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Hels, Tove; Bernhoft, Inger Marie

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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 II: Country reports

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Prevalence of alcohol and other psychoactive substances in drivers in general traffic
Part II: Country reports

Editors:

SWOV - Sjoerd Houwing, Marjan Hagenzieker, René Mathijssen (SWOV Institute for Road Safety Research, the Netherlands)

DTU - Inger Marie Bernhoft, Tove Hels, Kira Janstrup (Technical University of Denmark, Denmark)

UGent - Trudy Van der Linden, Sara-Ann Legrand, Alain Verstraete (Ghent University, Belgium)

Authors:

- Country report **Belgium** - Trudy Van der Linden (Ugent), Sara-Ann Legrand (Ugent), Peter Silverans (BIVV), Alain Verstraete (Ugent),
- Country report **Czech Republic** - Aleš Zaoral (CDV), Jan Weinberger (CDV), Petr Zámečnik (CDV), Darina Havlíčková (CDV),
- Country report **Denmark** - Tove Hels (DTU) and Inger Marie Bernhoft (DTU), Kirsten Wiese Simonsen (UKBH) and Anni Steentoft (UKBH),
- Country report **Spain** - Juan Carlos González-Luque (DGT), Mónica Colás (DGT), Javier Álvarez (Uva), Inmaculada Fierro (Uva), Trinidad Gómez-Talegón (Uva), Manuel López-Rivadulla (University of Santiago de Compostela),
- Country report **Finland** - Charlotta Engblom (THL), Kaarina Langel (THL), Tom Blencowe (THL), Pekka Räty (Finnish Road Administration), Anna Pehrsson (THL), Heikki Ihalainen (Ministry of Internal Affairs), Lasse Lehtone (Hospital District of Helsinki and Uusimaa), Pirjo Lillsunde (THL),
- Country report **Hungary** - László Institóris (USZ), Anita Réka Tóth (USZ), Attila Molnár (Police Headquarter County Csongrád), Zsófia Árok (USZ), Tibor Varga (USZ),
- Country report **Italy** – Santo Davide Ferrara (TFA-UNPD), Donata Favretto (TFA-UNPD), Massimo Montisci (TFA-UNPD), Susanna Vogliardi (TFA-UNPD), Giulia Stocchero (TFA-UNPD), Guido Viel (TFA-UNPD), Rafi El Mazloum (TFA-UNPD), Colette Case (TFA-UNPD),
- Country report **Lithuania** - Marija Caplinskiene (TMI), Alvydas Pauliukevicius (TMI), Zita Minkuviene (TMI), Vaida Stankute (TMI),
- Country report **Netherlands** - Sjoerd Houwing (SWOV), Rene Mathijssen (SWOV), Marjan Hagenzieker (SWOV), Beitske Smink (NFI),
- Country report **Norway** - Hallvard Gjerde (FHI), Asbjørg S. Christophersen (FHI), Per T. Normann (FHI), Terje Assum (TØI), Bjørg Pettersen (FHI), Ada Josefine Rognerud (FHI), Azemira Sabaredzovic (FHI), Jørg Mørland(FHI),
- Country report **Poland** – Ilona Buttler (ITS),
- Country report **Portugal** - Mário Dias (CPS-NILM), Suzana Fonseca (CPS-NILM), Susana Simões (CPS-NILM),
- Country report **Sweden** - Åsa Forsman (VTI), Robert Kronstrand (RMV), Gunnel Ceder(RMV), Linda Renner (VTI), Magnus Hjälmdahl (VTI).

Task Leader: Marjan Hagenzieker (SWOV, the Netherlands)

Work Package Leader: Inger Marie Bernhoft (DTU, Denmark)

Project Coordinator: Horst Schulze (BASt, Germany)

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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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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 Part 1 and 2 of the report

Part 1 of the report presents the general results of the roadside surveys, based on the thirteen country reports that were written by all partners. Part 1 describes the general results and common trends, and focuses on both similarities as well as difference between countries This second part includes the report from each of the participating countries with more detailed descriptions of the method, results and representativeness of the individual national studies.

Each of the following chapters contains the edited report of one country. The national reports were written by the partners according to a template, leaving room for individual countries to include their own specific findings. A general check on the consistency of the reports was performed by the editors, ensuring that all requested information was included, and the reports were made comparable in length and layout; this whole process was conducted in consultation with the partners.

Each of the country reports contains the following sections:

1. Description of the roadside driver sample
2. Roadside data collection and analysis (description of methods)
3. Non-response
4. Results (based on a set of example tables, including confidence intervals)
5. Discussion of results
6. Acknowledgements
7. References

1.3 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)
2. Czech Republic (CZ)
3. Denmark (DK)
4. Spain (ES)
5. Finland (FI)
6. Hungary (HU)
7. Italy (IT)
8. Lithuania (LT)
9. Netherlands (NL)
10. Norway (NO)
11. Poland (PL)
12. Portugal (PT)
13. Sweden (SE)

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).

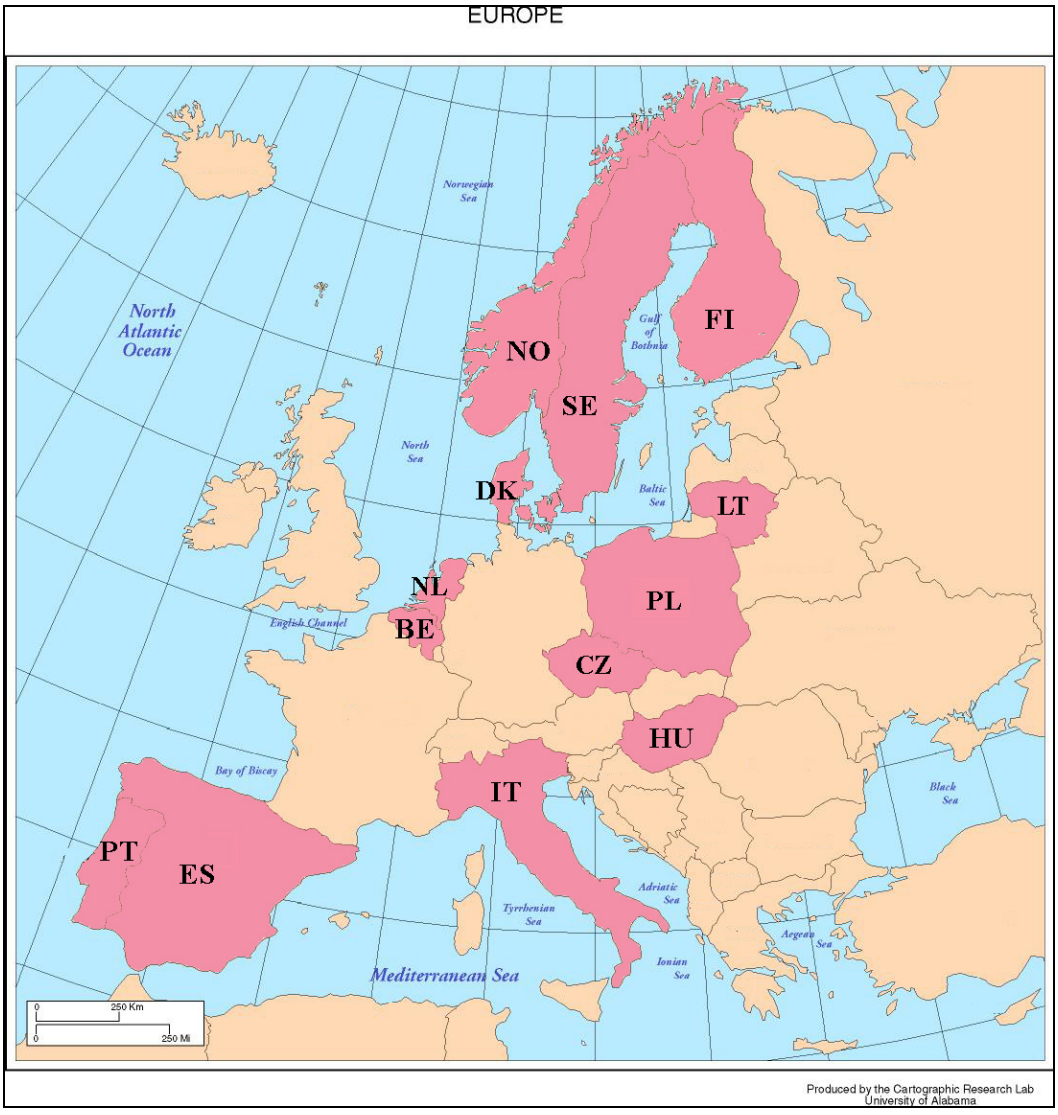

Figure 1.1 Participating countries

1.4 Method

Detailed information on the general design of the study, substances, data collection and analysis can be found in Part 1, Chapter 2 of Deliverable 2.2.3. Here we summarize the main aspects. Each country report also provides more specific information.

1.4.1 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 in Part 1).

1.4.2 Substances

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 Annex 2 in Part 1 for details about the core and additional substances.

For each substance an analytical cut-off has been prepared based on the lowest limit of quantitation (LOQ). This is the concentration at which quantitative results can be reported with a high degree of 95% confidence. For the analysis of the data, equivalent cut-offs, and not the LOQ's, are used for the core substances. The equivalent cut-offs in saliva are chosen in a way that they will on average result in the same number of positives for a substance as it would be the case when the analysis would have been in blood. The reason for this is that for many substances the concentrations in oral fluid are much higher than in blood, while for other compounds the concentrations are lower (Gjerde et al., 2010; Wille et al., 2009). This means that if oral fluid samples were used to collect information on recent drug use, the prevalence of the substances is likely to have higher prevalence results than that it would have been the case if blood was used as a sampling matrix. Therefore, equivalent cut-offs have been used for substances in oral fluid, which are the equivalent of the LOQ's in blood. However, 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. Therefore, the equivalent cut-off in blood has been determined. Table 1.2 provides an overview of the initial and the equivalent cut-offs for all core substances.

Table 1.2. 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*

1.4.3 Data collection

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 (in Part 1).

Prevalence of alcohol and drugs was calculated on the basis on the 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.

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.
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 partners from the Netherlands 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 (in Part 1) provides a detailed overview of the toxicological methods that were used by the partners.

1.4.4 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 and the equivalent cut-offs for substance concentrations.
Records were removed from the databases of the thirteen countries in case data for one or more total substance groups were missing or if samples were not analysed at all. Finally, underaged drivers (aged 17 years and younger) were removed as well from the databases. Table 1.3 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.

Table 1.3. 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)	9236
10. Norway (NO)	4822
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.

1.4.5 Analysis

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

2 Country report Belgium

Authors: *Trudy Van der Linden, Sara-Ann Legrand, Peter Silverans, Alain Verstraete*

2.1 Description of the roadside driver sample

2.1.1 Introduction; description of main deviations and justification/reasons

The roadside survey in Belgium complies with the general guidelines mentioned in Annex 1 of the summary report.

The objective for the Belgium roadside survey was to study the prevalence of drug and alcohol use among drivers in 5 regions that correspond to the catchment areas of the hospitals [1]selected in the Belgium hospital study (deliverable 2.2.5). The drivers included in the roadside survey will be used as control population in a case-control study of non-fatal accidents. Because no traffic volume data are available for those 5 regions separately, for the international database those 5 catchment areas were combined into 3 regions (Flanders, Brussels and Wallonia).

For road type a slightly different categorisation than urban and rural was used, because this distinction is not made in Belgium. Road type was classified into speed limit <90 km/h and ≥90km/h.

For type of vehicle there were 7 categories: personal car, motorcycle, small van, moped, truck/bus, bicycle and other. According to the guidelines (annex 1) only drivers of cars and van were included in the analyses.

Volunteers were also asked about the results of the alcohol test (safe, alarm, positive or no breath test), whether a drug test was performed, whether their license was withdrawn and whether the police made other comments. The last questions of the questionnaire were self-reporting about the use of medication and recreational drugs.

It was decided not to include following optional factors:

- time of driver's participation (only date and time of the session is listed)
- nationality of driver
- valid license
- driving experience
- clinical signs of impairment: we decided to use self-reported drug use and time of consumption

2.1.2 Geographic distribution of drivers over the country

The geographical distribution of the roadside sessions was performed systematically: an equal number of sessions was scheduled in the catchment area of each hospital participating in DRUID task 2.2.b.
In Belgium, federal police forces organise all activities on highways. In the original planning, 20% of sessions were scheduled with their collaboration. The remaining 80% of sessions were organised in collaboration with the regional police forces. These are subdivided in police zones covering several municipalities and/or cities. For practical reasons, it was decided to include 9 police zones for each catchment area. These were selected according to information from the emergency services. The nine police zones from which most accidents were transported to the participating hospitals in the years before the DRUID road side study started.
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[1] Ghent University Hospital, Regional Hospital of Namur, University Hospital Sart Tilman (Liège), Leuven University Hospital and Brussels University Hospital.

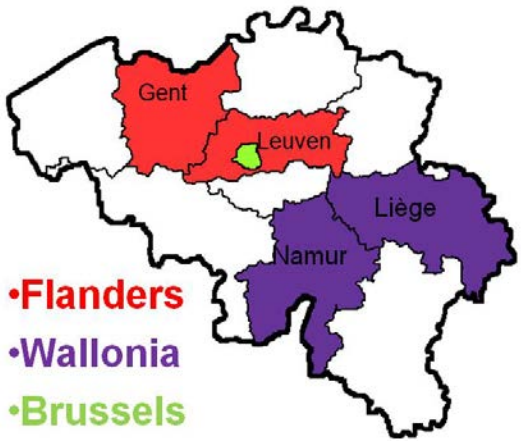


Figure 2.1: Belgian catchment areas and regions

For prevalence calculations, these data were converted into the three administrative regions in Belgium (Brussels, Flanders and Wallonia) since the distribution of vehicle kilometers is only available per region. The catchment areas of two hospitals are situated in Flanders (Ghent and Louvain), two in Wallonia (Liège and Namur) and one catchment area is situated partly in Flanders and partly in Brussels.

