate of 1.4 - 1.8%.

In general benzodiazepines were the most prevalent medicinal drug in traffic. However, in Denmark and Sweden medicinal opiates and opioids were more frequently detected. Z-drugs were less prevalent, except in Norway where they were detected among 0.69% of all drivers.

Table 6.2 Overview of general results for medicinal drugs

	Benzodiazepines	Z-drugs	Medicinal opiates and opioids
Mean prevalence:	0.90%	0.12%	0.35%
Prevalence ranking:	#3	#8	#7
Highest prevalence:	Portugal (2.73%)	Norway (0.69%)	Denmark (0.79%)
Main European region:	Southern Europe	Northern Europe	Northern Europe
Main gender effect:	Female drivers	Female drivers	Female drivers
Main age effect:	35 years and older	Drivers 50 years and older	35 years and older
Main time period effect	Daytime hours	Daytime hours at weekdays	Daytime hours

Benzodiazepines
Benzodiazepines were detected in all 13 countries. The highest prevalence was detected in Portugal, followed by Belgium, Hungary, Spain and Lithuania. The average European mean was 0.9%.
Benzodiazepines were not often used in combination with other psychoactive substances. In most countries the share was around 15%. However in Italy almost half of all benzodiazepines were used in combination.
The highest prevalence for single benzodiazepine use was detected among drivers aged 35 years and older. However, in Italy most benzodiazepines were used by young drivers aged 18-24.
Unlike for illicit drugs, benzodiazepine use is relatively more frequently detected among female drivers. Especially in Lithuania the share of female drivers was much higher than that of male drivers. In Denmark, Finland, and Poland the share of benzodiazepine use was higher among male drivers though.
Benzodiazepines were most commonly detected during daytime in many of the countries. Only in Poland and Portugal relatively more drivers were positive for the use of benzodiazepines during night time hours.
This trend was generally confirmed by the logistic regression analysis.

Z-drugs
Z-drugs were not commonly detected among European drivers. The prevalence is the highest in the Northern European countries, followed by Belgium, Hungary and the Netherlands. In all other countries no Z-drugs were detected among drivers.
Z-drugs were relatively often combined with other psychoactive substances in Finland and Hungary. In Denmark only single use of Z-drugs was detected. In Belgium, Norway, Sweden and the Netherlands the relative share of combinational use of Z-drugs varied between 9% and 26%.
Most drivers positive for Z-drugs were 50 years and older, except for Hungary where all drivers were between 25 and 34 years old.
In general the share of female drivers who were positive for Z-drugs was higher than the share of male drivers. However, In the Netherlands only (a small share of) male drivers were positive for Z-drugs and in Sweden the share of Z-drugs users was a little bit higher among male drivers than among female drivers. In Hungary Z-drugs were only detected among female drivers.
Z-drugs were most often detected during daytime hours at weekdays. In Denmark however, most Z-drugs were detected during daytime hours in the weekend and in Sweden most Z-drugs were detected during night time hours at weekdays. In none of the countries Z-drugs were found in weekend nights.

Medicinal opiates and opioids
In Hungary, Italy and Portugal medicinal opiates and opioids are relatively often used in combination with other psychoactive substances. In Czech Republic, Spain, and Poland only single use was detected.
Medicinal opiates and opioids were mainly detected among drivers of 35 years and older.

In most countries the share of female drivers is larger, except for Spain, Finland, Norway and Portugal where the share of male drivers positive for medicinal opiates and opioids was larger. The logistic regression results indicate a general higher prevalence among female drivers as well.
The distribution over the four different DRUID time periods varies largely, but in general highest prevalence was detected during daytime hours. In Denmark though, most medicinal opiates and opioids were detected in weekend nights and in Finland during weeknights.

6.2.3 Alcohol, alcohol-drugs and drug-drug combinations

Alcohol is the most frequently detected psychoactive substance in Europe. Alcohol-drugs combinations and drug-drug combination were relatively prevalent as well. All these groups are mainly prevalent in the Southern part of Europe.

Table 6.3 Overview of general results for alcohol, alcohol-drugs combinations and drug-drug combinations

	Alcohol alone (≥ 0.1 g/L)	Alcohol (≥ 0.1 g/L) and drugs	Drug-drug combinations
Mean prevalence:	3.48%	0.37%	0.39%
Prevalence ranking:	#1	#6	#5
Highest prevalence:	Italy (8.59%)	Spain (1.14%)	Italy (1.22%)
Main European region:	Southern Europe	Southern Europe	Southern Europe
Main gender effect:	Male drivers	Male drivers	Male drivers
Main age effect:	Differs per country	Young drivers (18-34)	Drivers younger than 50
Main time period effect	Weekday nights and weekends	Nighttime hours	Differs per country

Single alcohol use
The prevalence of single alcohol use in twelve of the thirteen countries ranged between 0.15% in Hungary and 8.59% in Italy. As stated before, no alcohol data was available for Sweden.
In general the largest prevalence for alcohol is present at the low BAC categories. In Denmark even 81% of the alcohol drivers had a BAC between 0.1 and 0.5 g/L. However, in Lithuania almost 40% of all alcohol intoxicated drivers had a BAC level of 1.2 g/L or higher, while for most other countries this share is below 15%. The total prevalence for alcohol ranged between 0.15% in Hungary and 8.59% in Italy.
In most countries the share of alcohol-positive drivers was the highest for the two oldest age groups (35-49 and 50+). This is both the case for male and for female drivers.
The prevalence of alcohol was in general the lowest at weekdays during daytime hours. However, in Portugal the share of alcohol drivers was higher during weekday hours than during weekday nights. Despite a large share of high BAC drivers, no alcohol use was found during weekend nights in Lithuania. In Hungary no alcohol was found at all during night time hours.

Alcohol-drugs combination
The Northern and Eastern European countries all had lower prevalence for the combined use of alcohol and drugs than the European average. In Western Europe the prevalence was around the average, while relatively the most drivers positive for alcohol and drugs were detected in Southern Europe. The highest prevalence was detected in Spain and Italy with prevalence rates just over the 1%.
The relative share of alcohol in combination with drugs as a total of all alcohol use varies between 0% (Hungary) and 23% (Spain). Countries with higher prevalence for single alcohol and single drug use have, as expected, higher prevalence for combined use of alcohol and drugs.
In general the prevalence for alcohol-drugs combinations for male drivers is higher than for female drivers. The only exceptions are Norway, where the prevalence of alcohol among male drivers was

equal to that of female drivers, and Italy where the prevalence of alcohol among female drivers was even higher than that in men.
Most drivers who used alcohol and drugs in combination with each other were younger than 35 years old, except for Italy, where the drugs-alcohol combination was relatively more prevalent among drivers over 35 years old.
The combined use of alcohol and drugs was mainly detected during night time hours. However, in Finland, Czech Republic and Belgium the prevalence during daytime hours was relatively high as well.

Drug-drug combinations
The prevalence of drug-drug combinations among drivers was the highest in Italy and Spain, which were the only two countries with a prevalence higher than the European mean of 0.39%. Most commonly used drugs in multi-drug combinations are THC, cocaine, and benzodiazepines, which are also the most frequently detected single psychoactive substances after alcohol.
The share of multi-drug use is on average around 10% of all drug use. Italy had the highest share of multi-drug use: 22% of the drug using had been using two or more different drugs.
Drug-drug combinations were most frequently detected among drivers younger than 50 years. The distribution over the four age groups varies largely though over the different countries.
In general multi-drug use is more common among male than among female drivers. However, in Czech Republic, Sweden and especially in Hungary, the share of female users is larger.
The distribution of multi-drug use by time period varies considerable between the different countries. In Southern European countries and in Norway the prevalence of drug-drug combinations was relatively high during night time hours at weekdays. The prevalence during daytime hours at weekdays was the highest in Italy and Hungary. The results of the logistic regression analysis also indicate no significant overall trend of time period.

6.3 Interpretation of the results

The results show that the prevalence of psychoactive substances varies per country, but that in general the highest prevalence of alcohol and illicit drugs (except for amphetamines) was found in Southern European countries and the highest prevalence of medicinal drugs in Northern European countries. These findings are in line with the prevalence of psychoactive substances in the general population (Ravera and De Gier, 2008).
Alcohol (≥ 0.1 g/L) was the most commonly detected psychoactive substance in European traffic. In most of the participating countries, the legal alcohol limit was higher than the 0.1 g/L cut-off level in this study. Only in Czech Republic and Hungary a zero tolerance limit for alcohol is present.
However, when a cut-off level of 0.5 g/L would have been applied, alcohol would still have been the most prevalent substance in European traffic with an average prevalence of 1.49%.
Figure 6.1 shows the prevalence of alcohol of 0.5 g/L and higher for twelve participating countries. No alcohol data was available for Sweden. The results in this figure show that those countries with the highest prevalence for alcohol have a legal BAC-limit of 0.4 or higher. However, a direct relationship between the height of the prevalence and the legal limit can not be concluded from this figure since other factors such as the general and specific deterrence effect from enforcement will influence the prevalence level as well (Veisten et al., 2010).

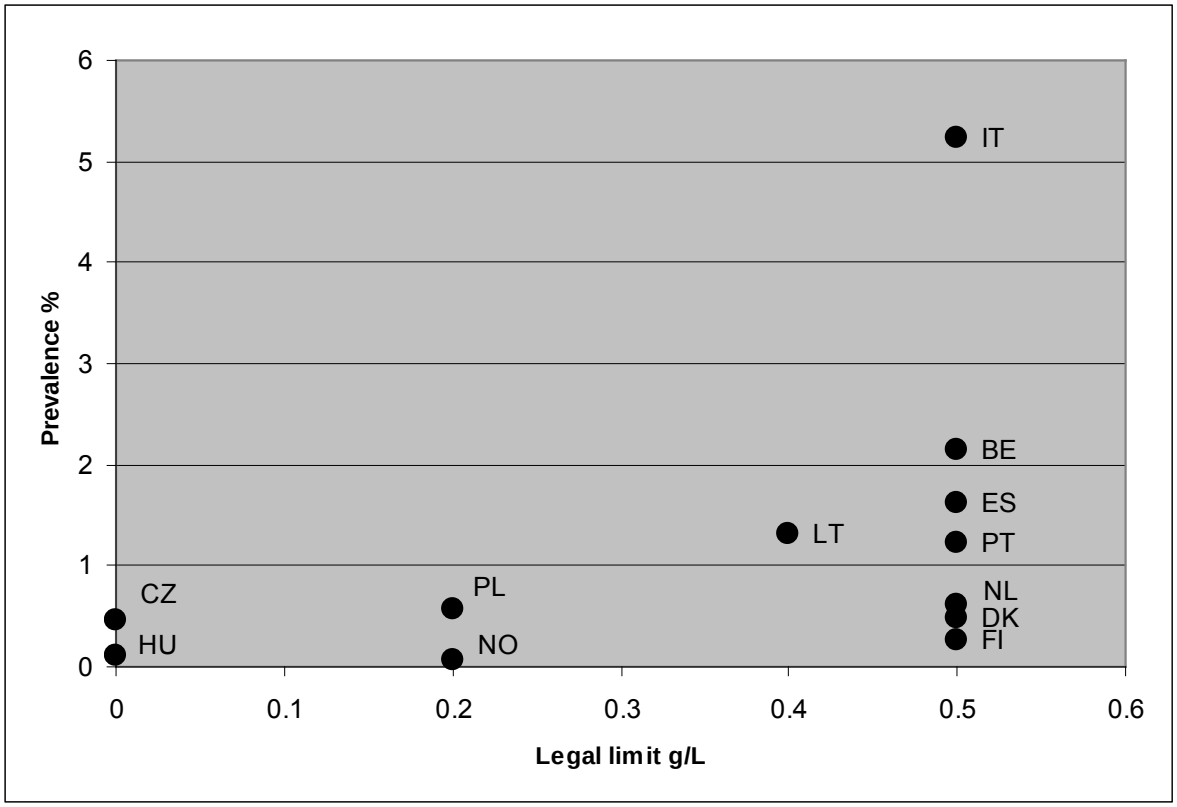

Figure 6.1. Prevalence alcohol ≥ 0.5 g/L by legal BAC limit in percentages

Previous case-control studies (Borkenstein et al., 1974; Compton et al., 2002; Keall et al., 2001; Krüger and Vollrath, 2004; Mathijssen and Houwing, 2005) have shown that the relative accident and injury risk increases drastically at high BAC levels. Therefore, from the viewpoint of traffic safety drivers with a BAC of 1.2 g/L and higher form the most important target group of alcohol intoxicated drivers.

The prevalence of the heavy alcohol intoxicated drivers is the highest in Italy and Lithuania, and therefore high prevalence among injured drivers would have been expected as well. The results from the DRUID hospital studies (Isalberti et al, 2011) show, however, that the prevalence of alcohol among injured drivers in Italy and Lithuania are actually relatively low, as compared to other participating European countries.

Both Lithuania and Italy had a relatively low number of participants and therefore chance could have had some influence on the results of the roadside survey. On the other hand, for the other psychoactive substances the relative share was in both countries as would be expected from the results of the hospital study.

Another possible explanation for the relatively high share of high BAC drivers in traffic compared to the share of high BAC drivers in the hospital is that the police has not always tested randomly. In the Italian country report (see Part 2 of this report) it was stated that the police may have applied a preselection, but that the results were in line with other studies on the prevalence of alcohol and drugs in Italy. In the Lithuanian country report no reference to possible bias was made and no other studies were available for comparison.

The results of chapter 4 and 5 differ from each other on some effects of factors such as gender, age and time period distributions. The reason for this is that the logistic regression method applied in chapter 5 is a different method than standard prevalence calculation on which the results of chapter 4 were based. For example, logistic regression calculation is only possible for those countries where sufficient positive samples are available. This means that effects are not based on the results of all countries that were included in the standard prevalence calculations, but on a subselection of the participating countries.

Another difference is caused by the use of different time periods. The results in chapter 4 show that the prevalence of illicit drugs is not mainly limited to nighttime hours as is the case for, e.g., the combination of alcohol and drugs. However, the results from chapter 5 indicate that there is a strong relationship between time period and the prevalence of illicit drug use. This difference between results

can be explained by differences in the applied distribution of time-periods. The logistic regression method of chapter 5 includes for the most prevalent substances the original eight 6-hour time periods that were selected at the beginning of the project, whereas the analysis in chapter 4 did not. Both choices have advantages as well as disadvantages. The reason for using four 6-hour time periods in the result section (chapter 4) was that some countries only had a few samples in some of the time periods and in one country no data at all was available for one of the time periods. Low numbers result in low statistical power and increased confidence intervals. As explained in section 3.1, clustering was used to cover for most of the issues regarding low numbers of samples. The disadvantage of clustering is that the level of detail is decreasing. The daytime period covers the morning (04.00-09.59), the afternoon (10.00-15.59) and the evening (16.00-21.59). It is not likely that these time periods are very similar concerning the prevalence of psychoactive substances. E.g. in Italy the highest prevalence for total substance use was detected in evening hours both during weekdays and in the weekend. During these hours the total prevalence of psychoactive substances was around 20% while it was around 15% during the other time periods, except for weekday mornings when the prevalence was below the 10%. After clustering, the total prevalence of psychoactive substance was around 15% in all four time periods.
In Italy the prevalence of alcohol was the highest during weekday and weekend mornings. However, after clustering the highest prevalence for alcohol was found in weekend nights.
These two examples show that the results by time period should be interpreted with care and that the loss of information due to clustering will sometimes lead to other conclusions.

Despite the common design, differences in the set up of the study were still present between the thirteen participating countries. These differences sometimes had an effect on the response rate as well. The non response in the thirteen countries varied between 0 and 52%. Mandatory drug testing resulted in very low refusal rates, but voluntary drug testing not always resulted in high refusal rates.
The need for informed consent varied per country. In six countries written informed consent was needed and in six others it was not. In Italy written informed consent was no issue since participation was mandatory. Based on the non-response rates it can be concluded that written informed consent was not always associated with increased non-response.
In all countries where the police performed a mandatory drug test or where drug testing by researchers preceded the mandatory breath test for alcohol, non-response was very low (0-5%). In countries where the police performed the mandatory breath test for alcohol before the voluntary drug test was performed by a researcher, the non-response range was relatively broad: 5-52%. Only in two out of seven countries (Denmark and Norway) a non-response below 10% was achieved.

Weighting was based on the distribution of traffic by the eight DRUID time periods in the participating countries. For those countries who did not have data available on traffic by time period, an average score was computed based on the distribution of 4 OECD countries. Additional weighting by region was possible as well in case all time periods were covered in all of the regions, and in case the distribution of both the prevalence and the traffic differed over the time periods by region.
Another possible way of calculating weight factors by time period is by means of traffic counts during the roadside survey sessions. The use of this method has been discussed within the WP. Traffic counts seem to provide the most up-to-date information on traffic, however the collection of these data is not that straightforward. The first issue is that roadside surveys during night time hours are generally planned at roads with relative much traffic in order to include sufficient samples during hours with low traffic densities. If traffic counts would be used for weighting purposes, it would be likely that traffic proportions during night time hours would be overestimated.
Furthermore, the traffic volume is not always the same, due to e.g. local events, weather conditions, and roadworks. Therefore, it would be better to use more than one traffic count per location and have the other traffic counts at the same day of the week during the same time of the day as that of the roadside survey and then calculate the average traffic volume based on the results.
Both methods have their pros and cons. For comparability reasons it was decided that national traffic distribution data was used for calculating the weight factors.

When comparing the results of the DRUID study with the findings of a American national roadside survey of alcohol and drug use by drivers that was conducted in 2007 (Lacey et al., 2009), under the authority of the National Highway Traffic Safety Administration (NHTSA), some interesting similaties in the results can be observed.

The main differences between the two studies were that in general more substances were included in the NHTSA study and that other cut-offs were applied. Therefore, it is only useful to compare patterns of drug use and not to compare prevalence rates.
The general patters of drug and alcohol use in the United States and in Europe are in line with eachother; both studies show that illicit substance use is more common among young male drivers and that the use of medicinal drugs is more common among older female drivers.
As well as in the European DRUID study, alcohol was the most frequently detected psychoactive substance in the United States followed by THC. Furthermore, the NHTSA study found that benzodiazepines were thirdly ranked during daytime hours whereas cocaine was thirdly ranked during night time hours. These substances were also the most prevalent substances after THC in the DRUID study.
The NHTSA study provides information on drug use for the combination gender, age and timeperiod. However in the DRUID study this disaggregation was not presented, although it could provide some interesting additional information for identifying specific user groups. However, a disadvantage of such disaggregations is that they lead to smaller cell numbers and therefore, larger confidence intervals and thus less reliable figures.

6.4 Strengths and limitations of the study

Strengths
The main strength of this study is that for the first time a road side survey was conducted throughout Europe, and that samples were collected in thirteen different European countries by applying to a large extent the same method. To this end practical guidelines have been developed within the project. In the first stage, one or more regions per country were selected. These regions were meant to be representative for the country with regard to substance use and traffic distribution. Within these regions smaller research areas were selected, and within these areas, survey locations were selected, where subjects were stopped at random, and were requested to participate in the study. With regard to days of the week and times of the day, the study population sample was stratified into eight time periods over the week, for each of the survey areas. The time periods did not overlap each other and covered all the days of the week and all times of the day.

Another strength of this study is the proficiency testing that was required for all participating laboratories. Both for blood and saliva 4 rounds of proficiency tests were included to assure the validity of the results.

Limitations
The European mean that was estimated should be used with care because it was based on the results of 'only' thirteen countries. The representativeness on a national level varies per country. In order to correct for large under representations in one of the eight time periods, clustering of the data was needed. Clustering does certainly not solve all representativity issues, but at least it would improve the validity of the data to some extent. The results from countries with relatively small sample sizes, such as Italy, Lithuania and Czech Republic will theoretically have benefited the most from this clustering.

The population of Southern EU countries are best represented in this prevalence study. The countries that are involved in the roadside survey account for 89% of the Southern European population, the population from Eastern EU countries is represented for almost two-thirds (63%). The population of the Northern EU countries together with Norway are represented for only 29% due to the absence of a roadside survey in the United Kingdom which accounts for 63% of the total Northern EU population. Finally, the population of the Western Member States are only represented for 11%, since large Member States like Germany and France, together accounting for 80% of the total Western EU population, did not participate in the DRUID roadside surveys.
The results from Western Europe weight the most with a weight factor of 181.4/500, although barely 27 million of the 181.4 million inhabitants were represented. On average the results from Western Europe are very close to the European mean. Therefore, despite the relative heavy weight of Western Europe in the European average, the underrepresentation is not expected to have a substantial effect on the results for the European mean.

A limitation of this study is the use of different body fluids. The use of psychoactive substances will lead to different concentrations in blood and saliva and the correlation between these concentrations

is poor. We tried to compensate for this by using equivalent cut-offs to correct for differences in sample collection method. In general the substance concentrations in saliva are higher than in blood and therefore the limit of quantitation was more easily met by substances in saliva. The use of the limit of quantitation as the cut-off value would therefore have led to relatively higher prevalences in countries that collected saliva samples. In order to compensate for this possible bias, equivalent cut-offs were introduced in the analysis. However, when applied in the countries where only saliva samples were used for the roadside survey, the results will in general give an underrepresentation of the prevalence. In combination with the collection of blood samples at the roadside or for comparison with the results in hospital studies among injured or killed drivers, a correction for the different body fluids will be needed.