Overall, only 3.7 % of drivers were sampled in Brussels, while 57.2% were sampled in Flanders and 39.3% in Wallonia. This is almost identical to the known distribution of vehicle kilometers per region in Belgium. (Table 2.1)

Table 2.1. Geographic distribution of drivers over the country

Region	Distribution of drivers	Distribution of vehicle kilometers by region[2]
Brussels	110 (3.7%)	3.98%
Flanders	1681 (57.2%)	57.44%
Wallonia	1158 (39.3%)	38.58%
Total	2949 (100%)	100%

2.1.3 Distribution of drivers by road type

Table 2.2 provides an overview of the distribution of drivers by road type.

Table 2.2. Distribution of drivers by road type

Road type	Distribution of drivers	Distribution of vehicle kilometers by road type[3]
Other roads (≤ 90 km/h)	2593 (87.9%)	65.15%
Highway (> 90 km/h)	356 (12.1%)	34.86%
Total	2949 (100%)	100%

[2] and [2] Federale overheidsdienst mobiliteit en vervoer (2008). Directoraat-generaal Mobiliteit en Verkeersveiligheid Directie Mobiliteit. Opmeting van de in 2007 jaarlijks afgelegde kilometers. Nr. 43. September 2008. Retrieved January 18 2009 from http://www.mobilit.fgov.be/data/mobil/brochkmsit07Nl.pdf

The road type in this report differs from the international description. 'Urban' and 'rural' was not used, but instead a division of road types based on maximum speed: 'highway' and 'other roads' was made. 87.9% of the drivers were sampled on 'other roads' (≤90 km/h) and 12.1% on the 'highway' (>90 km/h) (see also the short introduction in chapter 1.1 above).

2.1.4 Distribution of drivers by season

An overview of the distribution of drivers by quarter of the year can be found in table 2.3.

Table 2.3. Distribution of drivers by quarter of the year

Quarter of the year	Distribution of drivers	
	n	%
First	842	28.5
Second	776	26.3
Third	693	23.6
Fourth	638	21.6
Total	2949	

2.1.5 Distribution of drivers by day of the week and time of the day

Table 2.4. Distribution of drivers by day of the week and time of the day

Time period	Distribution of drivers	Distribution of Belgian traffic flow over DRUID time periods[4]
Week 04:00-9:59	278 (9.4%)	18.7%
Week 10:00-15:59	765 (25.9%)	25.15%
Week 16:00-21:59	632 (21.4%)	25.15%
Week 22:00-3:59	95 (3.2%)	5.8%
Weekend 04:00-9:59	171 (5.8%)	6.3%
Weekend 10:00-15:59	228 (7.7%)	8.18%
Weekend 16:00-21:59	521 (17.7%)	8.18%
Weekend 22:00-3:59	259 (8.8%)	2.54%
Total	2949 (100%)	100%

Most of the drivers were sampled during the week, between 10:00-15:59 (25.9%). For comparison we also give the distribution of the Belgian traffic flow over the 8 DRUID time periods (table 2.4). Table 2.4 shows that the findings are similar to the calculations based on figures provided by the Flemish department 'roads and traffic' (2007). Differences can be found in the time periods 1, 3, 7 and 8 with oversampling between 16:00-3:59 in weekends. Weighing factors adjusted these data.
The various time periods have been fully covered. There were no systematic lunch breaks at defined times.

[4] Source: own calculations based on Vlaamse Overheid-Agentschap wegen en verkeer. Verkeerstelling 2007.

2.1.6 Distribution of drivers by gender and age

Tables 2.5, 2.6 and 2.7 give an overview of the distribution of drivers by gender and age groups

Table 2.5. Distribution of drivers by gender and age

		Gender			Total
		male	female	unknown	
Age groups	unknown	19 (1.0%)	1 (0.1%)	0	20 (0.7%)
	18-24	208 (10.5%)	127 (13.2%)	1	336 (11.4%)
	25-34	381 (19.2%)	230 (23.8%)	0	611 (20.7%)
	35-49	730 (36.8%)	367 (38.0%)	0	1097 (37.2%)
	50+	645 (32.5%)	240 (24.9%)	0	885 (30.0%)
Total		1983(100%)	965(100%)	1	2949 (100%)

67.2% (1989) of the drivers were male and 32.7% (967) female (see also table 6). 57.9% of the drivers can be placed in the age groups 25-34 (20.7%) and 35-49 (37.2%). This is almost identical to the known distribution of drivers by age groups in Belgium. (Table 7) To make this comparison, the DRUID age data were recoded into the same age categories used in this study. There is a minor difference in the 55+ category.

Table 2.6. Distribution of drivers by gender

		Belgian roadside survey of drinking and driving 2007	DRUID Respondents
Gender	Male	7853 (67%)	1983 (67.2%)
	Female	3867(33%)	965 (32.7%)
	Unknown		1 (0.03%)
Total		11721	2957

Table 2.7: Distribution of drivers by age groups

		Belgian roadside survey of drinking and driving 2007[5]	DRUID Respondents
Age groups	<25 y	12%	13.1%
	26-39 y	31%	31.6%
	40-54 y	35%	35.9%
	55+	22%	18.7%
	unknown		0.7%
Total		100%	100%
Druid Age groups	18-24		11.4%
	25-34		20.7%
	35-49		37.2%
	50+		30.0%
	unknown		0.7%
Total			100%

[5] Cf. http://bivvweb.ipower.be/Observ/FR/Rapport%20ROI%202007%20FR.pdf

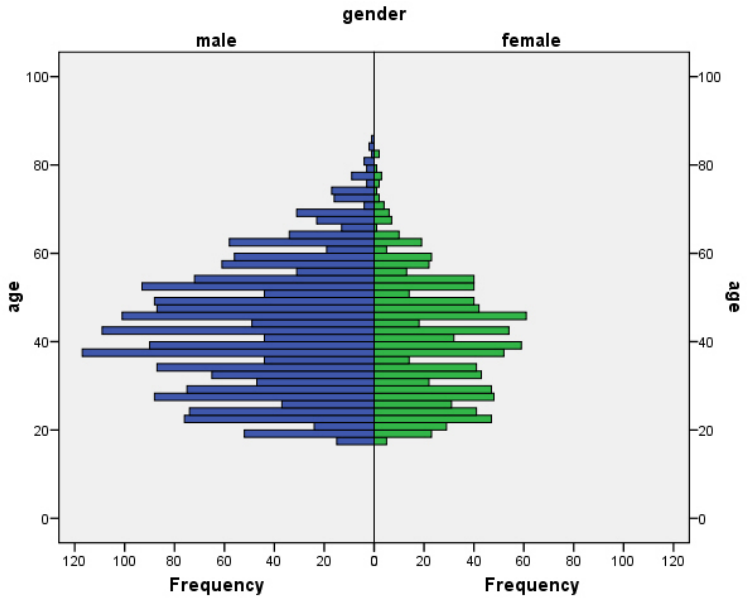


Figure 2.2. Histogram: age and gender distribution of respondents

2.2 Roadside data collection and analysis

2.2.1 Ethical approval

The protocol was submitted to the ethics committee of Ghent University Hospital. Approval was obtained on 18/07/2008. (Belgian registration number B67020073143)

2.2.2 Setup of the sampling

The research procedure consisted of two independent phases: the first phase was an aselect alcohol control performed by the police force (the respondents were selected at random by police officers). The police officers were asked not to pay attention to: external signs of impairment, age, gender,..., but to stop drivers at random and to test all stopped drivers. The stopped drivers were, after the police procedure, asked if they wanted to cooperate in the DRUID-research. If they refused, a refusal form with demographical data of the person was completed to be able to calculate a response rate. The second phase was the DRUID research itself, which took place in a mobile home purchased for the DRUID project. The drivers were informed about the objective and the content of the research, asked to fill in a questionnaire, to give a saliva sample and a blood sample taken by a nurse. Drivers who did not want to participate in the study, where asked to only fill in the questionnaire. If they refused, a refusal form was filled in to be able to calculate a response rate. Respondents who participated in the study were given a compensation in form of a gift voucher of € 20.

2.2.3 Body fluid collection: blood, oral fluid or both; method of oral fluid collection

Each volunteer was asked to provide a blood sample (5mL tube with potassium oxalate) and an oral fluid sample collected with the Statsure Saliva Sampler. The vast majority of participants were willing to provide both samples: 93.13 % gave both while 6.73% only gave an oral fluid sample (table 2.8).

Table 2.8. Number of oral fluid and whole blood samples taken from participants

		blood sample taken	
		Yes	No
Oral fluid sample taken	Yes	2750 (93.13%)	199 (6.73%)

2.2.4 Toxicological analysis of body fluids

The following methods were used:

- enzymatic method for ethanol analysis on saliva and whole blood samples on a Roche cobas Integra 400.
- liquid-liquid extraction followed by UPLC-MS/MS analysis for saliva samples
- solid phase extraction followed by UPLC-MS/MS analysis for all substances except cannabinoids in whole blood samples
- ELISA for qualitative analysis of cannabinoids in whole blood (IDS Elisa One-Step Cannabis (Cat No. TH-96-CE-U)
- liquid-liquid extraction followed by GC-MS analysis for cannabinoids in whole blood.

All blood samples of volunteers for whom saliva samples where positive for cannabinoids, as well as 400 negatives were analysed) with ELISA. Only one saliva-negative was found positive for cannabinoids in blood (THC: 3.0 ng/mL and THCOOH 12.6 ng/ml).
Whole blood samples that were positive with ELISA were analysed by GC-MS after extraction using liquid-liquid extraction.
Detailed information on the toxicological analyses can be found in D2.2.5, part2 annex 3 of the Belgian Country Report, p 215 - 221.

2.2.5 Method of BAC quantification

Both oral fluid and whole blood were analysed for ethanol. For comparability with other country reports (which mainly use oral fluid), results for ethanol presented are based on oral fluid and converted using the following formula:

Calculated blood ethanol (g/L) = measured ethanol in oral fluid (g/L) x 1.22

2.2.6 Interviews

The following data were recorded:

- per roadside session:
    - date and time of day
    - maximum speed allowed at location
    - weather and road conditions
    - total number of drivers stopped by police (including total data on alcohol and drug controls)
- from each participating driver (answers on a questionnaire)
    - type of vehicle
    - gender
    - age
    - education level
    - result of breathalyser test, drug control or other observations by police
    - self-reported drug, alcohol and medicine use
- from each refusing driver (filled in by a police officer)
    - type of vehicle
    - gender
    - age
    - result of breathalyser test, drug control or other observations by police

2.2.7 Statistical analysis

In order to calculate frequencies to describe the distribution of drivers (by age groups, gender, road type,...) we made our statistical analysis with the software programme SPSS version 15 (renamed in PASW). Mann-Whitney, Chi-square, Fisher Exact tests and Confidence intervals (95%) for difference in proportions were used to determine differences in distribution. Percentages of positive findings and concentration ranges were calculated using Microsoft Office Excel 2007.
The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

2.3 Non-response

As non-response increases, the potential for a biased sample increases. This means that the obtained responses of a probability sample may no longer be representative of the larger population. A strategy for addressing non-response is to compare date on respondents and non-respondents (refusals).

2.3.1 Size and nature of non-response

2.3.1.1 Age and Gender

Table 2.9. Non-response distribution of drivers by gender and age

Gender			Participation	
			Refusals	Participation
Male	Age groups	unknown	19 (0.8%)	19 (1.0%)
		18-24	223 (10.0%)	208 (10.5%)
		25-34	552 (24.7%)	381 (19.2%)
		35-49	858 (38.4%)	730 (36.8%)
		50+	584 (26.1%)	645 (32.5%)
	Total		2236 (100%)	1983 (100%)
Female	Age groups	unknown	28 (3.1%)	1 (0.1%)
		18-24	75 (8.3%)	127 (13.2%)
		25-34	238 (26.4%)	230 (23.8%)
		35-49	369 (40.9%)	367 (38.0%)
		50+	193 (21.4%)	240 (24.9%)
	Total		903 (100%)	965 (100%)
Unknown	Age groups	unknown	4 (6.0%)	0
		18-24	7 (10.4%)	1 (100%)
		25-34	14 (20.9%)	0
		35-49	28 (41.8%)	0
		50+	14 (20.9%)	0
	Total		67 (100%)	1 (100%)

67.2% (1983) of the drivers (respondents) were male and 32.7% (965) female (see also table 2.6). 69.7% of the drivers who refused to participate were male and 28.2% female (chi-square, p =0.001[6]). We can conclude that there is a significant difference in gender between the group of respondents (volunteers) and the group of refusals (non-response). Males were underrepresented and females overrepresented in the respondents,.[7]

64.2% of the drivers who refused to participate in the DRUID-research can be placed in the age group 25-34 (25.1%) and the age group 35-49 (39.1%).
There was a significant ($p < 0.001$)[8] difference in distribution by age groups between the refusers and participants. The age group 18-24 was overrepresented in the female respondent group. A possible

[6] Chi square and p-value were calculated based on the database leaving out the 'unknown' gender data
[7] Confidence intervals for difference in proportions were calculated for every gender / age group between the group of refusals and the group of volunteers.
[8] Mann –Whitney and p-value were calculated based on the database leaving out the 'unknown' data.

explanation could be that the gift card of 20 euro was a more attractive incentive for this group. The age group 25-34 was underrepresented and the 50+ age group overrepresented. This can possibly be explained by the fact that part of them, being retired and less under time pressure to go to work, were more inclined to participate. There was no significant difference for the age group 35-49.[7]
The magnitude of these differences was very small, and mainly significant due to the large sample sizes.