6.5 Recommendations

The results of this study can generally be used in selecting overall activities and target groups in the policy field of psychoactive substance use in traffic across Europe. The results indicate, however, that the prevalence of psychoactive substances by gender, age and time period varies largely per country. Therefore, recommendations for national activities regarding, e.g., policy issues, enforcement, education or campaigns, should primarily be based on the results of the country reports, rather than on the general report.

Alcohol is still the most prevalent substance in traffic, as well as it is among injured and killed drivers (Isalberti et al., 2011). Therefore, with regard to enforcement on psychoactive substances it is recommended that this would remain to be mainly focused on alcohol use among drivers. Since enforcement of drug driving legislation is costly in terms of time and money, selective drug testing is recommended above random drug testing. However, drug enforcement should not go at cost of alcohol enforcement (Veisten et al., 2010).

The thirteen roadside surveys that were conducted within the DRUID-project provided a very valuable insight in the prevalence of psychoactive substances among car drivers in Europe. In the near future new legislations on drug driving will be applied in several European countries (e.g. the Netherlands) and the results from the DRUID project may affect future policies towards drink and drug driving. Therefore, it would be very valuable to monitor if these changes will indeed have a positive effect on the use of psychoactive substances in traffic. National roadside surveys on the prevalence of substance use in traffic on a regular, say, annual or bi-annual base would be a helpful tool to monitor the trend of drink and drug driving. It is recommended that these monitoring surveys would be carried out in more countries than the thirteen European countries that participated in the DRUID roadside surveys, in order to get a more representative European overview.
Since the main purpose of this roadside survey would be to monitor the trend of drug driving, the number of samples per country might be smaller than in the present study. A power study should be conducted to estimate the required number of samples from randomly selected car drivers.

In order to compare the results from new roadside surveys in Europe with the data collected in DRUID it is recommended to follow the study design guidelines from the DRUID roadside surveys (See annex 1) as much as possible.

It is recommended to collect saliva samples when the roadside surveys are solely used for monitoring the prevalence of drug use in traffic, since higher non-response rates are to be expected when collecting blood samples.

If the roadside survey is part of a case-control study, it is recommended to use the same sample collection method at the roadside as is used in the hospital, in order to be able to make good comparisons between cases and controls.

Furthermore, in order to reduce non-response researchers should invite the participants of the survey before the police tests the driver for alcohol.

It is mandatory to have permission of the various national Medical Ethics Commission to conduct a roadside survey like this. The process of getting this permission can take a lot of time in some countries, this should be taken into account when planning future prevalence studies on psychoactive substances.

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Annex 1 Guidelines for roadside surveys

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Introduction

The guidelines for the roadside survey are derived from DRUID Deliverable 2.1.2: Working paper “Uniform design and protocols for carrying out case-control studies”.

In order to be able to calculate the relative risk and to compare the prevalence as well as the relative risk in the various countries, a uniform study design has been set up for roadside surveys and hospital studies. This annex contains the guidelines for the roadside surveys only. Guidelines for the hospital study are included as an annex in Deliverable 2.2.5 of DRUID "Prevalence of alcohol and other psychoactive substances in injured drivers, based on hospital surveys in seven member states".

Furthermore, uniform guidelines regarding collection of specimen, transport of specimen as well as analysis of specimen have been derived.

Finally, a decision has been made regarding a core list of 23 substances, including alcohol, to be analysed for in all countries.

This annex includes all decisions taken as part of the uniform design. The following partners have contributed to the various guidelines: DTF, UGent, SWOV, TOI, KTL, UKL-HD and TFA-UNDP.

Background

During the DRUID WP2 meeting at SWOV on January 9-10, 2007, a group was appointed to outline how to ensure representativeness of the roadside survey results. The aim of this document is to establish a joint background for planning roadside surveys among participants in WP2. This joint background will increase the generalization of the results and ensure comparability between results from various countries. DRUID WP2 is a unique possibility to have scientifically valid estimates for prevalence of drink-and-drug driving in various European countries.

Purpose and principles

A major purpose of the DRUID roadside surveys is to compare the prevalence of psychoactive substance use in traffic between countries. This comparison requires national representativeness. The problem is how to achieve this goal with the practical limitations implied by roadside surveys. These limitations vary between the countries, and may cause limited comparability in the results unless utmost care is taken to ensure comparability.

The general hypothesis of DRUID is that drug use increases accident risk. Consequently the surveys should cover drug use among road users who may cause road accidents. Ideally, all active road users, in all regions of each country, on all roads, in all vehicles, at all times of the year, week and day should be represented in the survey, in order to have the road traffic in each country surveyed in a representative way. For practical reasons, however, covering all aspects of road traffic may be difficult. Roadside surveys will usually require co-operation between the police and researchers. The principles of police work are different from those of research, and the police as well as the researchers have practical and economic restraints.

Consequently, deviations from the ideal principle may be necessary. Deviations from general, national representativeness should preferably be agreed within the DRUID consortium to ensure comparability between countries.

This document describes, how representativeness and comparability can be guaranteed within a practically feasible research design.

Recommendations

Deviations from this design by individual research institutes will have to be substantiated, and approved by the Task and WP leader.

Representativeness factors

Taking a completely random sample of all road users in a country is impossible since it would include random sampling of road users at a random sample of locations and times. A first simplification which is generally applied to roadside surveys into impaired traffic is a limitation with regard to road user type. Usually only car drivers are included, since it is assumed that psychoactive substance use by this road user category has the greatest impact on road safety consequences. Generally a systematic sample of research locations and times is used. Traffic at the selected research locations and times should be representative of traffic on all roads at all times. At the selected research locations, drivers are generally taken at random from moving traffic. It is important that selected drivers in all countries are tested for alcohol and drugs in a uniform way.

Selection of research locations and times

Both traffic exposure and the prevalence of psychoactive substance use may vary considerably by place (region, research area, road type, research location) and time (year, season, day of the week, time of the day). Therefore, sample fractions by place and time should be proportional to traffic exposure fractions by place and time. Examples of traffic exposure indicators for car drivers are: population, number of cars, number of license holders, distance travelled (vehicle mileage), time spent in traffic, number of trips.

The research locations and times should be systematically selected in such a way that it is plausible that the resulting sample of car drivers is representative of all car drivers in a country, if necessary

after weighting. It is recommended that the selection in all participating countries is made in a (more or less) uniform way.

When subpopulations, such as regions or road types, vary considerably, it is advantageous to sample each subpopulation (stratum) independently. Stratification is the process of grouping members of the population into relatively homogeneous subgroups before sampling, thus ensuring the representation of all subpopulations. Then sampling is applied within each stratum (Wikipedia[1]). For the nationwide result to be valid, samples within each stratum must be weighted by a factor relating to the actual proportion of the whole stratum that the sample constitutes.

To have the road traffic surveyed in a way that represents the whole country, certain factors need to be considered.

These factors are:

- Nation - stratified into regions
- Road network stratified into road types
- Time – stratified into year (season), week, day
- Vehicles - foreign versus only domestic vehicles, motorized vs. non-motorized, two-wheelers versus four-wheelers, etc.
- Road users – pedestrians, riders, drivers, professional drivers vs non-professional drivers, genders, age categories, etc.
- Weighting for traffic volumes

The theoretical principle is that the results of the survey should be representative of the country or nation in question. For practical reasons, such as co-operation with the police, long travel distances, very low traffic volumes in sparsely populated areas, or hospital catchment areas in case/control studies, this may not be possible. Ideally, recording efforts should be equal in all regions and all regions equal in size (expressed by population size or mileage driven). If not, the results in the various regions should be multiplied with different weight factors to ensure equal representation of regions.

Recommendations

It will be accepted that a less representative area is chosen. The reason for this choice, however, should be stated and explained. More importantly, the representativeness of the chosen region or area should be assessed, based on e.g. the population percentage of the region. The group recommends weighting the results according to a factor that is available in all participating countries, i.e. population size. Statistical estimates for the whole country should be made.

Weighting of strata (if stratified sampling)

If a stratified statistical sampling procedure is used, the strata should be weighted together in the end by their size according to the stratification variable. If regions are used as strata according to their population, the regions should be weighted according to population when they are added together.

Road network

The theoretical principle is that the survey samples should represent the total road traffic in each country, a requirement which normally means that all road types should be included, i.e. the same road categories as constitute the basis of the national road accident statistics. This may be impossible for practical reasons such as extremely low traffic volumes on certain road categories, high speed limits making the stopping of cars unsafe, too little space in many city or village streets, the reluctance of the police to spend time on low traffic volume roads, etc. On the one hand, collecting a sufficient number of samples on such roads is extremely expensive. Moreover, samples from such low-volume roads will have a marginal impact on the national averages, as the national averages will statistically be dominated by high-volume roads. On the other hand, some people claim that drivers under the influence of drugs and alcohol will choose low-volume byroads, because police checks are infrequent there, and consequently it is important to include such roads. The same arguments may apply to small

[1] http :.wikipedia.org/wiki/Stratified_ sampling

city, town and village streets in addition to the lack of space which may make it difficult to arrange traffic controls there.

After road types have been surveyed, results must be weighted according to the proportion that traffic volume on the different road types make up of the total traffic volume within the region.

Recommendations

It will be accepted that extremely low-volume roads and streets may be excluded from the survey. The kinds of roads included in and excluded from the survey should be stated and substantiated. Preferably estimates should be made for the whole road network.

How to weight for varying traffic volumes?

To have a representative sample of the road users, the samples from each road section should be weighted according to the road traffic volume of the particular road section as well as month, weekday and hour.

Recommendations

Two different ways of weighting for traffic volume will be accepted. Either the road traffic can be counted when the samples are collected, which is the simplest and most reliable, but more expensive method or existing traffic volume data can be used. The method used should be explained in the national report.

Time

Road traffic occurs all year, all week and 24 hours a day. Consequently, the roadside surveys should also cover all the year, all week and all day. Moreover, the extent of alcohol and drug use or driving under the influence of alcohol and drugs may vary considerably around the year, week and day.

Some people claim that alcohol and drug use vary mostly between week days and weekend days and between day time and night time. Consequently, it would be sufficient to cover week days and week nights, as well as weekend days and weekend nights. The cooperation with the police may also require certain limitations as to times of the year, the week and the day. An important point is that at least both week days and week nights as well as weekend days and weekend nights should be sufficiently covered in the survey to make four-ways significant comparisons, see following example.

Example: Prevalence of alcohol and drugs among drivers of motor vehicles. Per cent (fictional figures).

	Weekdays	Weekends	N
Daytime	0. 2	0.4	
Night time	0.8	1.6	
N			

Week and weekend – day and night is defined in the following 8 time intervals of the week to ensure comparability.

Weekdays		Weekend	
1. Monday to Friday	04:00 to 10:00	5. Saturday and Sunday	04:00 to 10:00
2. Monday to Friday	10:00 to 16:00	6. Saturday and Sunday	10:00 to 16:00
3. Monday to Thursday	16:00 to 22:00	7. Friday to Sunday	16:00 to 22:00
4. Monday to Thursday	22:00 to 04:00	8. Friday to Sunday	22:00 to 04:00

Recommendations

It is recommended to include all times of the year, the week and the day in the surveys. However, there may be variation in travel patterns between countries which may substantiate different

definitions. Deviations should be stated and substantiated, and preferably estimations as to whole year, week and day should be made.

Vehicles

All vehicles using the roads and streets make up the road traffic that in total creates the road accidents. Even non-motorized vehicles like pedal bicycles are part of this road traffic. However, the motor vehicles pose more threat to other road users than the non-motorized ones. There may be reason to limit the surveys to certain types of vehicles, such as passenger cars and small vans, excluding heavy vehicles, motor cycles, taxis, mopeds and pedal bicycles. There is also the question of foreign versus domestic vehicles. On the one hand, there is no doubt that foreign vehicles contribute to the accident number in each country. Accidents involving foreign vehicles are recorded in the accident statistics of the country where the accident occurs rather than in the country where the vehicles are registered. On the other hand the national authorities may claim that it is impossible to enforce the national Highway Code to foreign vehicles, even though the national Highway Code applies to foreign vehicles. Including foreign vehicles may also pose language problems in the data collection.

Recommendations

It is recommended to include passenger cars (no more than eight passengers) and small vans (up to 3,500 kilos – demands driving license B) in the surveys, including taxis. It is recommended to include both foreign and domestic vehicles. When conducting the survey, the type of vehicle must be recorded. This way, results can be compared between countries for passenger cars and small vans no matter which types of vehicles are included in the various countries.

Road users

All drivers of *passenger cars (no more than eight passengers) and small vans* should be included, professional as well as non-professional drivers, foreign and domestic drivers etc. As mentioned before, type of vehicle must be recorded in order to be able to compare the recommended vehicle types between countries.

Recommendations

Drivers of the above vehicles are recommended for inclusion. Deviations should be stated and substantiated. Men and women, young, middle aged and elderly people as well as different ethnic groups should be represented in the proportion that they are represented in the road user categories to be included in the roadside surveys. Since the vehicles are stopped at random, the sample should be representative according to these factors. However, when pooling the collected data, results can and should be adjusted later to match the composition of the population in question. It is important to instruct the police to stop vehicles according to some random mechanism rather than according to suspicion of alcohol and drug use, e.g. young men in old vehicles. A random mechanism could be stopping the next vehicle or vehicles when the research personnel are ready for new samples or according to the last digits of the license plate number, etc.

Information to be recorded from the roadside surveys

Information needed on all randomly selected subjects

The following data are needed on all randomly selected subjects in order to be able to identify high-risk groups, roads and times

- Identification number (for sample collection device and recorded data)
- Date (year, season)
- Time and day (8 time intervals of the week)
- Gender
- Age
- Vehicle type
- Road type

- Clinical signs of impairment*
- Self-reported drug use and time of consumption*

Recommendations

This is the recommended information. However we are aware that it may not be possible to collect all information in some countries.

In addition to this, some partners might want to collect the below data in order to estimate the potential bias resulting from non-response and to assess the sensitivity of saliva testing:

Information needed on refusers

Some people will refuse to take part in the survey by refusing to give a sample of blood or saliva. It is extremely important to count the number of refusers. For those road users the following information is needed:

- Identification number
- Date (year, season)
- Time and day (8 time intervals of the week)
- Gender
- App. age
- Vehicle type
- Road type
- The reason of refusal, e.g.: No time
  Other reason…….. ……..

Recommendations

This is the recommended core information.

In addition to this, some partners might want to collect the below data in order to estimate the potential bias resulting from non-response and to assess the sensitivity of saliva testing:

- Clinical signs of impairment*
- Self-reported drug use and time of consumption*

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* If subjects are tested for drug use on a voluntary basis, self-reported drug use (and signs of impairment) might help to estimate the non-response bias. This is especially of importance for the relative risk estimates, based on comparing blood-tested cases and saliva-tested controls. Without additional information, comparing blood and saliva testing results may lead to incredibly high relative risks. It is not very likely that subjects will report drug use, if they didn't use any. So the risk of over-reporting is negligible. On the other hand, some underreporting is to be expected. Therefore, the self-reported drug use will have to be considered as a lower drug use limit.

Annex 2 Toxicology

Body fluid collection

It was decided to use oral fluid or whole blood as matrix for the substance analyses.
Table 1 shows which country uses which matrix.

Table 1: body fluids used in DRUID WP 2

Country	Oral Fluid	Blood
Belgium	X	X
Czech Republic	X	
Denmark	X	
Finland	X	
Hungary	X	
Italy	X	X
Lithuania		X
Norway	X	
Poland	X	
Portugal	X	
Spain	X	
Sweden	X	
The Netherlands	X	X

Method of body fluid collection:

1. Blood samples

Summary:
- 5-10 mL whole blood collection in vacuum tubes containing sodium fluoride and potassium oxalate
- Transportation at 4°C (max 48 hours)
- Storage in laboratory at -20°C.

Sample collection:
All laboratories analyzing blood samples within WP2 performed analysis on whole blood.
Blood was most commonly obtained from the median cubital vein on the anterior forearm. It could be drawn by venipuncture with vacuum tubes (tubes that contain a vacuum that aspirates blood into the tube.).
A tourniquet was placed on the arm where blood was to be collected. The vein to be used was palpated to determine its size, depth and direction. The skin was wiped with a disinfectant swab; an alcohol swab was not used due to possible contamination of the sample. The tourniquet was loosened or removed once blood started to enter the tube. As agreed at the Leidschendam meeting (January 2007) a collection tube containing potassium oxalate and sodium fluoride (grey tops) were used. Blood collection tubes had to be filled completely to ensure that proper additive concentrations were maintained. The tubes were gently mixed by inverting 5 to 10 times immediately after collection to prevent coagulation.
All appropriate documents had to be filled in using the same identification number as used to label the collection tubes. Labelling had to be unambiguous.
If more than one container was taken from the same subject, these containers had to be identified with the same identification label, but the labels should specify how many containers were drawn from the same subject.

Storage and transportation
Data on the stability of commonly used illicit drugs were scattered over various publications, and a uniform study design had not been applied. The stability of drugs in blood was reviewed by Levine and Smith in 1990 (Forensic Science Reviews, 2:147-157) and Skopp and Pötsch in 2002 (Rechtsmedizin, 12: 195-202, in German). Since stability of even the most labile compounds (especially cocaine) had to be ensured, transportation measures had to be strict. Enzymatic degradation was slowed down by

the presence of preservatives in the tubes. Chemical hydrolysis was decreased by low temperature during transportation. Therefore the blood samples had be transported cooled down or frozen.
Direct transportation of the samples to the laboratory was preferred. If this was impossible due to geographical reasons, samples could be shipped under specific conditions. Before shipping, national and international regulations had to be ascertained. Specimens had to be sent as diagnostic specimens and in two containers: the primary container had to be wrapped with Parafilm® or sealing tape around the lid, placed into a plastic bag or a screw cap container with enough absorbent material to absorb all of the fluid in the primary container, and be wrapped by a secondary container such as a cardboard box or mailing tube. This container had to prevent crushing of the specimen during transport.
Dry ice had to be placed between the plastic bag and the outer shipping container. It hat to be shipped in insulated outer packaging, and could not be shipped in airtight container. Useful information and appropriate shipping containers were available from most contractors.
Upon arrival in the laboratory, samples had to be stored at -20°C.
Since the maximum time for storage at 4°C (= time between sampling at the roadside and freezing) was 2 days, and transportation to the laboratory was not always easy to organize in some countries depending on the design of the studies (e.g. the presence of researchers at the roadside, the availability of a motor home, geographical situation, presence of dedicated personnel at the hospital,…) it was recommended to store samples frozen in the hospitals for e.g. one month and transport them to the laboratory in one shipment. During this transportation insulation and time were important, so that the samples were still frozen when they arrived at the laboratory since the consequences of multiple freeze-thaw cycles for the recovery of drugs in blood samples were unknown.

2. Oral fluid samples

Summary:
- 1mL oral fluid collected using StatSure Saliva Sampler.
- Collection according to guidelines by manufacturer
- Transportation at 2-8°C (max 48 hours)
- Storage in laboratory at -20°C

Sample collection:
Oral fluid was collected using the StatSure Saliva Sampler device. Collection had to be done according to the guidelines printed on the instruction leaflet:

- Do not use device beyond expiration date printed on package
- Record identification number on tube label
- Stand tube upright on flat surface. Check level of buffer fluid; if adequate (see fluid level line), place tube in tube rack. Discard kit if fluid is below fluid line.
- Remove collector form pouch.
- Do not rinse mouth. Gather saliva in mouth, do not swallow. Position collector under tongue. Close mouth. Do not chew or suck on pad. Do no move pad around during collection.
- The collector should remain under the tongue until the indicator turns completely blue. Blue colour indicates collector is saturated with a volume of 1mL saliva. The collection time is variable and may take 2 to 15 minutes; if the indicator has not turned blue within 15 minutes, the pad should be removed from the mouth and discarded; recollection with a new device may begin immediately but only after saliva has first accumulated in the mouth. The collector may be placed in the same position.
- Open mouth and lift tongue. Remove collector from mouth.
- Remove cap from transport tube. Insert saturated collector into tube. Do not place collector in mouth after it has been in buffer liquid.
- Carefully place cap over top of collector stem in tube. Forcefully push cap downward until cap “snaps”.
- Mix saturated collector with buffer by gently shaking tube.