2.3.1.2 Type of vehicle

Table 2.10. Distribution of drivers by type of vehicle non-response

		Participation	
		Refusals	**Respondents**
Type of vehicle	Personal car	2961 (92.4%)	2778 (94.2%)
	Van	245 (7.6%)	171 (5.8%)
Total		3206 (100%)	2949 (100%)

In the non-response group, 92.4% was driving a personal car; in the group of respondents, this was 94.2%. There was a significant difference (p= 0.004) in the distribution between volunteers and refusals. People driving a van refused more to participate. This is probably explained by the fact that drivers of vans are more likely to be driving for work, and less inclined to participate because of pressure to complete their assignments on time.

2.3.1.3 Breath alcohol results

Table 2.11. Distribution of drivers by BAC non-response (excluding the unknowns)

		Participation	
		Refusals	**Respondents**
BAC	safe	2949(98.2%)	2257 (98.1%)
	alarm	18(0.6%)	21 (0.9%)
	positive	35 (1.2%)	22 (1.0%)
Total		3002(100%)	2300 (100%)

Looking at the BAC categories, we can find an almost identical distribution of BAC (Table 2.11) between the group of volunteers and refusals (p= 0.321). Thus there is no significant difference in distribution of drivers by BAC between the refusals (non response) and the respondents (volunteers).

2.3.1.4 Druid Time Periods

Table 2.12. Distribution of drivers by time period, non-response

		Participation	
		Refusals	**Respondents**
Time period	Week 4:00-9:59	357(11.1%)	278 (9.4%)
	Week 10:00-15:59	700 (21.8%)	765 (25.9%)
	Week 16:00-21:59	548 (17.1%)	632 (21.4%)
	Week 22:00-3:59	66 (2.1%)	95 (3.2%)
	Weekend 4:00-9:59	341 (10.6%)	171 (5.8%)
	Weekend 10:00-15:59	322 (10.0%)	228 (7.7%)
	Weekend 16:00-21:59	584 (18.2%)	521 (17.7%)
	Weekend 22:00-3:59	288(9.0%)	259 (8.8%)
Total		3206(100%)	2949(100%)

For the distribution of drivers by time period, there is also a significant difference; ($p < 0.001$).
By calculating confidence intervals for the difference in proportions for each time period separately, the following non-response data were found:
- in time period 4:00-9:59 (week and weekend) and from 10:00-16:00 in weekends more people refused than participated

- on weekdays from 10:00 to 3:59 there were more volunteers than refusals
- on weekend days from 16:00 to 3:59 there was no significant difference between respondents and refusals.
The magnitude of these differences was very small, and mainly significant due to the large sample sizes.

2.3.2 Possible confounding effect of non-response

The differences in distribution of drivers between the group of respondents and non-responders can have an effect on the prevalence.
In general it is known that males are more often positive for psychoactive substances. In this study there was an oversampling of females and males were underrepresented. This could indicate an underestimation of the obtained prevalence.
The age groups 18-24 and 50+ are both slightly overrepresented. An increased use of medicines in the age group 50+ or increased use of recreational drugs in the group 18-24 years could have had an effect on the prevalence. Thus the resulting prevalence estimate could be an overestimation.
There were more respondents during weekdays and less during weekend-days compared to refusers. We expect higher prevalence on weekend-days, so there might be an underestimation of the prevalence estimates.
In general the differences between the compared groups of refusers and respondents were very small and mainly became significant due to the very large sample sizes.

None of the characteristics associated with the response rate seemed to have major effects. However, we cannot entirely exclude the possibility of a remaining bias in the prevalence estimates. This bias may be due to a possible correlation between drug use and willingness to participate in the study that is in itself uncorrelated with the variables taken into account in the non-response analysis. Since drug using participants might as well be more willing to participate (in order to show a positive "nothing to hide" attitude towards the police, for instance) then less willing to participate (fear of being caught, willing to hide drug use, ...) we have no idea of the direction of such a possible bias. But this remaining degree of incertitude has to be taken into account in the interpretation of the prevalence estimates.

2.4 Results

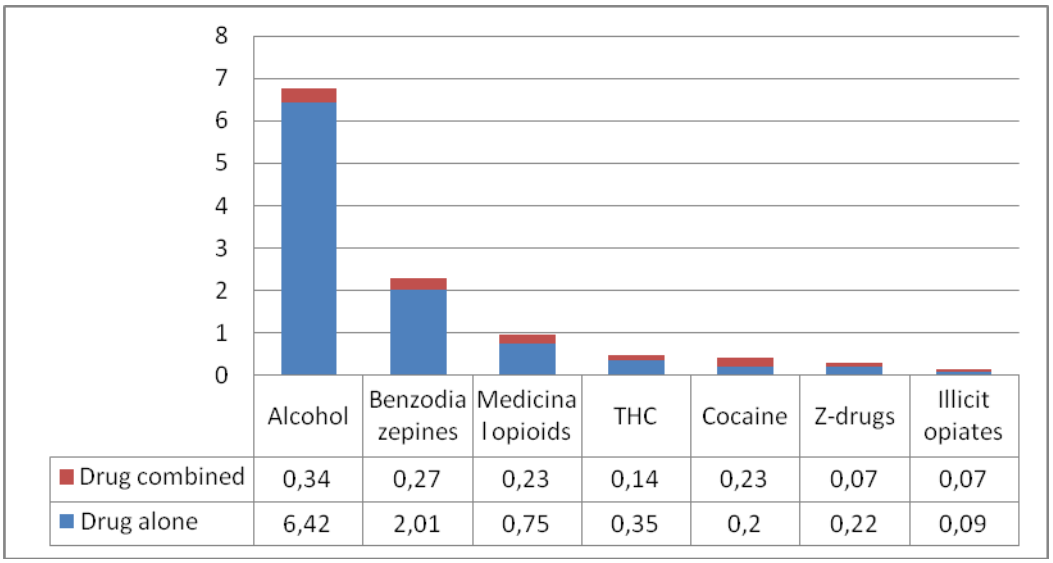
2.4.1 Adjusted general substance group distribution

In all the results presented below (except for figure 2.3), the prevalence estimates are for the named drug only. If the drug is used in combination with alcohol, or in combination with another drug, the prevalence is not included in the drug-only estimate but only in the drug- drug and drug-alcohol estimates at the bottom of the table. Hence the prevalence estimates need to be read as a drug-only prevalence estimate. The total prevalence of each drug (alone and in combination) is higher than the drug-only estimate. (see fig 2.3)

Table 2.13. Substance group distribution (n= 2949)

Type	Group	Prevalence (%)	Confidence Intervals
None		89.35	88.18-90.41
Alcohol	Alcohol	6.42	5.59-7.36
Illicit Drugs	Amphetamines	0	
	Cocaine	0.20	0.09-0.43
	THC	0.35	0.19-0.64
	Illicit opiates	0.09	0.03-0.28
Medicinal drugs	Benzodiazepines	2.01	1.57-2.59
	Z-drugs	0.22	0.10-0.47
	Opiates and opioids	0.75	0.50-1.13
Various combinations	Drug-alcohol	0.31	0.16-0.58
	Drug-drug	0.30	0.16-0.58
Total		100	

10.7% of drivers were found positive for one or more (il)licit substances. The highest prevalence was found for alcohol only (6.42%). Almost 3% of the sampled subjects were positive for medicinal drugs only: benzodiazepines (2.01%) and medicinal opioids (0.75%) being the most common drugs detected. 0.6% of respondents had used an illicit drug with the highest prevalence for THC (0.35%).



	Alcohol	Benzodiazepines	Medicinal opioids	THC	Cocaine	Z-drugs	Illicit opiates
Drug combined	0,34	0,27	0,23	0,14	0,23	0,07	0,07
Drug alone	6,42	2,01	0,75	0,35	0,2	0,22	0,09

Figure 2.3. Distribution of drugs alone and combined

In figure 2.3 the total distribution of all substance groups is shown, taking into account both the drug alone or in combination (not mutually exclusive). In 6.8% of the samples alcohol (> 0.1 g/L) was found, benzodiazepines in 2.3%. Except for cocaine, all other groups have a higher prevalence for single use compared to combined use.

In general 6.8% of the respondents was found positive for alcohol (alone or in combination). Of these, 65.4% had a BAC between 0.1 g/l (= DRUID cut-off) and 0.5 g/l (= the legal cut-off in Belgium) and 8.2% had a BAC at or above 1.2 g/l.
In the general population the prevalence of driving with a BAC > 0.5 g/L is 2.4%.

2.4.2 Adjusted distribution of substance groups age and gender

Table 2.14. Distribution of substance groups by gender and age (male: n= 1957; female: n= 971), Prevalence + Confidence Intervals

Gender Substances	Age groups								Total	
	18-24		25-34		35-49		50+			
	%	CI	%	CI	%	CI	%	CI	%	CI
Male										
None	84.08	78.13-88.65	89.64	86.11-92.36	90.90	88.62-92.77	86.05	83.21-88.48	88.28	86.78-89.62
Alcohol	7.08	4.20-11.71	7.51	5.23-10.66	6.24	4.71-8.21	8.92	6.98-11.33	7.47	6.39-8.72
Cocaine	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
THC	3.91	1.93-7.76	0.64	0.19-2.11	0.06	0.01-0.64	0	0-0.57	0.51	0.28-0.93
Illicit opiates	0.63	0.12-3.15	0.29	0.05-1.55	0	0-0.52	0	0-0.57	0.11	0.03-0.39
Benzo-diazepines	0	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
Z-drugs	0	0-2.03	0	0-1.03	0	0-0.52	0.54	0.20-1.45	0.18	0.07-0.49
Medicinal opioids	0.63	0.12-3.15	0	0-1.03	0.61	0.25-1.49	0.32	0.09-1.12	0.51	0.28-0.93
Drug-alcohol	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
Drug-drug	1.36	0.42-4.27	0.72	0.23-2.23	0	0-0.52	0.51	0.18-1.40	0.43	0.22-0.83
Total male	100		100		100		100		100	
Female										
None	93.08	86.75-96.51	93.63	89.88-96.05	91.80	88.54-94.19	88.22	83.57-91.68	91.52	89.60-93.11
Alcohol	5.77	2.73-11.80	5.32	3.15-8.85	3.10	1.76-5.42	4.31	2.40-7.64	4.28	3.17-5.74
Cocaine	0	0-3.37	0	0-1.52	0	0-1.04	0	0-1.55	0	0-0.39
THC	0.26	0.02-3.86	0	0-1.52	0	0-1.04	0	0-1.55	0.03	0-0.45
Illicit opiates	0	0-3.37	0	0-1.52	0.13	0.01-1.27	0	0-1.55	0.05	0-0.48
Benzodiazepines	0	0-3.37	1.05	0.33-3.25	2.70	1.47-4.91	4.82	2.77-8.27	2.50	1.69-3.69
Z-drugs	0	0-3.37	0	0-1.52	0.53	0.14-1.94	0.40	0.07-2.26	0.30	0.10-0.89
Medicinal opioids	0.88	0.15-4.92	0	0-1.52	1.66	0.77-3.56	2.06	0.89-4.72	1.25	0.72-2.16
Drug-alcohol	0	0-3.37	0	0-1.52	0.08	0.01-1.19	0	0-1.55	0.03	0-0.45
Drug-drug	0	0-3.37	0	0-1.52	0	0-1.04	0.19	0.02-1.90	0.05	0-0.48
Total female	100		100		100		100		100	
Total										
None	87.45	83.19-90.75	91.25	88.76-93.23	91.20	89.39-92.73	86.63	84.27-88.69	89.35	88.18-90.41
Alcohol	6.58	4.28-10.00	6.62	4.92-8.87	5.20	4.04-6.67	7.68	6.12-9.60	6.42	5.59-7.36
Cocaine	0.61	0.16-2.33	0.35	0.10-1.21	0.10	0.02-0.52	0.03	0-0.48	0.20	0.09-0.43
THC	2.55	1.27-5.04	0.38	0.11-1.23	0.04	0-0.43	0	0-0.42	0.35	0.19-0.64
Illicit opiates	0.40	0.08-1.99	0.17	0.03-0.93	0.04	0-0.43	0	0-0.42	0.09	0.03-0.28
Benzo-diazepines	0	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
Z-drugs	0	0-1.28	0	0-0.62	0.18	0.05-0.65	0.50	0.21-1.22	0.22	0.10-0.47
Medicinal opioids	0.72	0.21-2.50	0	0-0.62	0.96	0.53-1.73	0.79	0.39-1.61	0.75	0.50-1.13
Drug-alcohol	0.83	0.26-2.67	0.22	0.05-1.01	0.11	0.02-0.55	0.43	0.17-1.11	0.31	0.16-0.58
Drug-drug	0.85	0.27-2.70	0.43	0.14-1.33	0	0.-0.35	0.42	0.16-1.10	0.30	0.16-0.58
Total	100		100		100		100		100	

In general a significant difference was found for gender (p= 0.001) and age groups (p= 0.004). More males were positive for one or more substances compared to females and more positive subjects were found in the age groups 18-24 and 50+.

Alcohol alone was found significantly more frequently in males (7.47%) than in females (4.28%) (p= 0.001). This was also the case for THC (p= 0.036) which was found more often in the age group 18-24 (2.55%) compared to the other age categories (ranging 0.04-0.38%). In females THC was only found in drivers between 18 and 24 years old. This trend was also seen in the injured drivers study (see D2.2.5). Benzodiazepines were found equally in both genders (p= 0.201) and more in the age group 50+ (3.5%), while none were observed in drivers between 18 and 24 years old (p < 0.001). Z-drugs were only found in drivers older than 35, no difference was found regarding gender (p= 0.691). Medicinal opioids were found more often in females (p= 0.031).

2.4.3 Adjusted distribution of substance groups by day of the week and time of the day

Table 2.15. Distribution of substance groups by day of the week and time of the day (n= 2949), Prevalence + Confidence Intervals

Substances	Time periods								Total	
	Weekdays 04:00-21:59		Weeknights 22:00-03:59		Weekend-days 04:00-21:59		Weekend-nights 22:00-03:59			
	%	CI	%	CI	%	CI	%	CI	%	CI
None	91.81	90.54-92.92	76.84	69.97-82.53	86.28	83.47-88.69	78.38	67.80-86.19	89.35	88.18-90.41
Alcohol	3.99	3.22-4.93	21.05	15.61-27.76	8.94	7.00-11.34	16.60	9.85-26.61	6.42	5.59-7.36
Cocaine	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
THC	0.20	0.08-0.51	0	0-2.20	0.76	0.33-1.76	1.54	0.30-7.51	0.35	0.19-0.64
Illicit opiates	0.06	0.01-0.29	0	0-2.20	0.23	0.05-0.97	0	0-4.88	0.09	0.03-0.28
Benzodiazepines	2.12	1.58-2.84	1.05	0.27-3.98	2.03	1.21-3.41	1.16	0.19-6.90	2.01	1.57-2.59
Z-drugs	0.3	0.14-0.65	0	0-2.20	0.07	0.01-0.70	0	0-4.88	0.22	0.10-0.47
Medicinal opioids	0.98	0.63-1.50	0	0-2.20	0.30	0.08-1.08	0.39	0.03-5.59	0.75	0.50-1.13
Drug-alcohol	0.14	0.05-0.43	0	0-2.20	0.78	0.34-1.79	1.16	0.19-6.90	0.31	0.16
Drug-drug	0.31	0.14-0.66	0	0-2.20	0.37	0.11-1.19	0.39	0.03-5.59	0.30	0.16-0.58
Total	100		100		100		100		100	

In general a significant difference was found between the time periods ($p< 0.001$). More positives were found on weeknights compared to week-days and more during weekend nights compared to weekend day. Comparing day and night, fewer positive cases occurred during the day ($p< 0.001$). More respondents sampled during the weekend tested positive compared to cases sampled during weekdays ($p< 0.001$).

A significant difference was found for alcohol alone (≥ 0.1 g/L) between day and night ($p < 0.001$), more drivers tested positive during nights with percentages of 21.05 during the week and 16.6 during the weekend. For the distribution of alcohol by week versus weekend a significant difference was seen between with a higher percentage during the weekend. ($p < 0.001$)
For THC alone the highest percentage was found during weekend-nights (1.54%); no cases were found during weeknights. More positive cases were found during the weekend compared to weekdays ($p = 0.020$) and no difference was seen when comparing day and night ($p= 0.582$)
Comparing week and weekend no significant difference in the distribution of cocaine ($p=0.646$), illicit opiates ($p= 0.440$), benzodiazepines ($p= 0.880$), Z-drugs ($p=0.347$) and medicinal opioids ($p=0.081$) were found.
Comparing day and night no significant differences in the distribution of cocaine ($p=0.083$) and benzodiazepines ($p=0.480$) were found. Z-drugs were found more often during the night. For medicinal opiates and drug-drug combinations only one person was found positive during a weekend-night.
The highest percentage for alcohol-drug combinations was found during weekend-nights, none during weeknights.

2.4.4 Adjusted general distribution of alcohol alone by BAC categories

Table 2.16. Distribution of alcohol alone by BAC categories (n=189)

Alcohol alone	Prevalence (%)	Confidence intervals
BAC 0.1 - 0.49 g/L	4.27	3.59-5.06
BAC 0.5 - 0.79 g/L	1.33	0.97-1.81
BAC 0.8 - 1.19 g/L	0.42	0.24-0.72
BAC ≥ 1.2 g/L	0.41	0.23-0.71
Sum	6.42	5.59-7.36

The highest prevalence was found for the BAC-category 0.1-0.49 g/L (4.27%). The distribution was found equal for the groups 0.8-1.19 g/L and ≥1.2 g/L. 2.16% of the general driving population in Belgium is positive for alcohol only with a BAC > 0.5 g/L.

2.4.5 Adjusted distribution of BAC categories by gender and age

Table 2.17. Distribution of alcohol alone by BAC category and gender and age (n=189), Prevalence + Confidence Intervals

Gender	Alcohol alone BAC g/L	Age groups								Total	
		18-24		25-34		35-49		50+			
		%	CI	%	CI	%	CI	%	CI	%	CI
Male	0.1 - 0.49	4.40	2.26-8.39	4.46	2.78-7.09	4.60	3.31-6.36	5.83	4.29-7.88	5.00	4.13-6.05
	0.5 - 0.79	0.99	0.26-3.71	2.13	1.08-4.18	0.76	0.34-1.69	1.85	1.07-3.19	1.40	0.97-2.02
	0.8 - 1.19	0.52	0.09-2.96	0.32	0.06-1.60	0.76	0.34-1.69	0.54	0.20-1.45	0.57	0.32-1.02
	≥ 1.2	1.17	0.34-3.99	0.59	0.17-2.03	0.12	0.02-0.73	0.70	0.29-1.67	0.50	0.27-0.92
Sum male		7.08	4.20-11.71	7.51	5.23-10.66	6.24	4.71-8.21	8.92	6.98-11.33	7.47	6.39-8.72
Female	0.1 - 0.49	4.26	1.79-9.82	2.85	1.40-5.74	1.92	0.93-3.90	3.30	1.68-6.35	2.77	1.91-4.00
	0.5 - 0.79	0.53	0.06-4.33	2.47	1.15-5.24	0.89	0.32-2.48	0.62	0.14-2.62	1.19	0.67-2.08
	0.8 - 1.19	-	-	-	-	-	-	0.40	0.07-2.26	0.10	0.02-0.58
	≥ 1.2	0.99	0.18-5.09	-	-	0.30	0.06-1.57	-	-	0.22	0.06-0.77
Sum female		5.77	2.73-11.80	5.32	3.15-8.85	3.10	1.76-5.42	4.31	2.40-7.64	4.28	3.17-5.74
Total	0.1 - 0.49	4.34	2.54-7.30	3.81	2.56-5.63	3.71	2.75-5.00	5.15	3.89-6.78	4.27	3.59-5.06
	0.5 - 0.79	0.82	0.25-2.65	2.27	1.36-3.77	0.80	0.42-1.52	1.52	0.91-2.54	1.33	0.97-1.81
	0.8 - 1.19	0.33	0.06-1.87	0.19	0.04-0.96	0.51	0.23-1.13	0.50	0.21-1.21	0.42	0.24-0.72
	≥ 1.2	1.10	0.39-3.07	0.35	0.10-1.22	0.18	0.05-0.65	0.51	0.21-1.22	0.41	0.23-0.71
Sum total		6.58	4.28-10.00	6.62	4.92-8.87	5.20	4.04-6.67	7.68	6.12-9.60	6.42	5.59-7.36

The BAC-category 0.1-0.49 g/L was more present in the male subgroup (5.00%) compared to the females (2.77%). The other BAC-categories were equally distributed over the gender categories. 2.5% and 1.5% of respectively males and females in the general driving population in Belgium is positive for alcohol only with a BAC > 0.5 g/L.

For the age groups, all BAC-categories were equally distributed, except that there were more BAC ≥1.2 g/L in the age group 18-24.

2.4.6 Adjusted distribution of BAC categories by day of the week and time of the day

Table2.18. Distribution of alcohol alone by BAC category and time period (n=189), prevalence and confidence intervals

Alcohol alone BAC g/L	Time periods								Total	
	Weekdays 04:00-21:59		Weeknights 22:00-03:59		Weekend-days 04:00-21:59		Weekend-nights 22:00-03:59			
	%	CI	%	CI	%	CI	%	CI	%	CI
0.1 - 0.49	2.73	2.10-3.53	14.74	10.20-20.82	5.84	4.30-7.88	8.11	3.79-16.52	4.27	3.59-5.06
0.5 - 0.79	0.95	0.61-1.48	4.21	2.07-8.36	1.27	0.66-2.44	5.41	2.13-13.03	1.33	0.97-1.81
0.8 - 1.19	0.26	0.11-0.59	2.11	0.78-5.53	0.35	0.10-1.16	1.54	0.30-7.51	0.42	0.24-0.72
≥ 1.2	0.05	0.01-0.28	-	-	1.48	0.80-2.71	1.54	0.30-7.51	0.41	0.23-0.71
Sum	3.99	3.22-4.93	21.05	15.61-27.76	8.94	7.00-11.34	16.60	9.85-26.61	6.42	5.59-7.36

The BAC-category 0.1-0.49 g/L was found less on weekdays compared to the other time periods. The categories 0.5-0.79 and 0.8-1.19 g/L were more prevalent at night compared to daytime. The category ≥ 1.2 g/L was not found on weeknights and was more prevalent in weekend compared to weekdays (p= 0.001). On weekdays, 1.3% of the general driving population in Belgium is positive for alcohol only with a BAC > 0.5 g/L, on weeknights 6.32%. In the weekend this percentage increases to 3.1% on weekend-days and 8.49% on weekend-nights.

Although the data are not completely comparable due to the fact that only the "alcohol alone" prevalence was taken into account in these analyses, it is interesting to compare these results with the most recent Belgian drink driving road side survey, which took place in 2009. Based on a sample of more than 12000 subjects tested in October and November 2009, it was estimated that 13% of the drivers on weekend-nights tested above 0.5 g/L. On weeknights the prevalence was 6.7%, around 1.5% on weekdays and around 2.2% on weekend days. Taking the confidence intervals into account the DRUID results seem roughly comparable to the roadside survey results, although the prevalence on weeknights seems somewhat underestimated and the prevalence on weekend-days seems somewhat overestimated in the DRUID study compared to the road side survey. These differences might be related to methodological differences (e.g. the DUI road side survey only took place in 2 months of the year, whereas the DRUID sample covered the entire year, the DRUID estimates do not take drug-alcohol combinations into account in the present analyses, only breath test results were taken into account in the DUI road side survey whereas the DRUID results for alcohol are based on saliva etc...).

2.4.7 Adjusted distribution of additional substances

Table 2.19. Distribution of additional substances (n= 2949), prevalence and confidence intervals

Substance	Prevalence (%)	Confidence Intervals
Amitryptiline	0.19	0.088 – 0.43
Bromazepam	0.52	0.31 – 0.85
Buprenorphine	0	
Citalopram	1.52	1.13 – 2.02
Mirtazapine	0.23	0.11 – 0.48
Trazodone	1.17	0.84 – 1.63

Table 2.19 shows that citalopram (1.52%) and trazodone (1.17%) were the most common additional findings, all other additional substance have significantly lower prevalence.
These findings are in line with the sales figures of medicines in Belgium: citalopram is a frequently prescribed antidepressant[9].

[9] http://www.riziv.fgov.be/drug/nl/statistics-scientific-information/pharmanet/info-spot/2010-09-08/index.htm

2.4.8 Distribution of positives according to the Belgian Law

Out of the 2949 respondents, 86 (2.9%) had a BAC above the Belgian legal level.

Out of the 2750 respondents for which a blood was available, 38 concentrations were above the Belgian cut-off for illicit substances (ethanol not included) mentioned in the Belgian law. (see table 2.20). Taking into account the number of respondents positive for more than one illicit substance (except ethanol), 28 respondents would be punishable for driving under the influence of illicit drugs.

Table 2.20. Number of positives according to Belgian Law based on results of blood samples (n=2750)

Substance	Cut-off Belgian Law (ng/mL) blood analysis	Positive according to Belgian Law (n)
Ethanol*	0.5 g/L	86
THC	1	13
Amphetamine	25	0
MDMA	25	0
Morphine	10	5
6-acetyl-morphine	10	1
Cocaine	25	7
Benzoylecgonine	25	12

* The figures listed in this table for ethanol are calculated BAC based on oral fluid for all respondents (n=2949)

Out of the 199 respondents for which only a saliva sample was available, 26 saliva concentrations were above the Belgian cut-off for illicit substances mentioned in the Belgian law (see table 2.21). Taking into account the number of respondents positive for more than one illicit substance, 15 respondents would be punishable for driving under the influence of illicit drugs.

Table 2.21. Number of positives according to Belgian Law based on results of saliva samples (n=199)

Substance	Cut-off Belgian Law (ng/ml) saliva analysis	Positive according to Belgian Law (n)
THC	10	7
Amphetamine	25	0
MDMA	25	1
Morphine	5	3
6-acetyl-morphine	5	2
Cocaine	10	7
Benzoylecgonine	10	6

Adding up the number of positives in blood and in oral fluid (table 20 and 21) and taking into account the number of respondents positive for more than one illicit substance, we can conclude that, of all our respondents, 43 (1.5%) would be punishable for use of illicit drugs and 2.9% for alcohol according to the Belgian law.

Table 2.22. Comparison number of positives in blood and oral fluid according to Belgian Law

Substance	Number of cases taken into conside-ration	Cut-off Belgian Law (ng/ml) oral fluid analysis	Positive in oral fluid according to Belgian Law (n)	Cut-off Belgian Law (ng/ml) blood analysis	Positive in blood according to Belgian Law (n)
THC	2750	10	40	1	13
Amphetamine	2750	25	2	25	0
MDMA	2750	25	0	25	0
Morphine	2750	5	12	10	5
6-acetylmorphine	2750	5	3	10	1
Cocaine	2750	10	25	25	7
Benzoylecgonine	2750	10	24	25	12

When comparing the number of positives in blood to the number of positives in oral fluid according to the Belgian Law, out of the 2750 respondents for which a blood and a saliva sample was available, 38 blood concentrations and 106 oral fluid concentrations were above the Belgian cut-off (see table 22). Taking into account the number of respondents positive for more than one illicit substance, 28 respondents would be punishable according to the cut-off in blood, 71 respondents according to the cut-off in oral fluid.
These figures show that the Belgian Law is stricter for results of oral fluid samples than for blood.

2.5 Discussion

2.5.1 Representativeness

Compared to the whole Belgian driving population, the selection of subjects was very representative for the whole population of drivers in Belgium. This is illustrated by the good correspondence between the study data and the data from the Flemish department 'roads and traffic' regarding gender, regional and road type distribution.

The distribution of drivers by gender and by age group are almost identical to the known distribution of drivers in Belgium (see table 2.6 and 2.7)[10]. There is also an equal distribution of the traffic flow over the time periods (table 2.4).