Storage and transportation

According to the guidelines on the instruction leaflet, saliva specimens had to be shipped to the laboratory at 2 to 8°C as soon as possible.
Guidelines on packaging and transportation were the same as for whole blood (see above). Upon arrival at the laboratory, samples had to be frozen until analysis.
After thawing, a plastic column with white centerpiece bottom and a rubber band (delivered together with every device) was pushed down the collection tube. The saliva:buffer mixture could then easily be recovered and analysed.
UGent had contacted StatSure to determine a time frame in which the devices can be stored safely at 4 °C (based on their experience). They stated this time had to be determined empirically for each analyte. However in their experience they had never seen degradation of any analyte when it was left out a room temperature for <2 hours or <72 hours if kept at 2-8°C.
Therefore it was decided that the same time frame as used for whole blood transportation (max. 48 hours at cooled temperature) could be used for oral fluid.

Toxicological analysis of body fluids an applied methods

Table 2 shows the analytical methods used by the WP2-road side partners. Extraction was based on liquid-liquid (LLE) or solid phase (SPE), chromatographic separation was performed by gas chromatography (GC) or liquid chromatography (LC): High Performance (HPLC) or Ultra Performance (UPLC). Detection was done by mass spectrometry (MS).

Table 2: Analytical methods used in WP2

Country	Extraction	Chromatography	Detection
Belgium Oral fluid: Blood:	 LLE SPE (LLE for THC)	 UPLC UPLC (GC for THC)	 MSMS MSMS (MS for THC)
Czech Republic Oral fluid:	 LLE	UPLC	MSMS
Denmark Oral fluid:	SPE	UPLC	MSMS
Finland Oral fluid:	LLE,SPE	GC	MS
Hungary Oral fluid:	LLE	GC	MS
Italy Oral fluid: Blood:	 SPE +LLE (for THC) SPE +LLE (for THC)	 HPLC GC for THC	 MSMS MS for THC
Lithuania Blood:	LLE	GC	MS
Norway Oral fluid:	LLE	HPLC	MSMS
Poland Oral fluid:	SPE	HPLC	MSMS
Portugal Oral fluid:	LLE	LC	MSMS
Spain Oral fluid:	SPE	HPLC	MSMS
Sweden Oral fluid:	SPE	UPLC	MSMS
The Netherlands Oral fluid: Blood:	 PP PP	UPLC	MSMS

DRUID core and extra substances

1. Core substances

The following list of core substances (analysed for in all countries that participated in the roadside survey) as well as analytical cut-off values for analyses of both blood and saliva were decided upon based on discussions between all partners. These were carried out by means of email and personal communication and the final decision was made at the WP2 meeting in January 2007.

Table 3: Core substances analysed in WP2

Substance	Whole blood analytical cut-off (ng/ml)	Saliva analytical cut-off (ng/ml)
Ethanol*	0.1 g/L	0.1 g/L
6-acetylmorphine	10	5
Alprazolam	10	1
Amphetamine	20	25
Benzoylecgonine	50	10
Clonazepam	10	1
Cocaine	10	10
Codeine	10	20
Diazepam	20	5
Flunitrazepam	2	1
Lorazepam	10	1
MDA	20	25
MDEA	20	25
MDMA	20	25
Methadone	10	20
Methamphetamine	20	25
Morphine	10	20
Nordiazepam	20	1
Oxazepam	50	5
THC	1	1
THCCOOH	5	NR
Zolpidem	20	10
Zopiclone	10	10

* Quantitative breath analyser results valid as well; NR: Not recorded

2. Extra substances

Besides the core list, each country added a minimum of 3 extra substances for analysis, based on knowledge on distribution in the various countries and impairing effect on driving performance (e.g. based on pharmacological profile or previous studies).
Analytical cut-off values for analyses of both blood and saliva were decided upon based on discussions between partners who analysed the same extra substances. These were carried out by means of email and personal communication. The final list was made in February 2010.

Table 4: Extra substances analysed in WP2 Extra substances by country (based on final databases) and their cut-offs

	FIN	LT	DK	PL	BE	CZ	ES	PT	NO	NL	IT	HU	S		Cut-off (ng/mL)	
	THL	TMI	DTU/ UKBH	ITS/ IES	UGent	CDV/UGent	DGT/ UVa	CPS-NILM	FHI	SWOV/NFI	TFA-UNPD	USZ	VTI/ RMV	Total	OF	Whole blood
Carisoprodol	1								1				1	3	50	500
Ketamine											1	1		2	20	20
Buprenorphine	1		1		1						1			4	1	1
Tramadol	1	1	1	1	1	1	1	1			1	1	1	11	50	50
7-a-clonazepam		1		1	1	1	1	1	1	1	1	1	1	11	1	10
Carbamazepine	1		1											2	10	NA
Olanzapine											1			1	5	10
Bromazepam			1		1	1					1			4	5	20
Meprobamate									1				1	2	1200	2000
Chlordiazepoxide			1											1	10	20
7-a-flunitrazepam		1	1	1	1	1	1	1	1	1	1		1	11	1	2
Midazolam	1									1		1		3	2	10
Nitrazepam	1		1						1	1		1	1	6	2	10
7-a-nitrazepam			1						1	1			1	4	1	10
Temazepam	1									1		1		3	10	20
Amitryptiline	1				1		1				1			4	10	10
(Es)Citalopram	1				1	1								3	5	5
Fluoxetine	1										1			2	5	10
Mirtazapine	1				1	1								3	5	5
Trazodone					1	1								2	5	10
Venlafaxine											1			1	5	10
Diphenhydramine							1							1	10	NA
Levomepromazine	1						1							2	10	NA
Norbuprenorphine	1										1			2	5	2
11 OH-THC										1				1	NA	1
Number of extra substances	13	3	8	3	9	7	6	3	6	7	11	6	7			

NA: Not applicable

BAC quantification

Alcohol concentrations were based on either breath, saliva or blood.

Table 5: Methods used for BAC quantification in the different countries involved in WP2

Country	Breath	Saliva	Blood
Belgium		X	X (3)
Denmark	X (1)	X	
Finland	X		
Hungary	X		
Italy		X	X
Lithuania	X		
Norway		X	
Poland	X		
Portugal	X		
Spain	X		
Sweden (2)			
The Netherlands	X		

(1) Due to missing information of the police, no breath test was carried out in 194 cases. In these cases concentrations are based on oral fluid.
(2) Ethanol was not included in the analysis since drivers positive for alcohol in the breath test were excluded from the study
(3) For the drivers who did not provide an oral fluid sample (4 cases), concentrations are based on whole blood

Proficiency tests

Two institutes conducted proficiency testing (PrT).
For blood PrT: Arvecon GmbH, Germany
For Oral Fluid PrT: Center for forensic sciences, RTI International, North Carolina, USA

Both qualitative and quantitative results were measured
Qualitative results were evaluated using sensitivity (and specificity), Quantitative results were evaluated using the standard deviation according to Horwitz (SD_{HOR}). Z-scores were calculated using SD_{HOR}.

$$VC = 2^{(1-0,5\log C)}$$

VC = variation coefficient (%)

C = analyte concentration (kg/L)

$$z-score = \frac{result - target\ value}{SD_{HOR}}$$

1. Oral fluid proficiency testing

A proficiency testing scheme was set up for the DRUID research project, in which oral fluid is analysed by eleven laboratories. A common collection and analysis methodology was used: Statsure Saliva Sampler was used for collection and LC-MS/MS or GC-MS confirmation analysis of 22 substances containing both licit and illicit drugs is performed on all samples.

Four rounds of proficiency testing were organized between March 2008 and September 2009.
Oral fluid PrT samples were prepared in a synthetic oral fluid matrix developed at RTI International. Each sample was formulated to contain 3 to 5 analytes. 1.5 mL of neat oral fluid was dispensed into a 4 mL silanized amber vial (Supelco St. Louis, Missouri, USA), capped with a Teflon-lined cap (Supelco) and frozen until shipment. Samples for each survey year were prepared in a single production.
Laboratories were instructed to add 1 mL of the neat oral fluid sample to a StatSure collection device. The 1 mL of neat PrT oral fluid was added directly to the buffer in the collection tube.
Analytes were screened, identified and quantified using a mass spectroscopy-based technique.
Reported analyte concentrations were corrected for dilutions to provide the concentration for the neat oral fluid shipped to the laboratory. Samples were expected to be tested and electronically reported to RTI. Results were reported back to each participating lab anonymously, but with identification to the DRUID coordinator to allow the latter to make corrective actions.

Qualitative results were evaluated using sensitivity and specificity. Sensitivity is defined as the number of analytes correctly reported positive divided by the total number of analytes spiked in the samples. Specificity is defined as the number of analytes correctly reported negative divided by the total number of core list analytes not spiked in the samples, high specificity means a low number of false negatives. Quantitative results were evaluated using z-scores and the standard deviation of Horwitz.

Eight laboratories reported results in the first round, three laboratories did not report because method development and validation were still being performed. In the second to fourth round, all eleven laboratories reported results. Not all laboratories reported results for ethanol, since in some countries ethanol concentration for each volunteer was already known based on breathalyzer results from standard police procedure and hence analysis was not mandatory.
Specificity was above 99% in each round, sensitivity increased during the program, also reaching 99% in the last round. The percentage of satisfactory z-scores (absolute value lower than 2) increased from 79.4% to 89.2%. This trend was seen for all drug classes, except zopiclone. False negatives were mostly attributable to Z-drugs, benzodiazepines and THC.
Different results were obtained for benzoylecgonine per testing round. In the first round, five laboratories reported the presence of benzoylecgonine in samples in which cocaine but no

benzoylecgonine was spiked. After consultation with participating laboratories this problem could be explained by hydrolysis of cocaine during extraction and low extraction yields for benzoylecgonine. Laboratories adapted their procedures accordingly and in the second round, there were no longer false positives for benzoylecgonine. In the third and fourth round, again all the laboratories reported false positives, this phenomena could be explained by pre-analytical hydrolysis, either in sample preparation or shipment. Therefore these were not scored as false positives.
In the first round of proficiency testing, most laboratories were still in the process of development and validation or had only recently completed this, explaining the lower scores in the first rounds.

2. Whole blood proficiency testing

A proficiency testing scheme was set up for the DRUID research project in which whole blood was analyzed by twelve laboratories. A common collection and analysis methodology was used: vacuum tubes containing sodium fluoride and potassium oxalate were used for collections and LC-MS/MS or GC-MS confirmation analysis of 25 substances (26 in second round) containing both licit and illicit drugs is performed on all samples.

Four rounds of proficiency testing were organized between March 2008 and December 2009. Results of the fourth round are still to be sent.
Whole blood samples were spiked with analytes and lyophilized at Arvecon.
Laboratories were instructed to first store the vials at room temperature for 30 min. After reconstitution with exactly 5.0 ml bidistilled (demineralised) water, the specimen had to be swirled gently and stored for 15 minutes at room temperature. Before sampling, the vial had to be inverted gently to ensure homogeneity. It was strongly recommended to prepare the sample material for the analysis of cocaine and zopiclone on the day of reconstitution.
Analytes were screened, identified and quantified using a mass spectroscopy-based technique. Samples were expected to be tested and electronically reported to Arvecon. Results were reported back to each participating lab anonymously, but with identification to the DRUID coordinator to allow the latter to make corrective actions.