Based on these figures and the available data, we can conclude that there are no indications that our sample is not representative for the whole population (of drivers) in Belgium.

2.5.2 Effects of non-response

Comparing volunteers and refusers, significant differences were observed for distribution of drivers by gender, age groups and time period. In the next paragraph some possible confounding effects are mentioned. Due to the low percentage for some drugs, not all substance groups are discussed.

Since males were slightly underrepresented[11] and there was a difference seen in positives between males and females, gender could be a confounding effect indicating an underestimation of the found prevalence.
Benzodiazepines were more found in the age group 50+, which was also overrepresented[12], indicating a possible overestimation of the prevalence of benzodiazepines.

[10] Dupont, 2009. Belgian roadside survey of drinking and driving 2007: http://bivvweb.ipower.be/observ/NL/rapportrijdenonderinvloed2007.pdf
[11] Confidence interval for difference in proportion between male participants (67.3%) and male refusers (71.2%): (0.0158;0.0622)
[12] Confidence interval for difference in proportion between participants aged 50+ (30.2%) and refusers aged 50+ (25.1%): (0.0285;0.0735)

Non-response was higher on weekend-days, indicating a possible underestimation of the prevalence of alcohol. In contrast an overestimation could be made because non-response was lower on weekdays and –nights.
Since THC was detected mostly during weekend-nights and this time period was not under- or oversampled, no confounding effect of time period was presumed.

2.5.3 Highlights

The following substances (alone and in combination) were found in decreasing frequency: alcohol (6.8%), benzodiazepines (2.3%), medicinal opioids (1.0%), THC (0.5%), cocaine (0.4%), Z-drugs (0.3%) and illicit opiates (0.2%).
Approximately 5% of alcohol positive cases were positive for a drug-alcohol combination. Cases positive for alcohol only were more common in male drivers. The second most prevalent group was the one positive for benzodiazepines only (2%), with positive cases more common in the subpopulation aged 50 and over and none in drivers between 18 and 24. THC was found more in the age group 18-24, none in females of 25 and older. This trend was also seen in the injured drivers study (see D2.2.5).
Alcohol alone was found more during nights compared to daytime and more during weekend-days compared to weekdays. Drivers positive for cannabis only were found more often during weekend-night, and no positive cases found during weeknights. Alcohol-drug combinations were most found during the weekend.
The BAC-category 0.1-0.49 g/L was more present in the male subgroup (5.00%) compared to the females (2.77%). For age groups, all BAC-categories were equally distributed, except for BAC ≥1.2 g/L, which had a higher percentage in the age group 18-24.
On weekdays, 1.3% of the general driving population in Belgium is positive for alcohol only with a BAC > 0.5 g/L, on week nights 6.32%. In the weekend this percentage increases to 3.1% on weekend-days and 8.49% on weekend-nights.
Most positives have low blood concentrations. Comparing blood and oral fluid, higher concentrations are found in oral fluid samples. Implementing the new equivalent DRUID-cut-offs made it more feasible to compare the Belgian results, based on blood, with the results of the other that are based on oral fluid.
More than 80% of findings for benzodiazepines and Z-drugs were sub-therapeutic concentrations. For antidepressants approximately 50% of the concentrations were therapeutic and 50% were lower than therapeutic. For opioids almost 62% were in therapeutic range. In general only 3 concentrations (2 alprazolam, 1 codeine) were above therapeutic range.
According to the Belgian law, of all our respondents, 43 (1.5%) would be punishable for driving under the influence of illicit drugs and 86 (2.9%) for driving under the influence of alcohol.
When comparing the number of positives in blood to the number of positives in oral fluid using the cut-offs mentioned in the Belgian Law, out of the 2750 respondents for which a blood and a saliva sample was available, 28 (1.0 %) respondents would be punishable according to the cut-off in blood, 71 (2.6%) respondents according to the cut-off in oral fluid, which illustrates that more people will be found positive with the saliva cut-offs than with the blood cut-offs.
The comparison of the number of positive subjects among the volunteers who gave blood and saliva, and the volunteers who refused to give a blood sample shows that there was a much higher percentage of positives (in saliva) among the latter (7.5% versus 2.6%, p= 0.0005). This suggests a possible bias in those who have refused to give a blood sample. One can suppose that people thinking that they could test positive might have been more likely to refuse to give a blood sample.

2.6 Acknowledgements

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The researchers are grateful to all the students who helped to collect our data.

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And finally, we would like to thank our colleagues from SWOV for their assistance with the report and the database.

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3 Country report Czech Republic

Authors: *Aleš Zaoral, Jan Weinberger, Petr Zámečnik, Darina Havlíčková, Transport Research Centre (CDV).*

Toxicological analyses: *Alain Verstraete, manager of the toxicological laboratory of the University Hospital Gent (Belgium)*.

3.1 Description of roadside driver sample

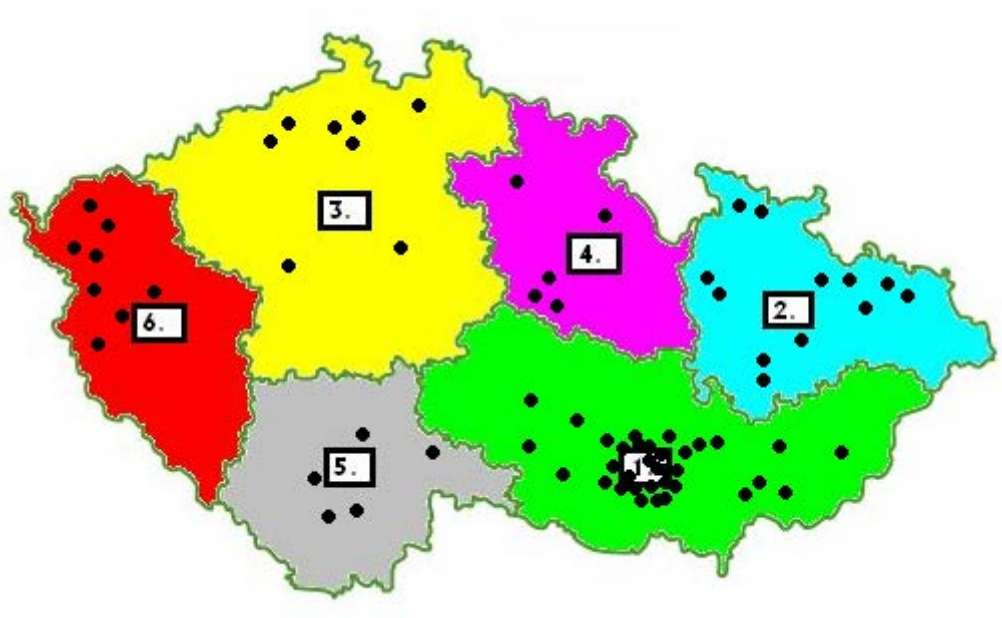
The roadside survey in the Czech Republic complies with general guidelines mentioned in Annex 1 of the general part of the report. The compliance of the working method has been approved by the Ethical committee of teaching hospital in Brno. The research was carried out and facilitated thanks to cooperation between Directorate Traffic police Services and Centrum dopravního výzkumu – Transport Research Centre (CDV).

3.1.1 Study objectives and research design

The project DRUID is the international project incorporated into seventh frame program. The objective of the project is to gain more insight into the prevalence of psychoactive substances among the driving population.
The roadside survey in the Czech Republic started with pilot data collection (saliva samples from CDV staff) in February 2008. The main survey was started in March 2008 and finished in June 2009. We gained the saliva samples from drivers in the cooperation with the traffic police patrols. The research (the personal data) was anonymous, driver´s participation was voluntary and practically the whole territory of Czech Republic was more or less represented.
Besides saliva samples the researchers also collected drivers' statistical data (type of driving license, mileage in the last year, car type and make, collection time, weather condition etc.).

3.1.2 Research area and selection of research sites – geographic distribution

Data on control drivers and saliva sampling were taken randomly at six regions of the Czech Republic. The Czech Republic is nowadays divided into 14 regions (13 regions and Prague). In order to simplify the division of the territory we used the former division of regions – two Moravian and four Bohemian regions. The saliva collection carried out in the fifth - Central Bohemia region – was allocated to the other Bohemia regions according to their geographical location. The saliva collection was carried out practically in the whole of the Czech Republic – in 26 Bohemian and Moravian districts. The collection in Moravia lasted usually one day, in Bohemia usually two days. According to the control plan of traffic police patrols we collected the saliva often in more places during one day. Some traffic police controls took place on the urban, other on rural traffic roads. During each session the traffic police patrols usually checked drivers successively at various checkpoints.



	Region	Number of samples
1.	South Moravia	**367**
2.	North Moravia	**326**
3.	North Bohemia	**326**
4.	East Bohemia	**346**
5.	South Bohemia	**367**
6.	West Bohemia	**307**

Figure 3.1. Regional distribution of samples

In each sample collection session, a team consisting of two DRUID employees cooperated with the traffic police patrol.

Table 3.1. Geographic distribution of drivers over the country

DRUID regions	Roadside sample fraction	Fraction of traffic volume
South Moravia	0.18	0.21
North Moravia	0.16	0.18
North Bohemia	0.16	0.15
East Bohemia	0.17	0.14
South Bohemia	0.18	0.11
West Bohemia	0.15	0.21
In total	**1**	**1**

3.1.3 Distribution of drivers by road type

The saliva sampling was collected at random in all regions of the Czech Republic. We were dependent on diurnal or nocturnal control schedule of traffic police patrols. Number of samples from urban and rural roads were almost equal.

Table 3.2. Distribution of drivers by road type

Road type	Roadside sample fraction	Fraction of traffic volume
Urban (type 1)	0.56	0.25
Rural (type 2)	0.44	0.75

3.1.4 Distribution of drivers by season

Within each region the samples were distributed into seasons (Spring: March – May; Summer: June – August; Autumn: September – November; Winter: December – February). We tried to get saliva samples throughout the whole year and irrespectively of weather conditions. The lower level of saliva samples acquired in winter months was caused by increased sick leave of researchers and adverse weather conditions in 2008-2009 winter (Month 01 – 03).

Table 3.3. Distribution of drivers by seasons

Season of the year / Months	Roadside sample fraction	Fraction of traffic volume
Winter (Month 01 – 03)	0.13	0.248
Spring (Month 04 – 06)	0.45	0.261
Summer (Month 07 - 09	0.19	0.239
Autumn (Month 10 – 12)	0.23	0.252

3.1.5 Distribution of drivers by day of the week and time of the day

We tried to collect saliva samples at any hour of the day and any day of the week. During March 2008 – June 2009 we participated in 39 roadside sessions and obtained 2039 saliva samples. The most saliva samples (675) were taken during time period 2 (10 – 16 h on working days), when traffic is the heaviest. The least samples (82 saliva samples) were taken in time periods 4 and 8 (22 – 04 h on working days and weekend); in these time periods the traffic density is the lowest. The samples collection in the other six time periods was roughly divided according to traffic density in this time periods. Various time periods have been fully covered and there were not any systematically time period with no samples.

Table 3.4. Distribution of drivers by DRUID time periods

DRUID Time period	Roadside sample fraction	Fraction of traffic volume
1 Weekday 04:00-09:59	0.18	0.2
2 Weekday 10:00-15:59	0.34	0.29
3 Weekday 16:00-21:59	0.17	0.16
4 Weekday 22:00-03:39	0.06	0.02
5 Weekendday 04:00-09:59	0.06	0.08
6 Weekendday 10:00-15:59	0.07	0.11
7 Weekendday 16:00-21:59	0.05	0.13
8 Weekendday 22:00-03:39	0.07	0.01

3.1.6 Distribution of drivers by gender and age

On roads in the Czech Republic the total of 2039 saliva samples from drivers were acquired. 1593 (78%) of drivers were men and 446 (22%) women. That is the result of random sampling of drivers who were stopped and controlled by traffic police patrols and who gave us their saliva. This result supports the claim that more males than females are driving cars.
The number of drivers divided in four age categories is indicated in the table below.

Table 3.5. Distribution of drivers by age

Age group	Fraction of males	Fraction of females	Fraction together
18 - 24	0,12	0,20	0,16
25 - 34	0,27	0,33	0,30
35 - 49	0,34	0,34	0,34

50+	0,27	0,13	0,20

Comparatively, the most drivers in our sample belong to age group 25-34 (on average 57.3 drivers in this category every year), then to age group 35-49 (on average 46,5 drivers in this category every year) and to age group 18-24 (on average 38,6 drivers in this category every year). The age group 50+ covers the widest age range – from 50 to 80 years. Here the average representation of drivers in one year is the lowest.

3.2 Roadside data collection and analysis

3.2.1 Ethical approval

Before saliva sampling started we got in touch with the Ethical committee of teaching hospital in Brno. We informed the committee in detail about the methodology of saliva sampling and statistical data acquisition. The commission dealt with our request for approval of saliva sampling and sent us the following opinion: For saliva sampling we don't need approval. It is also not necessary to demand the informed approval from volunteers – their consent is sufficiently expressed by their agreement to the collection of the sample and to the publication of the statistical information.

3.2.2 Body fluid collection and results, traffic police controls and suggestion

CDV executed within the WP2 oral fluid - saliva sampling. Oral fluid was collected by the Saliva-Sampler (Statsure Diagnostic Systems, Inc. Medford, New York, USA) device (Annex 2, Part 1). The device is intended for collection and transport of saliva Samples and consist of a Saliva collector with volume adequacy indicator and a Transport tube with a snap cap. In this device a variable amount of absorbed oral fluid (300 – 1500 mg) is diluted with a fixed buffer volume (1 mL). The buffer contains 0,2% sodium azide as a preservative substance. Saliva collection proceeded in all regions of the Czech Republic in all seasons, in all days of the week and all hours of the day.
In the course of saliva sampling the tubes were deposited in the frost-resistant box with the dimensions 13.5 x 13.5 x 10 centimeters and with the capacity of 25 tubes. In this box the samples were stored in deep freeze under the temperature of 22 degrees below zero. The same boxes were used for the transport of saliva samples – in the car freezer (by the temperature of 18 degrees below zero) – to the toxicological laboratory in Gent (Belgium).