Qualitative results were evaluated using sensitivity. Sensitivity is defined as the number of analytes correctly reported positive divided by the total number of analytes spiked in the samples.
Quantification was evaluated using the standard deviation according to Horwitz (SD_{HOR}). Z-scores were calculated using SD_{HOR}: When $|z|<2$, one point was given, $|z|<3$ got a score of 0.5. These points were added up and divided by the total number of analytes spiked in the samples.

Ten laboratories reported results in the first and third round. In the second round, all twelve laboratories reported results. Two laboratories did not report in the first round because method development and validation were still being performed.
Sensitivity increased during the program from 92.6 to 96% the third round. The percentage of z-scores increased from 81% to 91.6%. False negatives were mostly attributable to Z-drugs and benzodiazepines.
In the second round sample A was spiked with 10 micrograms THC/L. However only 7 participants detected this substance, including 4 labs with values less than 1 microgram/L. Therefore these values were only reported for informative purpose (only 24 compounds were taken into account instead of 25 for the results of the proficiency test). A spiking error was excluded, so the deviation was to be reducible to the difficult whole blood matrix.
In the first round of proficiency testing, most laboratories were still in the process of development and validation or had only recently completed this, explaining the lower scores in the first rounds.

Annex 3 Excluded samples

Country	Total number of samples original database	Excluded records: no sample available	Excluded records: missing substance group	Excluded records: underage drivers	Number of samples for analysis
BE	2957	--	4	4	2949
CZ	2039	--	--	2	2037
DK	3030	27	--	1	3002
ES	3174	--	--	--	3174
FI	4091	15	235	--	3841
HU	2743	--	--	5	2738
IT	1310	--	--	--	1310
LT	1309	45	--	--	1264
N	9261	19	--	6	9236
NL	4822	--	--	--	4822
PL	4276	251	19	1	4005
PT	4002	35	--	2	3965
SE	6372	168	--	5	6199
Total	**49386**	**560**	**258**	**26**	**48542**

Table 1. Number of samples included for analysis by country

Table 1 presents the number of cases that were removed from the database. The Spanish, Italian and Dutch databases were complete and no records needed to be excluded.
The Belgian database missed THC and THCCOOH analysis in 2644 blood samples. For 2640 of these records a saliva sample was available which were used for the analysis. The 4 records with missing values for THC and THCCOOH for which no saliva sample was available where removed from the database. An additional 4 records were removed since they contained underage drivers.
The database from Czech Republic contained 2 underage drivers that were removed from the database.
The Danish database contained 1 underage driver and 27 records with no samples. In total 28 records were removed.
The Finnish database contained 250 records in which one or more substance groups were missing. These records were deleted. Around the same number of records miss part of a substance group (e.g. 1 of the 7 benzodiazepines was missing). These records have been kept in though.
From the Hungarian database 5 underage drivers were removed. None of the 2738 included records contained a value for flunitrazepam or 7-a-flunitrazepam.
For Lithuania 45 records with no toxicological analysis have been removed.
The Norwegian database contained 19 records with no toxicological results and 6 underage drivers. The have been removed. Furthermore, samples were not analysed for tramadol since this medicinal drug is not available in Norway.
251 records with no sample and 1 record from an underage driver were removed from the Polish database.
From the Portuguese database 35 records without sample were removed as well as 2 underage drivers.
From the Swedish database 168 records with no sample were removed as well as 5 records with underage drivers. Furthermore, due to legislation, it was not allowed to collect data on alcohol use from all drivers. Therefore, the prevalence results from the Swedish roadside survey will not contain information on alcohol.

Annex 4 The distribution of traffic over time periods.

Background

In the European DRUID-project population based case-control studies are conducted to assess the relative risk of driving under the influence of psychoactive substances. In a population based case-control study controls are selected in a way that they are representative for the study base from which the cases were selected. This means that if cases are injured drivers that were included from a specific hospital, the controls should be selected from this hospital's catchment area and moreover, the controls should represent the traffic. According to this, the controls should be distributed over time according to the distribution of traffic over time. If this is not the case, weight factors would be needed to correct for an unevenly distributed control group.
If the distribution of traffic over time is not available from (national) travel surveys or traffic counts, estimates could be used to approximate the distribution of traffic over time in the DRUID-study.
The following paragraph will give an overview of the distribution of national and regional traffic volume over the DRUID time periods. These data is provided by OECD-members who were requested to provide these data if available. We are very thankful that several OECD-partners took the effort to provide us the data or to let us know that this data is not available for their country.
Next, the data will be averaged to form an estimate that could be used by partners in the DRUID project. This process is described in paragraph 3.
Finally, conclusions and recommendations for the use of the calculated distribution estimates of traffic volume will be given in paragraph 4.

Data

On February 4th a request by e-mail was sent SWOV to all OECD-members for data on the distribution of vehicle kilometers in person cars by hour and day of the week. The goal of this e-mail was to collect as many data as possible on the distribution of traffic volume over time, in order to provide good estimates of traffic distribution for those DRUID partners that were not able to collect this data.
A table with vehicle kilometer data from the Netherlands was attached to the e-mail as an example. Furthermore, a link was attached to the homepage of the DRUID-project to provide more background information on the project that the data was used for.
It was stated that other time or vehicle categories were accepted as well, if better data was not available.

Four OECD-members replied to have data available. Data for a 5th country was made available by other resources than the OECD-members. Peter Silverans, who is also involved in the DRUID-project, prepared an estimate of the DRUID-distribution based on traffic counts that were available in an other time-distribution (6 a.m-22 p.m. and 22 p.m- 6 a.m). Two other countries delivered data that was only available for other time periods than the 6-hour DRUID periods. Seven OECD-members replied that no such data was available in their country.

Table 1 presents the distribution of traffic volume in those countries that were able to provide data aggregated for the DRUID time periods.

Table 1. Distribution of traffic volume in DRUID-time periods.

		NL	NO	BE	SE	GB	New Zealand
Weekdays	**04-10**	22,0%	22,9%	18,7%	23,5%	18,9%	19,9%
	10-16	23,6%	27,7%	25,2%	25,4%	26,3%	27,9%
	16-22	26,9%	19,9%	25,2%	24,3%	25,4%	24,1%
	22-04	3,0%	4,1%	5,8%	1,7%	2,4%	1,9%
Weekenddays	**04-10**	2,7%	2,2%	6,3%	4,2%	3,5%	4,0%
	10-16	11,1%	8,0%	8,2%	12,2%	12,2%	12,9%
	16-22	8,0%	12,9%	8,2%	7,3%	8,8%	8,2%
	22-04	2,7%	2,8%	2,5%	1,5%	2,5%	1,0%

The Norwegian data is based on traffic counts on a highway near Oslo. The Belgian data converted from an other time-distribution than the DRUID distribution. This conversion is based on a evenly distribution of traffic volume within the hours of a time-period. The data from the Netherlands, Sweden, Great-Britain and New Zealand are all based on large scale national travel surveys.

The distribution over the different time periods is quite similar for the six countries in table 1. Table 2 presents the mean of the share of traffic in each time period and its standard deviation.

Table 2. Mean and standard deviation of the share of traffic in each DRUID time period

Time period		Mean	Standard deviation
Weekdays	**04-10**	21,0%	2,1%
	10-16	26,0%	1,6%
	16-22	24,3%	2,4%
	22-04	3,2%	1,6%
Weekenddays	**04-10**	3,8%	1,4%
	10-16	10,8%	2,1%
	16-22	8,9%	2,0%
	22-04	2,2%	0,7%

Table 3 provides an overview of the spread of the data per time period as compared to the mean share of traffic per time period. Green percentages lie within a distance of 1 standard deviation and yellow percentages lie between 1 and 2 standard deviations from the mean.

Table 3. distance from the mean green is 1 SD, yellow is between 1 and 2 standard deviation)

		NL	NO	BE	SE	GB	New Zealand
week	**04-10**	22,0%	22,9%	18,7%	23,5%	18,9%	19,9%
	10-16	23,6%	27,7%	25,2%	25,4%	26,3%	27,9%
	16-22	26,9%	19,9%	25,2%	24,3%	25,4%	24,1%
	22-04	3,0%	4,1%	5,8%	1,7%	2,4%	1,9%
weekend	**04-10**	2,7%	2,2%	6,3%	4,2%	3,5%	4,0%
	10-16	11,1%	8,0%	8,2%	12,2%	12,2%	12,9%
	16-22	8,0%	12,9%	8,2%	7,3%	8,8%	8,2%
	22-04	2,7%	2,8%	2,5%	1,5%	2,5%	1,0%

Table 3 shows that the traffic distribution data from Norway and Belgium have a bigger deviation from the mean than data from other countries. This can be caused by real life differences in traffic distribution.
Another possible explanation is that the sample of the highway in Norway is not representative for the total traffic in Norway and that the rough estimate for the Belgian distribution is a bit too rough.

Estimate of traffic distribution for DRUID time periods

An estimation of the distribution of traffic can be calculated in various ways. One could use the mean of the six studies and get the estimate that were presented in table 2. A second option is that only the data from the four national studies are used. This means that the data from Norway and Belgium will be dropped. A third option is a middle-of –the –road option where the distribution data from the four national studies will be taken into account double under the assumption that the data from the other two studies will have a lower validity.
A fourth option would be the same as the third but then with an exclusion of the Belgian data since this distribution is based on assumptions that are to general and therefore incorrect.
The results of these three options are presented below in table 4.