3.2.3 Driver selection and data collection procedures

Drivers were stopped randomly by police and their identification and car documents were checked. The police occasionally checked the car technical condition as well. The police conducted the breath test for checking alcohol presence in accordance with the patrol day´s plan. Sometimes breath test was performed on all drivers, sometimes only on a few randomly chosen drivers, sometimes on none.
After the police control ended the police officer introduced CDV researchers to the driver and we asked him (her) to give us their saliva sample. In the course of the saliva collection we gave the driver more information about DRUID project and the influence of psychotropic substances (medicinal drugs and illegal drugs) on driving.

3.2.4 Safe keeping of saliva samples and their transportation to the toxicological laboratory

After the slice was saturated with saliva (the control spot changed colour) the driver removed the slice and the researcher gave it in the tube marked with the day order number. All tubes were placed in the small box which has the capacity of 25 tubes. The box was deposited in the car fridge. The fridge was necessary particularly in hot days when the inside car temperature was often more than fifty degrees.
The researchers took collected saliva samples to CDV working place. Here the researcher indicated necessary data on the tube (date of saliva sample collection, sex of the driver and order number of the

sample). The small boxes with saliva samples in the tubes were then deposited into a deep freezer with the inside temperature of 22 degree centigrade below zero.
For carrying out the toxicological analysis we transported the saliva samples to the toxicological laboratory of Ghent University in Belgium. When it comes to transport we made the resolution not to rely on the postal services (no matter whether samples would be sent by car or plane) because we could not guarantee the stable temperature below zero that has to be guaranteed throughout the course of transport. Finally we decided to deliver the saliva samples ourselves by a car where they were deposited in the car freezer. The purchased car freezer guaranteed the inside temperature of 18 degree centigrade below zero. The business trip with our company car took two nights. During the night the freezer was transferred into a hotel room and plugged into the electric network and powered by 220V.
Since the car freezer's capacity was restricted (about 700 tubes with saliva samples in the small boxes) we had to make the journey Brno – Gent – Brno three times. The date of saliva samples delivery was always agreed in advance with the staff of toxicological laboratory in Ghent. After the CDV car arrived in front of university hospital of Ghent the researcher informed the toxicological laboratory staff over the phone and after the car was parked in the hospital parking house two employees of laboratory came and helped with the transport into the laboratory rooms. The laboratory staff took the tubes out of the car freezer and took small boxes out of the laboratory containers and stored them in the deep freezer. At this point the car freezer and CDV employee were ready for the way back.

3.2.5 Description of method for toxicological analyses

The toxicological analysis of 2039 saliva samples acquired from drivers on the roads of the Czech Republic were performed by DRUID partner University of Ghent (Belgium). The samples were carried out in the toxicological laboratory UNI Gent. The relevant staff of toxicological laboratory is the competent person to describe the method used for toxicological analysis. The toxicological analysis contained information about the number of positive samples, type of detected illegal drugs or medicine drugs in the sample. The laboratory also informed us about the number of samples that were not possible to analyze at all or only partially.
In the first delivery of saliva sample the laboratory could not analyze four samples. In twenty other samples the content of saliva was low but the laboratory managed to accomplish the analysis.
In the second delivery of saliva samples the laboratory could not to analyze one sample number due to an insufficient amount of saliva
In the third delivery all samples were analyzed, no samples were not fit for analysis.

3.2.6 Interviews

After completion of saliva sampling the CDV researchers asked the drivers some statistical questions. Their answers we entered into the statistical questionnaire. We entered the date and time we obtained the saliva sample, day order number, type of road, density of traffic and weather conditions (daylight or night, cloudless sky/sunny weather or overcast, rain, snowfall, fog, frost, hot weather.
We further collected information like car category (passenger car or van), car make, driver´s gender and age, their license type, year of license issue, if the driver is professional driver or not, current driving practice (how many kilometers he/she did in the past twelve months), number of motoring offences and traffic accidents in the past twelve months (offender or only traffic accident participation), place of residence (city or village), experience with drug use, medical drug usage and alcohol test result (in case of alcohol breath test performance).
In the course of saliva sampling and interview we didn´t note the signs of impairment, because no one of CDV researcher was professionally trained for this competent appraisal.

2.7 Analysis
The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

3.3 Non-response

3.3.1 Size and nature of non response

During the saliva sampling the CDV researchers asked 2 648 drivers for saliva samples. Only 2039 drivers gave us the saliva, which means that 609 (22.9%) drivers refused to give their saliva.

Table 3.6. Distribution of respondents and non-respondents by gender

	Male	Female	Total
Respondents	1593 (76%)	446 (83%)	2039 (77%)
Non respondents	513 (24%)	96 (17%)	609 (23%)
Total	2106 (100 %)	542 (100 %)	2648 (100%)

In total 84%of the drivers who refused to give a saliva sample was men, whereas in the response group the share of men was 78%. Men are a bit overrepresented in the non response group. This reason for this was that men were more often „in rush“ than women.

3.3.2 Possible confounding effect of non - response

There were two types of answers, by which respondents explain why they don't want to give saliva. Firstly, they were "in rush" and didn't want to devote ten minutes. Secondly, drivers ask if it is necessary to give saliva and when they ascertained voluntary participation, they left. In the latter group we expect large shares of "potentially positive" samples.
Many drivers who refused to give saliva argued: "We do not want to give our genetic code (DNA)". Our commercial television NOVA (independently of our saliva sampling within the DRUID project) was telling in that time people that the DNA sample could be misused in different ways.
We think the real reason for refusal was the alcohol or drug presence in the driver´s bloodstream at the time we asked for saliva samples. These drivers were most likely afraid that we would give police the information about the alcohol or drug presence in their tests plus their identification because they knew they breached the law.

3.4 Results

The toxicological laboratory found, that among 2039 saliva samples 108 were positive for one or more drugs. In total these positive samples contained 138 legal or illegal drugs.

Illegal drugs: THC – in 33 samples, Alcohol - in 23 samples, Amphetamine – in 12 samples, Methamphetamine – in 12 samples, Cocaine - in 1 sample and Benzoylecgonine – in 2 samples.
Legal drugs: Citalopram – in 18 samples, Nordiazepam – in 9 samples, Bromazepam – in 8 samples, Alprazolam – in 7 samples, Tramadol – in 6 samples, Trazodone – in 3 samples, Mitrazepin – in 3 samples, Flunitrazepam – in 1 sample.

In total, the toxicological laboratory detected 83 illegal drugs and 55 drugs, that have a negative impact on the ability to drive, in the saliva samples acquired from drivers on Czech roads.
76 illegal drugs and 36 drugs were detected in saliva samples of 55 men. The most frequent illegal drug combination was Amphetamine with Methamphetamine which was detected in 11 saliva samples. Drugs were detected in saliva samples of 17 women, 4 female drivers were under influence of illegal drugs, one woman drove the car under influence of 4 illegal drugs (THC, Methamphetamine, Cocaine and Benzoylecgonine).

Table 3.7. Adjusted general distribution of *core substance categories* (N=2039)

Substance category	Prevalence (%)	Confidence interval (%)
Negative	97.20	96.39 - 97.83
Alcohol	0.99	0.65 - 1.53
Amphetamines	0.36	0.17 - 0.72
Cocaine	-	-
THC	0.46	0.25 - 0.86
Illicit opiates	-	-
Benzodiazepines	0.62	0.36 - 1.07
Z-drugs	-	-
Medicinal opioids	0.21	0.08 - 0.52
Alcohol – drugs	0.05	0.01 - 0.28
Multiple drugs	0.11	0.03 - 0.38

Table 3.8A. Adjusted distribution of *core substance categories* by gender and age (N=1593)

Male	**18-24**	**25-34**	**35-49**	**50+**	**All ages**
Substance	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
negative	94.48 89.73 - 97.10	96.93 94.81 - 98.21	97.57 95.94 - 98.56	97.74 95.92 - 98.76	97.15 96.21 - 97.86
amphetamines	0.64 0.11 - 3.52	1.50 0.70 - 3.18	0.00 0.00 - 0.68	0.00 0.00 - 0.84	0.46 0.22 - 0.93
cocaine	-	-	-	-	-
THC	2.84 1.16 - 6.78	0.94 0.37 - 2.42	0.18 0.03 - 1.00	0.00 0.00 - 0.84	0.59 0.32 - 1.10
illicit opiates	-	-	-	-	-
benzodiazepines	0.00 0.00 - 2.39	0.00 0.00 - 0.91	0.55 0.19 - 1.58	0.65 0.22 - 1.91	0.38 0.17 - 0.82
Z-drugs	-	-	-	-	-
medicinal opiates	0.00 0.00 - 2.39	0.00 0.00 - 0.91	0.00 0.00 - 0.68	0.47 0.13 - 1.63	0.13 0.04 - 0.47
alcohol	1.33 0.38 - 4.62	0.36 0.08 - 1.54	1.70 0.91 - 3.15	1.14 0.50 2.61	1.15 0.73 - 1.81
alcohol+drugs	0.63 0.11 - 3.51	0.00 0.00 - 0.91	0.00 0.00 - 0.68	0.00 0.00 - 0.84	0.06 0.01 - 0.35
drugs-drugs combi	0.08 0.00 - 2.55	0.27 0.05 - 1.39	0.00 0.00 - 0.68	0.00 0.00 - 0.84	0.08 0.02 - 0.38

Table3. 8B Adjusted distribution of *core substance categories* by gender and age (N=446)

Female	18-24	25-34	35-49	50+	All ages
Substance	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)
negative	98.83 93.64 - 99.79	96.95 92.55 - 98.79	97.19 93.36 - 98.84	96.92 89.35 - 99.16	97.39 95.46 - 98.51
amphetamines	0.00 0.00 - 4.32	0.00 0.00 - 2.73	0.00 0.00 - 2.31	0.00 0.00 - 5.68	0.00 0.00 - 0.85
cocaine	-	-	-	-	-
THC	0.00 0.00 - 4.32	0.00 0.00 - 2.73	0.00 0.00 - 2.31	0.00 0.00 - 5.68	0.00 0.00 - 0.85
illicit opiates	-	-	-	-	-
benzodiazepines	1.17 0.21 - 6.36	0.80 0.15 - 4.14	1.60 0.51 - 4.93	3.08 0.84 - 10.65	1.49 0.71 - 3.09
Z-drugs	-	-	-	-	-
medicinal opiates	0.00 0.00 - 4.32	1.53 0.43 - 5.27	0.00 0.00 - 2.31	0.00 0.00 - 5.68	0.47 0.13 - 1.64
alcohol	0.00 0.00 - 4.32	0.00 0.00 - 2.73	1.21 0.33 - 4.34	0.00 0.00 - 5.68	0.44 0.12 - 1.60
alcohol+drugs	0.00 0.00 - 4.32	0.00 0.00 - 2.73	0.00 0.00 - 2.31	0.00 0.00 - 5.68	0.00 0.00 - 0.85
drugs-drugs combi	0.00 0.00 - 4.32	0.72 0.13 - 4.01	0.00 0.00 - 2.31	0.00 0.00 - 5.68	0.22 0.04 - 1.25

Table 3.8C. Adjusted distribution of *core substance categories* by gender and age (N=2039)

Total	18-24	25-34	35-49	50+	All ages
Substance	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)
negative	96.01 92.74 - 97.84	96.94 95.15 - 98.08	97.49 96.07 - 98.40	97.64 95.94 - 98.64	97.20 96.39 - 97.83
amphetamines	0.41 0.07 - 2.30	1.13 0.53 - 2.40	0.00 0.00 - 0.53	0.00 0.00 - 0.74	0.36 0.17 - 0.72
cocaine	-	-	-	-	-
THC	1.84 0.75 - 4.44	0.71 0.28 - 1.83	0.14 0.02 - 0.78	0.00 0.00 - 0.74	0.46 0.25 - 0.86
illicit opiates	-	-	-	-	-
benzodiazepines	0.41 0.07 - 2.30	0.20 0.04 - 1.04	0.79 0.35 - 1.74	0.95 0.40 - 2.22	0.62 0.36 - 1.07
Z-drugs	-	-	-	-	-
medicinal opiates	0.00 0.00 - 1.56	0.38 0.11 - 1.33	0.00 0.00 - 0.53	0.41 0.12 - 1.43	0.21 0.08 - 0.52
alcohol	0.86 0.24 - 3.02	0.27 0.06 - 1.16	1.59 0.90 - 2.79	1.00 0.44 - 2.29	0.99 0.65 - 1.53
alcohol+drugs	0.41 0.07 - 2.30	0.00 0.00 - 0.69	0.00 0.00 - 0.53	0.00 0.00 - 0.74	0.05 0.01 - 0.28
drugs-drugs combi	0.05 0.00 - 1.66	0.38 0.11 - 1.34	0.00 0.00 - 0.53	0.00 0.00 - 0.74	0.11 0.03 - 0.38

Table 3.9. Adjusted distribution of *core substance categories* by day of the week and time of the day (N=2039)

Period of the week	weekday 04:00-21:59	weekday 22:00-03:59	weekend 04:00-21:59	weekend 22:00-03:59	All periods
Substance	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)
negative	97.45 96.45 - 98.17	98.77 89.25 - 99.87	96.76 95.10 - 97.87	91.98 72.61 - 98.02	97.20 96.39 - 97.83
amphetamines	0.22 0.08 - 0.66	0.00 0.00 - 8.62	0.64 0.25 - 1.60	0.62 0.02 - 16.88	0.36 0.17 - 0.72
cocaine	-	-	-	-	-
THC	0.43 0.19 - 0.95	0.00 0.00 - 8.62	0.51 0.18 - 1.42	1.85 0.15 - 18.82	0.46 0.25 - 0.86
illicit opiates	-	-	-	-	-
benzodiazepines	0.79 0.44 - 1.43	0.00 0.00 - 8.62	0.32 0.09 - 1.13	0.62 0.02 - 16.88	0.62 0.36 - 1.07
Z-drugs	-	-	-	-	-
medicinal opiates	0.07 0.01 - 0.41	0.00 0.00 - 8.62	0.51 0.18 - 1.42	0.00 0.00 - 15.86	0.21 0.08 - 0.52
alcohol	0.83 0.46 - 1.47	1.23 0.13 - 10.75	1.26 0.64 - 2.44	3.09 0.39 - 20.67	0.99 0.65 - 1.53
alcohol+drugs	0.07 0.01 - 0.42	0.00 0.00 - 8.62	0.00 0.00 - 0.59	0.00 0.00 - 15.86	0.05 0.01 - 0.28
drugs-drugs combi	0.14 0.04 - 0.53	0.00 0.00 - 8.62	0.00 0.00 - 0.59	1.85 0.15 - 18.82	0.11 0.03 - 0.38

Table 3.10. Adjusted general distribution of alcohol by concentration class (N=2039)

Alcohol alone	Prevalence (%)	Confidence interval (%)
Alcohol 0.1 – 0.49 g/L	0.54	0.30 - 0.97
Alcohol 0.5 – 0.79 g/L	0.24	0.10 - 0.57
Alcohol 0.8 – 1.19 g/L	0.15	0.05 - 0.44
Alcohol 1.2+	0.06	0.01 - 0.30
In total	0.99	0.65 - 1.53

Table 3.11. Adjusted distribution of *alcohol alone* by gender and age (N=2039)

Male	**18-24**	**25-34**	**35-49**	**50+**	**All ages**
BAC	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.08 0.00 - 2.55	-	0.87 0.37 - 2.04	1.14 0.50 - 2.61	0.64 0.35 - 1.17
0.5 – 0.79 g/L	1.25 0.34 - 4.50	0.33 0.07 - 1.49	0.29 0.07 - 1.18	-	0.31 0.13 - 0.73
0.8 – 1.19 g/L	-	-	0.55 0.19 - 1.58	-	0.19 0.07 - 0.56
alcohol 1.2+	-	0.03 0.00 - 0.97	-	-	0.01 0.00 - 0.26
In total	1.33 0.38 - 4.62	0.36 0.08 - 1.54	1.70 0.91 - 3.15	1.14 0.50 - 2.61	1.15 0.73 - 1.81

Female	**18-24**	**25-34**	**35-49**	**50+**	**All ages**
BAC	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	-	-	0.53 0.09 - 3.27	-	0.19 0.03 - 1.20
0.5 – 0.79 g/L	-	-	-	-	0.00 0.00 - 0.85
0.8 – 1.19 g/L	-	-	-	-	0.00 0.00 - 0.85
alcohol 1.2+	-	-	0.67 0.13 - 3.49	-	0.24 0.05 - 1.29
In total	0.00 0.00 - 4.32	0.00 0.00 - 2.73	1.21 0.33 - 4.34	0.00 0.00 - 5.68	0.44 0.12 - 1.60

Total	**18-24**	**25-34**	**35-49**	**50+**	**All ages**
BAC	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.05 0.00 - 1.66	-	0.79 0.36 - 1.75	1.00 0.44 - 2.29	0.54 0.30 - 0.97
0.5 – 0.79 g/L	0.81 0.22 - 2.94	0.25 0.05 - 1.12	0.22 0.05 - 0.92	-	0.24 0.10 - 0.57
0.8 – 1.19 g/L	-	-	0.43 0.15 - 1.23	-	0.15 0.05 - 0.44
alcohol 1.2+	-	0.02 0.00 - 0.73	0.15 0.03 - 0.80	-	0.06 0.01 - 0.30
In total	0.86 0.24 - 3.02	0.27 0.06 - 1.16	1.59 0.90 - 2.79	1.00 0.44 - 2.29	0.99 0.65 - 1.53

Table 3.12. Adjusted distribution of *alcohol alone* by day of the week and time of the day (N=2039)

Period of the week	weekday 04:00-21:59	weekday 22:00-03:59	weekend 04:00-21:59	weekend 22:00-03:59	All periods
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.44 0.20 - 0.96	-	0.75 0.32 - 1.75	1.85 0.15 - 18.82	0.54 0.30 - 0.97
0.5 – 0.79 g/L	0.23 0.08 - 0.67	1.23 0.13 - 10.75	0.19 0.04 - 0.93	0.62 0.02 - 16.88	0.24 0.10 - 0.57
0.8 – 1.19 g/L	0.07 0.01 - 0.42	-	0.32 0.09 - 1.13	-	0.15 0.05 - 0.44
alcohol 1.2+	0.08 0.02 - 0.44	-	-	0.62 0.02 - 16.88	0.06 0.01 - 0.30
In total	0.83 0.46 - 1.47	1.23 0.13 - 10.75	1.26 0.64 - 2.44	3.09 0.39 - 20.67	0.99 0.65 - 1.53

Alcohol was detected in 0.99% of the samples. The prevalence was higher among men (1.15%) than women (0.44), and higher at weekend nights than during the weekdays. Combinations of alcohol and drugs were found in only 0.05% and multiple drugs were found in 0.11% of the samples.

The prevalence of benzodiazepines was 0.62%. The prevalence was higher among women (1.49%) than among men (0.38%), but the difference is not statistically significant. Z-drugs, cocaine and illicit opiates were not found.

The most commonly found illegal drugs were THC and amphetamines. The total prevalence of THC was 0.46% and it was found only among male drivers. The prevalence was highest among drivers below 24 years (2.84%). The prevalence was higher during weekend nights and lower during weekdays.

Amphetamines were detected in 0.36% of the samples and it were found only among men. The prevalence was highest among age group 25 – 34 years (1.50%). The prevalence were higher during weekend nights and lower during weekdays.

3.5 Discussion

The research was really useful because it provided important information about prevalence of drugs and alcohol among drivers. In Czech Republic there are no previous studies that provide an overview of the situation among drivers in general traffic. For that reason, it is not possible to make any comparative analysis; moreover, we have to deal with a significant amount of respondents who refused to cooperate at the research (23%). This problem has probably several potential reasons and some of them were mentioned in paragraph 3. As we cooperated with police we cannot forget that the reputation and status of Czech police is very weak. Furthermore, Czech police has serious problems to conduct the breath test for checking alcohol presence among drivers as they refuse to cooperate.

If we focus on the results, the presence of at least one psychoactive substance was found in 2.8% of the drivers. Alcohol, benzodiazepines, amphetamines and THC, were the substances more often detected among participants, whereas cocaine, illicit opiates and Z-drugs were not found at all. The results illustrate generally easy access to amphetamines and drugs based on THC in Czech society and on the other hand the low popularity of cocaine. All mentioned substances had the highest prevalence among young males (age: 18-34), where the presence of at least one substance was found among 5.5% of the participants.

The results imply that drivers' drugs abuse is becoming more serious problem than alcohol abuse. One of the reasons of drug abuse in general traffic could be the limited ability of traffic police to control illegal drugs. The main reason is the price of carrying out controls. The price of alcohol check is max. 7 CZK whereas the price of saliva test DRUGWIPE5 is about 700 CZK. For that reason the probability of

drug control is very low. The police alcohol controls on the roads are carried out frequently, since 2010 the alcohol test has been regularly performed on all drivers controlled by traffic police.

The drivers in Czech Republic are fully aware of this fact and they therefore drive under the influence of drugs much more often than under the influence of alcohol. From the financial point of view the saliva drug tests for detection of only one drug (the price 70 CZK) would be preferential, but the Czech traffic police is not equipped with this screening device. Urine sample controls would be completely different – they would be less costly and the tests on urine are repeated several times – are retake capable. However, the implementation of such controls would require the law to be amended.

3.6 Acknowledgements

The roadside survey was carried out in close cooperation with the management of six regional police departments in Moravia regions – Brno (South), Ostrava (North) and Bohemia regions – Pardubice (East), České Budějovice (South), Plzeň (West) and Ústí nad Labem (North). The chiefs of regional traffic police informed the traffic police district commanders. These were the important officials with who we agreed the day, time and place of saliva samples collection. We are grateful to the traffic police staff, many of whom cooperated very well and helped us to gain saliva samples. The toxicological laboratory of Ghent university analyzed the samples quickly and the department headed by Alain Verstraete cooperated with CDV researchers very well.

4 Country report Denmark

Authors: *Tove Hels and Inger Marie Bernhoft, Technical University of Denmark, Department of Transport.*
Toxicological analyses: *Kirsten Wiese Simonsen and Anni Steentoft, University of Copenhagen.*

4.1 Description of the roadside driver sample

4.1.1 Introduction

The roadside survey in Denmark fully complies with the general guidelines mentioned in Annex 1 of the Summary Report. A pilot data collection was carried out in August 2007, whereas the main survey was carried out in the period 1 March 2008 – 31 May 2009. Police officers were in charge of stopping passenger cars and vans where after personnel employed by DTU were in charge of filling in the driver information and of taking the samples. Driver participation in the road side survey was voluntary.

In each sample collection session, a team consisting of two DRUID employees cooperated with the police team. The police stopped a driver and breath tested him/her for alcohol.

If the driver showed a BAC reading that indicate an illegal alcohol concentration, he was charged with drink driving and taken in custody of the police to a medical doctor for a blood sample. The driver was asked by the police to volunteer by giving a saliva sample to the DRUID personnel before being taken to the medical doctor. If he accepted, the DRUID personnel approached the police car, took a saliva sample, informed about the DRUID project, offered the driver a flyer with information on the project and filled in the driver information. The breath test reading was delivered by the police to the DRUID personnel and recorded in the interview.

If the driver was not illegally affected by alcohol, he was asked by the police to volunteer by giving a saliva sample to the DRUID-personnel. If he accepted, he drove on to the DRUID personnel. They then took a saliva sample, informed about the DRUID project, offered the driver an information flyer and carried out the interview. Sample and interview were provided with the same unique label. The breath test reading was delivered by the police and recorded on the interview.

In both situations the DRUID personnel filled out the refuser's interview if the driver rejected participation, including the result of the breath test reading from the police.

All saliva samples were stored in a cool box and after the session they were brought to the nearest of the cooperating hospitals where they were stored in a deep freezer in the laboratory. At regular intervals (app. each three months), samples from all laboratories were picked op by a courier and transported on ice to the DRUID partner University of Copenhagen for toxicological analysis. All interviews from participants and those who refused to participate were mailed to DTU immediately after the session.

The DRUID personnel were carefully informed of the importance of random sampling. The head of the police departments were then informed by the DRUID personnel to sample drivers randomly. Moreover, they instructed the police officers at the beginning of each session separately. The police officers were asked to stop each driver – or in case of resource problems – to stop every 5^{th} or 10^{th} driver.

4.1.2 Geographic distribution of drivers over the country

The intended number of samples from drivers was to be 3000, but in total, 3030 samples were collected. Drivers were stopped in three regions of the country, as shown in Figure 4.1. The regions were chosen according to the catchment areas of the hospitals that would be willing to take part in the DRUID hospital case study (Isalberti et al, 2011) and thus enabling a collection of the ideal control population for the DRUID case-control study, see Annex 1.

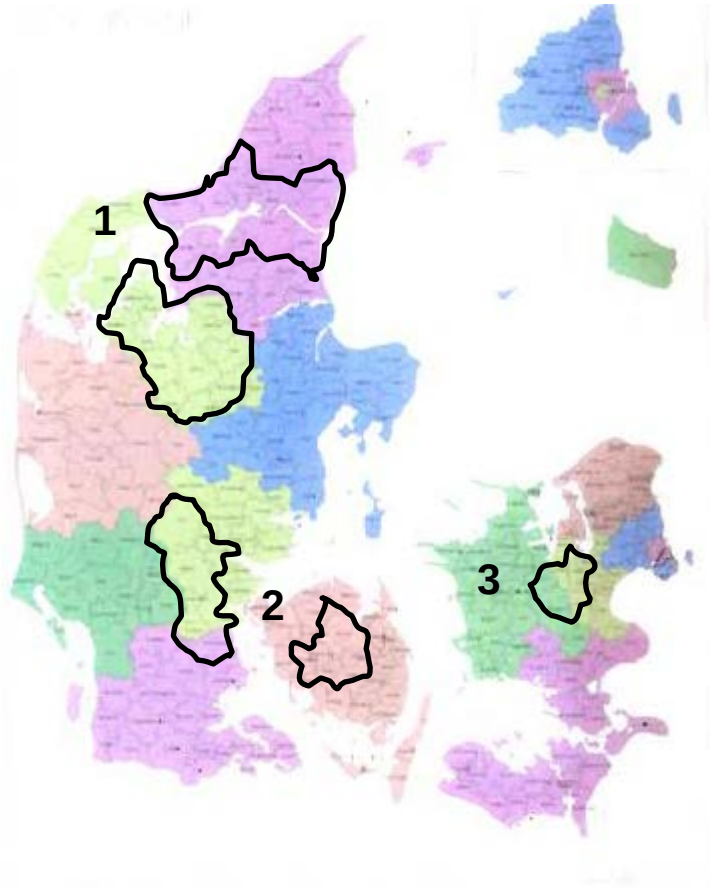


Figure 4.1 Map of Denmark showing the three regions for the road side survey

Samples were taken proportionately to population size in the three regions by September 2007, as reported by Statistics Denmark. The distribution of controls by region compared to the fraction of population is shown in table 4.1.

Table 4.1. Distribution of drivers by region, N=3030

DRUID regions	Road side sample fraction	Population size	Fraction of population
1	0.4899	516,135	0.495
2	0.4062	422,923	0.405
3	0.1039	106,645	0.10

4.1.3 Distribution of drivers by road type

Samples from drivers were taken on rural and urban roads. As a main rule, the definition of rural and urban areas was used as the criterion for the road type being a rural road or an urban road. But if the traffic clearly differed from the classification of the road, e.g. rural traffic on a highway within an urban area, then the type of traffic (rural vs. urban traffic) decided the road type.