Table 4. Average distribution per method

		6 countries		5 countries		4 countries		6 weighted		5 weighted	
		Mean	***SD***	**Mean**	***SD***	**Mean**	***SD***	**Mean**	***SD***	**Mean**	***SD***
week	**04-10**	21,0%	*2,1%*	21,2%	*1,9%*	21,1%	*2,1%*	21,0%	*2,0%*	21,3%	*1,9%*
	10-16	26,0%	*1,6%*	26,5%	*1,7%*	25,8%	*1,8%*	25,9%	*1,6%*	26,0%	*1,7%*
	16-22	24,3%	*2,4%*	24,1%	*2,3%*	25,2%	*1,3%*	24,7%	*2,0%*	24,6%	*2,1%*
	22-04	3,2%	*1,6%*	2,5%	*0,9%*	2,3%	*0,6%*	2,8%	*1,3%*	2,5%	*0,8%*
weekend	**04-10**	3,8%	*1,4%*	3,4%	*0,8%*	3,6%	*0,7%*	3,7%	*1,1%*	3,4%	*0,7%*
	10-16	10,8%	*2,1%*	11,6%	*1,9%*	12,1%	*0,7%*	11,3%	*1,8%*	11,6%	*1,5%*
	16-22	8,9%	*2,0%*	8,9%	*2,0%*	8,1%	*0,6%*	8,6%	*1,6%*	8,6%	*1,7%*
	22-04	2,2%	*0,7%*	1,9%	*0,8%*	1,9%	*0,8%*	2,1%	*0,7%*	2,0%	*0,8%*

Table 4 shows that the differences in the outcomes of the four different methods are quite small. Weighting for the validity of the data has a small effect on the outcomes of the study and on the standard deviations. The standard deviation did decrease for some of the eight time periods.
Exclusion of the country distributions from those two sources that were regarded as of less quality had a very big effect on the standard deviation of the traffic distribution of five out of eight time periods. Again the differences in means are quite small.
Finally, the exclusion of the Belgian data alone had a small effect on both the mean and the standard deviation. The same effect was seen for the weighted data excluding Belgium, but the standard deviation did decrease more drastically than in the case of the unweighted data.

Conclusion and recommendation

The amount of data on national traffic data is small and even smaller when the data needs to be distributed per time period. Traffic data on the DRUID 6-hour time periods was available for 6 countries, although Norway had data that was regional and Belgium had data that was based on estimates of aggregated data. We assume in this document that the Norwegian and Belgian data are of less quality than the national data from the other four countries. Furthermore, the Belgian estimates are based on the assumption that the traffic in a 16 hour period is evenly spread. This is certainly not the case as can be seen in the data from the other five countries.
If we exclude the estimates from Belgium, three possible estimates of the distribution of traffic are left: the 5 countries method, the 4 countries method and the weighted 5 countries method. The data from Norway differs in some time periods extremely from the other countries and it can be questioned whether this is because of the real life situation for the whole of Norway or because the traffic counts just reflect the situation in a selective area of Norway, namely a highway near Oslo.
Based on this information the weighted 5 countries method and the 4 countries method are assumed to be the best estimates for the distribution of traffic over the DRUID 6-hour time periods.

Figure 1 presents the situation where the standard deviations from both estimates are used to create an upper and a lower boundary around the mean.

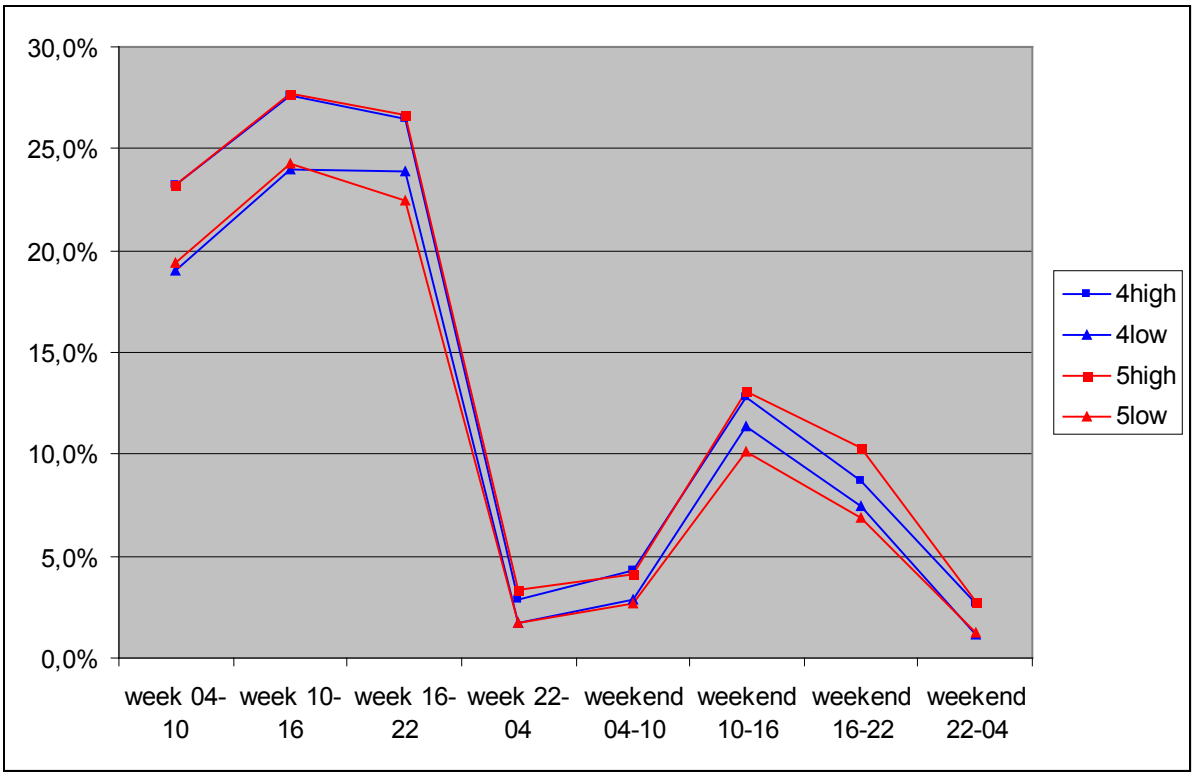

Figure 1. upper and lower limits of the 4 countries estimates and the weighted 5 countries estimates

The upper and lower limits of the distribution mean of the 4 countries estimates are almost all on or within the upper and lower limits of the weighted 5 countries estimates. Therefore, the mean that is based on the four countries is recommended as the best usable distribution of traffic in the DRUID-project.

Table 5. Average distribution for the 4 countries (The Netherlands, Sweden, Great Britain, New Zealand)

Mean	*SD*
21,1%	*2,1%*
25,8%	*1,8%*
25,2%	*1,3%*
2,3%	*0,6%*
3,6%	*0,7%*
12,1%	*0,7%*
8,1%	*0,6%*
1,9%	*0,8%*

Partners in the DRUID-project could be advised to use this distribution in case they do not have an alternative one. They could adjust this distribution as well if they have reliable sources that indicate a different distribution. The given standard deviations can then be used to get a feeling of the size of the new estimates.
If, for example, a country has relative much traffic on weekend days because the Saturday is a normal working day, the distribution shifts somewhat to the weekend days providing higher estimates on weekend days and slightly lower estimates during the rest of the week.

Annex 5 Logistic regression models

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This annex gives an overview of the statistical method applied in chapter 5 to investigate the underlying factors that are of influence on the prevalence of the various substances. The logistic regression method was used to reveal (significant) relations between given explanatory variables (quantitative and qualitative) and a binary response variable. Here, the response variable consisted of a collection of samples that were either positive or negative for alcohol/psychoactive substances. Data of as many countries in the models as possible and including country, time period, age and gender as explanatory variables. These statistical models have been constructed to reveal significant differences in prevalence among countries, genders and age groups when corrected for the other variables.

Applied statistical method

Differences in prevalence of alcohol and drugs were calculated on the basis on various designs of blood and/or saliva sampling in the driving populations in the partner states. In case of two samples – both blood and saliva, the value of blood was leading. This leads to the following evaluation scheme:

Blood sample	Saliva sample	Observation
Positive	No sample	Positive
Positive	Negative	Positive
Positive	Positive	Positive
Negative	No sample	Negative
Negative	Negative	Negative
Negative	Positive	Negative
No sample	Negative	Negative
No sample	Positive	Positive
No sample	No sample	NA

The drugs were grouped in nine different substance groups: alcohol, amphetamine, cocaine, THC, THC-COOH, illicit opiates, benzodiazepines, Z-drugs and medicinal opioids, see table 2.3 in the method section of the general report. Concentrations above the equivalent cut-offs, as indicated in table 2.2 in the method section of the general report, were interpreted as positive concentrations. For alcohol, two groups were tested: over or equal to 0.1 g/L and over 0.5 g/L. Moreover, there was a multiple drugs group for drivers tested positive for more than one drug. Finally, there was an alcohol-drug group for drivers tested positive for an alcohol level above or equal to 0.1 g/L and simultaneously for one or more drugs. The substance groups were defined as mutually exclusive so that a driver tested positive for alcohol and for a drug did not count as positive in the substance group alcohol or in the concerned drug category but only as positive in the alcohol-drugs substance group.

Most substance groups contained more than one substance. In the case of missing analysis of one or more (but not all) substances in a group, presence/absence of that substance group was evaluated on the basis of presence/absence of the non-missing substances. If all non-missing substances in the group were absent, that group was evaluated as absent. If on the contrary, one or more of the non-missing substances were present, that group was considered present. In the case of missing analysis of all substances in one substance group, that group was considered not analysed.

The alcohol-drug and the drug-drug categories were evaluated differently: In the case of missing analysis of one or more substances in a substance group, alcohol-drug and drug-drug were both considered not analysed.

Sampling designs met certain common criteria, but they differed somewhat among countries.

Logistic regression
Logistic regression relates a number of independent variables to the probability of an event, in this case the probability of a driver in the driving population being positive for alcohol or a specified drug group. Or put in another way: the prevalence.

The logistic function is given by

$$P(y) = \frac{\exp(y)}{1+\exp(y)}, \quad (1)$$

where *P*(y) denotes prevalence confined to values between zero and one. *y* (the logit) is a linear expression of x on the form:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \varepsilon \quad (2)$$

where $x_1, \ldots, x_n$ denote the four independent variables (gender, age group, time period, country) and the six interactions between them. β_0 denotes the intercept and $\beta_1, \ldots, \beta_n$ are coefficients scaling the variables.

Logistic regression allows adjustment of non-linear variables and interactions between variables. Furthermore, the method identifies the presence of significant and insignificant variables and standardization by both continuous and categorical variables. Hence, with a large data set as this one it produces dependable estimates (Roalfe et al. 2008).

The estimates found with this procedure denote the probabilities that an event will occur. In this case the probabilities that a driver is positive for the concerned substance group given certain values of the (significant) variables, including interactions, i.e. prevalence. Prevalence differences of alcohol and drugs can thus be calculated for groups of road users, for instance road users in different countries, being of different age or gender and in different time periods.

Weighted prevalence estimates represent the probability that a driver drawn randomly from the driving population is driving with alcohol or drug (or both) in the blood. To exploit data to the maximum, one overall model was constructed for each substance group that included as many countries as possible.

Weighting
Most of the participating countries had a sampling skewness in their data set due mainly to practical constraints. Thus, samples were not collected according to traffic volume, and the bias had to be accounted for in the calculations. This was done by weighting the logit (cf. above) in each 'cell' of an *n*-dimensional matrix, where *n* denotes the number of significant variables and interaction terms in the logistic regression model. If, for instance, gender was the only significant variable in a model, the logit was weighted with traffic volume fractions for the two genders to account for the fact that in most countries, men drive far more kilometers than women. If, in a model, gender, age and time were significant variables, logits were weighted with traffic volume fractions in a three dimensional matrix. Within the *n*-dimensional matrix, traffic volume fractions were normalized to sum up to 1. Some participating countries did not collect samples in all eight DRUID time periods. For these countries, interpolations were made in the matrices in order to normalize the traffic volume fractions.

After weighting the logit in an *n*-dimensional matrix, the prevalence was calculated by back transforming the logit as shown in equation (1) and as described by Roalfe et al. (2008), including the confidence intervals. In addition to this, the variable coefficients for the significant variables and interactions were calculated.

The procedure
The logistic regression was performed in SAS by *proc logistic.* In Figure 1, the prevalence calculation method is described in graphic terms. Prevalence calculations were carried out separately for each of the nine substance groups (alcohol, amphetamine, cocaine, cannabis, benzodiazepines, Z-drugs, medicinal opiates, alcohol-drug combinations, multiple drug combinations). Attempts were made to construct prevalence models for THC-COOH and illicit opiates, but this was not possible due to a low number of positive samples.

Interaction terms were removed from the model if not significant. Main effects were excluded from the model if not significant and not a part of any of the remaining interaction terms. Therefore, if a main effect was insignificant but a part of a significant interaction, the main effect was included in the model. Some of the models have been reduced (fewer independent variables and interactions) because of a low number of positive observations.

To construct models for some of the substance groups it was necessary to merge some of the time periods or even some of the age groups (cf. Chapter 5 for a description of each of the models). In some of the models a merge was done to run the logistic procedure the first time. After removal of some of the interactions, the original time periods or age groups were reintroduced into the model under the assumption that the removed interactions were not significantly different in the time periods or age groups in question.

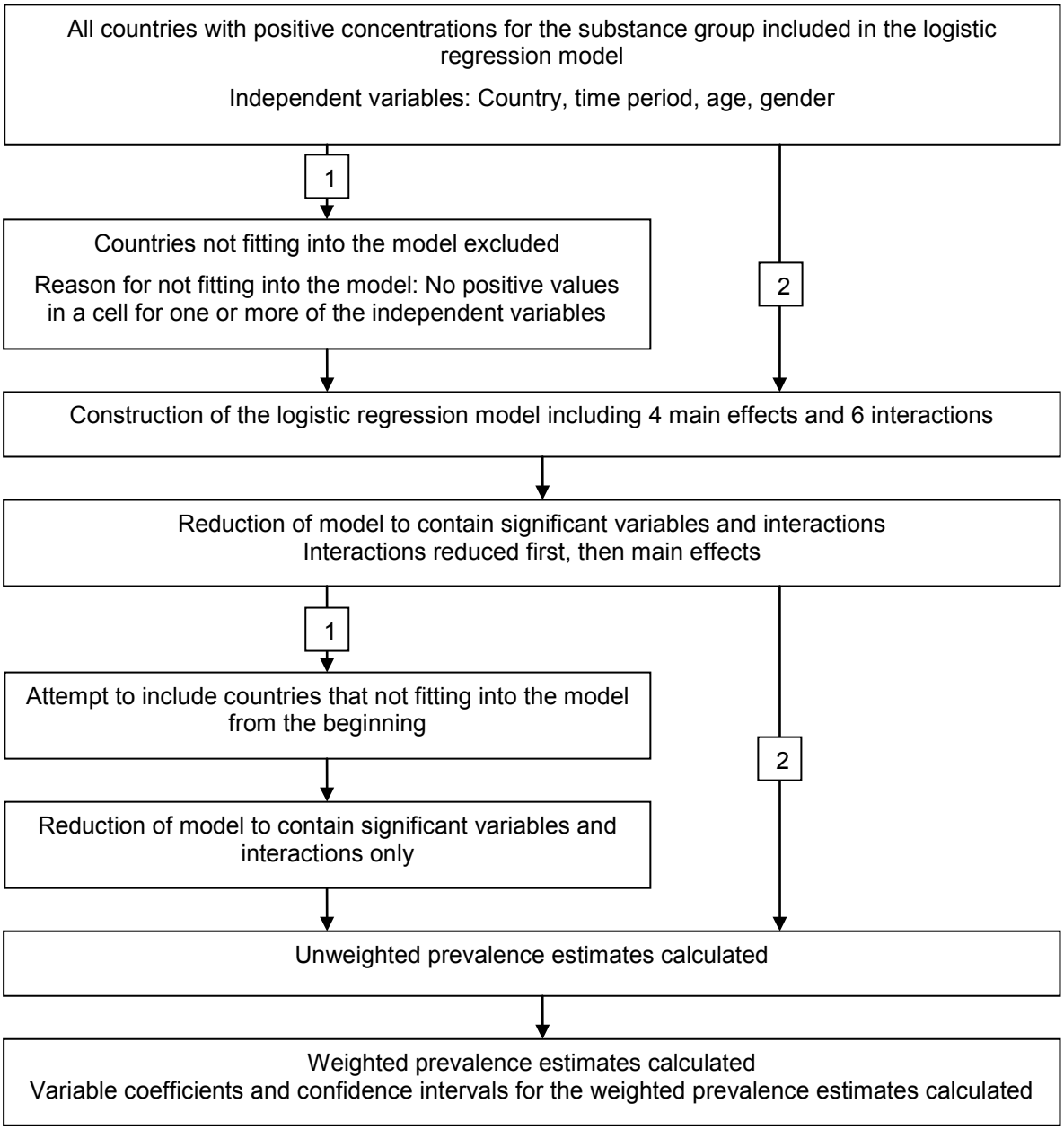

Figure 1. Overview of the various steps carried out for each substance group, one by one.

For some substances (cf. Chapter 5 for a more detailed description) due to a low number of positive samples and/or shortage of samples in some time or age categories, an assumption was made that one of the interactions was not significant. By removing that interaction from the model, a model could be constructed for the substance in question.

For three of the substance groups (cocaine, alcohol-drugs and multiple drugs) a model was constructed for one gender only (i.e. men) because of too few positive observations for females.

After construction of a model, weighting of the estimates were calculated by weighting the logit before back transforming as described by Roalfe et al. (2008). After weighting, mean and confidence intervals of the prevalence estimates were calculated in each of the categories of the significant variables in the model as described by Roalfe et al. (2008).

Weighting factors

As described above the prevalence estimates (more specifically: the logits) have been weighted in order to adjust for sample skewness. The final prevalence estimate must reflect the driving population as a whole, and therefore weighting of the prevalence estimates have been done according to traffic volume. This means for instance that in an overall estimate of prevalence, more weight has been given to prevalence estimates in time periods with high traffic density, and at the other end of the spectrum: little weight has been given to prevalence estimates in time periods with low traffic volume.

The following tables show weighting factors as reported from each participating country. The weight factors for the time periods for Hungary, Italy, Lithuania, Poland and Portugal are international estimates based on IRTAD-data (www.irtad.net). The figures represent the three weighting factors: Fraction of traffic volume in the period or for the gender or age group in question.

Table 1 Fraction of traffic volume by DRUID time periods

Time period	Weekday morning	Weekday daytime	Weekday afternoon	Weekday evening/night	Weekend morning	Weekend daytime	Weekend afternoon	Weekend evening/night	In total
BE	0.1870	0.2515	0.2515	0.0580	0.0630	0.0818	0.0818	0,0254	1.000
CZ	0.2000	0.2900	0.1600	0.0200	0.0800	0.1100	0.1300	0.0100	1.000
DK	0.2230	0.3050	0.1710	0.0240	0.0310	0.1130	0.1080	0.0250	1.000
ES	0.1700	0.2700	0.2200	0.0400	0.0300	0.0800	0.1400	0.0500	1.000
FIN	0.1860	0.2890	0.1970	0.0330	0.0570	0.0880	0.1300	0.0200	1.000
HU*	0.2100	0.2600	0.2400	0.0300	0.0400	0.1100	0.0900	0.0200	1.000
IT*	0.2100	0.2600	0.2400	0.0300	0.0400	0.1100	0.0900	0.0200	1.000
LT*	0.2100	0.2600	0.2400	0.0300	0.0400	0.1100	0.0900	0.0200	1.000
N	0.1500	0.2700	0.2300	0.0600	0.0100	0.0800	0.1500	0.0500	1.000
NL	0.2200	0.2360	0.2690	0.0350	0.0270	0.1110	0.0800	0.0220	1.000
PL*	0.2100	0.2600	0.2400	0.0300	0.0400	0.1100	0.0900	0.0200	1.000
PT*	0.2100	0.2600	0.2400	0.0300	0.0400	0.1100	0.0900	0.0200	1.000
S	0.2100	0.2600	0.2500	0.0200	0.0400	0.1200	0.0800	0.0200	1.000

* International estimates

Table 2 Fraction of traffic volume by gender

Gender	Men	Women	In total
BE	0.670	0.330	1.000
CZ	0.610	0.390	1.000
DK	0.640	0.360	1.000
ES*	0.590	0.410	1.000
FIN	0.703	0.297	1.000
HU	0.750	0.250	1.000
IT	0.570	0.430	1.000
LT	0.890	0.110	1.000
N	0.656	0.344	1.000
NL	0.698	0.302	1.000
PL	0.830	0.170	1.000
PT*	0.628	0.372	1.000
S	0.700	0.300	1.000

* Fraction of driving licence holders

Table 3 Fraction of traffic volume by age groups

Age group	18-24	25-34	35-49	50+	In total
BE	0.100	0.230	0.320	0.350	1.000
CZ	0.062	0.331	0.387	0.220	1.000
DK	0.057	0.167	0.396	0.380	1.000
ES*	0.090	0.240	0.360	0.310	1.000
FIN	0.098	0.177	0.361	0.364	1.000
HU	0.101	0.323	0.338	0.238	1.000
IT	0.100	0.230	0.350	0.320	1.000
LT	0.160	0.250	0.340	0.250	1.000
N	0.079	0.194	0.356	0.371	1.000
NL	0.105	0.211	0.358	0.326	1.000
PL	0.184	0.331	0.297	0.188	1.000
PT*	0.099	0.238	0.312	0.351	1.000
S	0.070	0.150	0.330	0.450	1.000

***** Fraction of driving licence holders

Reference

Roalfe A K, Holder R L and Wilson S (2008). Standardization of rates using logistic regression: a comparison with the direct method. BMC Health Services Research 2008 8:275 7pp. http://www.biomedcentral.com/1472-6963/8/275