The number of collected samples was distributed evenly on urban and rural roads (i.e. 50% of the samples at each road type), although, as shown in table 4.2, this differs to a high degree from the distribution of traffic by road type.

Table 4.2. Distribution of drivers by road type, N=3030

Road type	Road side sample fraction	Fraction of traffic volume
Urban (type 1)	0.503	0.20
Rural (type 2)	0.497	0.80

4.1.4 Distribution of drivers by season

Within each region, the samples were distributed into seasons (spring: March-May – summer: June-August – autumn: September-November – winter: December -February), according to the number of seriously injured drivers in the given season during the period 2004-2006 (slightly more in winter). This was decided in order to meet the assumptions of an ideal control sample for a population based case-control study. However, due to comparison with the other countries in the DRUID road side surveys, table 4.3 shows the distribution within the quarters of the year.

Table 4.3. Distribution of drivers by quarter of the year, N=3030

Quarter of the year	Road side sample fraction	Fraction of traffic volume
January-March	0.351	0.237
April-June	0.238	0.269
July-September	0.228	0.254
October-December	0.183	0.241

4.1.5 Distribution of drivers by day of the week and time of the day

Within each region, the samples were distributed into type of day (weekdays – weekend) and time of day (4-10, 10-16, 16-22, 22-04), following the 8 DRUID time periods, according to the number of seriously injured drivers in the given type of day/time of day during the period 2004-2006. This was decided in order to meet the assumptions of an ideal control sample for a case-control study.

The distribution of the drivers in the survey in the eight DRUID time periods is shown in table 4.4.

Table 4.4. Distribution of drivers by DRUID time period, N=3030

DRUID time period	Road side sample fraction	Fraction of traffic volume
1. Mon – Fri, 04:00 - 09:59	0.165	0.22
2. Mon – Fri, 10:00 - 15:59	0.227	0.31
3. Mon – Fri, 16:00 - 21:59	0.169	0.17
4. Mon – Fri, 22:00 - 03:59	0.067	0.02
5. Sat & Sun, 04:00 - 09:59	0.062	0.03
6. Sat & Sun, 10:00 - 15:59	0.082	0.11
7. Fri – Sun, 16:00 - 21:59	0.144	0.11
8. Fri – Mon, 22:00 - 03:59	0.082	0.02

The differences between the distribution of the road side sample and the traffic volume by time period reflects the fact that there is an overrepresentation of seriously injured drivers during evenings and nights (DRUID time periods 3,4,7 and 8) compared to the traffic in these time periods.

4.1.6 Distribution of drivers by gender and age

Following the random way the cars were stopped in the survey, the distribution of drivers by gender and age was at random. However, one of the drivers in the sample was below the age of 18. Age was unknown for seven drivers and gender was unknown for four of the drivers aged 18 and above.

Table 4.5. Distribution of drivers by age (18-24; 25-34; 35-49 and 50+), N=3022

Age group	Road side sample fraction	Fraction of traffic volume
18-24	0.086	0.057
25-34	0.166	0.167
35-49	0.353	0.396
50+	0.394	0.380

Table 4.6. Distribution of drivers by gender, N=3026

Gender	Road side sample fraction	Fraction of traffic volume
Men	0.66	0.64
Women	0.34	0.36

The distribution by age is shown in table 4.5 and by gender in table 4.6 for the drivers in the sample for whom this information was known. Table 4.5 shows that young drivers are overrepresented in the road side survey sample compared to their share of the traffic, whereas the age group 35-49 is slightly underrepresented. The distribution by gender in the road side survey sample (table 4.6) is very similar to that of the traffic.

Table 4.7. Distribution of drivers by age and gender in the road side sample (18-24; 25-34; 35-49 and 50+)

Age group	Fraction of men, N=1993	Fraction of women, N=1025
18-24	0.089	0.081
25-34	0.166	0.165
35-49	0.333	0.394
50+	0.412	0.360

The percentages of men and women differ slightly for drivers aged 35 and above (table 4.7), with a lower fraction of men aged 35-49 than of women and a higher fraction of men aged 50 and above than of women.

4.2 Roadside data collection and analysis

4.2.1 Ethical approval

No ethical approval was needed in Denmark. After having been informed about the project, the Ethical Committee answered that “the project is not encompassed by the law on Ethical Committees and consideration regarding bio-medical research projects. Therefore, the project should not be announced to the ethical Committee”. Hence, no informed consent was requested.

4.2.2 Body fluid collection

Oral fluid was collected by the Saliva-Sampler (Statsure Diagnostic Systems, Framingham, MA, USA) device (Annex 2, Part 1).

In this device, a variable amount of absorbed oral fluid (300 – 1500 mg) was diluted with a fixed buffer volume (1 mL). On the basis of measurements of 10 devices, we found that the average buffer content amounted to 1080 mg (SD = 22 mg). By weighing the device with absorbed oral fluid, the amount of oral fluid was determined in the individual case (xor) by subtracting the average device weight. By

using the formula zor = ((xor + 1080 mg)/xor) x 200 mg an amount (zor) of oral fluid-buffer mixture was weighed for extraction corresponding to 200 mg of pure oral fluid. Correction was made for the exact weighed amount of OF + buffer. Thus, a quantitative determination of compound found in 200 mg oral fluid was achieved in each case. The minimum accepted xor amount was 600 mg, so that a duplicate determination could be carried out.

4.2.3 Toxicological analysis

To analyze the oral fluid samples for the European DRUID project an ultra performance liquid chromatography tandem mass spectrometry (UPLC-MS/MS) method was developed and validated for detection of 29 medicinal and illicit drugs. The drugs detected were: morphine, 6-acetylmorphine, codeine, amphetamine, methamphetamine, MDA, MDMA, MDEA, methadone, cocaine, benzoylecgonine, zolpidem, tramadol, buprenorphine, diazepam, nordiazepam, nitrazepam, 7-aminonitrazepam, clonazepam, 7-aminoclonazepam, flunitrazepam, 7-aminoflunitrazepam, bromazepam, oxazepam, chlordiazepoxide, alprazolam, lorazepam, zopiclone, and ∆-9-tetrahydrocannabinol.

Solid phase extraction was performed with a Gilson ASPEC XL4 system equipped with Bond Elut Certify SPE sample cartridges. OF samples (200 mg) diluted with 5 ml of ammonium acetate/methanol (v/v, 90:10) buffer were applied to the columns and eluted with 3 ml of acetonitrile containing 0.5% (v/v) aqueous ammonia. Target drugs were quantified using a Waters ACQUITY UPLC system coupled to a Waters Quattro Premier XE triple quadrupole (ESI+, MRM mode). The column used for the chromatography was a 100 mm × 2.1 mm, 1.8 µm Acquity UPLC HSS T3 C18, which was maintained at a column temperature of 35°C and a constant flow rate of 0.4 mL/min. The mobile phase was composed of solvents A (2 mmol/L ammonium acetate, pH 6.2) and B (100% methanol). A chromatographic gradient program was run for 15 min. The injection volume was 10 µL.

Extraction recoveries were 36%–114% for all analytes. Lower limits of quantification (LloQ) was 0.5 µg/kg for all analytes; measuring range: 0.5-100 µg/kg. Total imprecision (CV) of the method was 5.9-19.4%.

4.2.4 Method of BAC quantification

BAC was measured in breath by means of hand hold alcolmeters of the police teams. The following four types from Lion Laboratories were used: SM-3, S-D2, S-300 and S-500. All alcolmetres of the police are calibrated to show a reading of 0.6 g/L ethanol when calibrated by means of breath containing 0.35 mg/L.

The calculated blood ethanol (g/L) is thus equal to the reading of the alcolmeter (mg/L) * 2.1 / (0.6/0.35) = the reading of the alcolmeter (mg/L) * 1.225.

However, due to missing information of the police, no breath test was carried out in 16 sessions comprising 194 samples. An Agilent GC-FID 6890 equipped with a headspacesampler G1888 was used for determination of ethanol in these 194 oral fluid samples.

100 µl sample volume (oral fluid + buffer) was sampled 2 times and analyzed on 2 different Restek columns, length: 30 m and I.D. 0.25 mm. 2-butanol was used as internal standard for the analysis on Restek column-1 and 2-methyl-2-propanol used as internal standard for Restek column-2. The chromatographic was done isotermic at 30 ^{0}C. Carrier gas was nitrogen 5.0. LoQ was 0.05 mg/g. The concentration in saliva was multiplied by 1.22 (Annex 2 of Part 1).

4.2.5 Interviews

Same information was collected for participants and for non-respondents (refusers):
Session number, control site, DRUID time period, road type, month, date and time of sampling, age and gender of driver, domestic/foreign vehicle, passenger car or van (up to 3.500 kg), result of alcohol breath test, saliva sample taken (yes/no).For refusers also the reason for refusal was recorded.

4.2.6 Statistical analysis

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 was calculated by dividing the weighted number of positives for this substance by the weighted total of samples. Because lower and upper confidence limits calculated using traditional approximations may result in limits outside the (0.1) interval, a more elaborate approximation was used. To that end, the Wilson confidence interval formula is used as it is supplied by SAS as one of the available options.

4.3 Non-response

In total, 3176 drivers were asked to take part in the road side survey in Denmark. Of these, 3030 gave saliva samples and 146 persons (4.6%) did not want to take part in the survey. The distribution by gender and age for the participants (respondents) and those who refused to take part (non-respondents) is shown in table 4.8 below.

Table 4.8. Distribution of respondents and non-respondents by gender and age (18-24; 25-34; 35-49 and 50+)

Age group	Respondents, male	Non-respondents male	Respondents female	Non-respondents female
18-24	177 (0.089%)	14 (0.152%)	83 (0.081%)	4 (0.075%)
25-34	331 (0.166%)	15 (0.163%)	169 (0.165%)	9 (0.170%)
35-49	663 (0.333%)	32 (0.348%)	404 (0.394%)	27 (0.509%)
50+	822 (0.412%)	31 (0.337%)	369 (0.360%)	13 (0.245%)

Men aged 18-24 years and women aged 35-49 were slightly overrepresented among non-respondents whereas both men and women aged 50 and above were slightly underrepresented among non-respondents. However, χ^2 - tests showed that the differences are not statistically significant (p=0.16 for men and p=0.31 for female). Therefore, the non-respondents are considered not to influence the results.

4.3.1 Possible confounding effect of non-response

The size of the non response is so small that even if there is a selective sample of non- respondents, the effect would be very small.

4.4 Results

The road sample consisted of 3030 drivers. One driver below the age of 18 was excluded of the database. In addition to this, for 27 of the samples there was not enough saliva to carry out the toxicological analyses. The following results are therefore based on a study sample of 3002 drivers. Table 4.9 shows the number of positive samples by core substance group. The core substance groups are shown in Annex 2, and the cut-offs, above which the samples have been included in the calculations as positive, are also shown in Annex 2.

Table 4.9. Number of positive drivers by *core substance categories,* N=3002

Substance category	Number of samples
Negative	2858
Alcohol	81
Amphetamine	1
Cocaine (incl. BZE)	0
THC	7
Illicit opiates	0
Benzodiazepines	14
Z-drugs	8
Medicinal opioids	26
Alcohol – drugs	5
Multiple drugs	2

As described in chapter 3 of Part 1, method, the samples in each DRUID time period have been adjusted by the traffic in the time period in question (see table 4.4). Table 4.10 and 4.11 show the adjusted general prevalence of driving under the influence of the core substance groups, calculated by the method described in chapter 3.

Table 4.10. Adjusted general distribution of *core substance categories,* N=3002

Substance category	Prevalence (%)	Confidence interval (%)
Negative	95.52	94.72 – 96.20
Alcohol	2.53	2.02 – 3.15
Amphetamine	0.02	0.00 – 0.16
Cocaine (incl. BZE)	-	-
THC	0.20	0.09 – 0.43
Illicit opiates	-	-
Benzodiazepines	0.47	0.28 – 0.79
Z-drugs	0.32	0.17 – 0.59
Medicinal opioids	0.79	0.53 – 1.18
Alcohol – drugs	0.10	0.03 – 0.30
Multiple drugs	0.06	0.02 – 0.24

Table 4.11. Adjusted general distribution of *alcohol* by concentration class, N=3002

Alcohol alone	Prevalence (%)	Confidence interval (%)
Alcohol 0.1 – 0.49 g/L	2.05	1.60 – 2.62
Alcohol 0.5 – 0.79 g/L	0.28	0.14 – 0.54
Alcohol 0.8 – 1.19 g/L	0.18	0.08 – 0.41
Alcohol 1.2+	0.02	0.00 – 0.16

The overall prevalence of alcohol is 2.53% (CI 2.02 – 3.15)**.** But most of the driving with alcohol takes place with a concentration below the legal limit in Denmark of 0.5 g/L. Only a very small share of the alcohol impaired driving is with concentrations above 1.2 g/L 0.02% (CI 0 – 0.16).

The prevalence of driving with an alcohol concentration over the limit amounts to 0.48%. Driving with illicit drugs is 0.02% (CI 0.00 – 0.16) for amphetamines and 0.20% (CI 0.09 – 0.43) for THC. No samples were found over the cut-off for cocaine and illicit opiates alone. However, it seems that driving with medicinal drugs is more common, that is 0.47% (CI 0.28 – 0.79) with benzodiazepines, 0.32% (CI 0.17 – 0.59) with z-drugs and 0.79% (CI 0.53 – 1.18) with medicinal opioids, in total 1.49%.

Combinations of alcohol and/or drugs are rare in this study. The prevalence of 0.10% for combined alcohol and drugs comprise five samples, one positive for cocaine, one for THC, two for benzodiazepines and one for medicinal opioids in combination with alcohol.

The multiple drug combinations were one sample positive for amphetamines and THC, and one positive for cocaine and THC.

It should be mentioned, however, that the decision on the cut-offs do not indicate that a positive concentration of illicit or medicinal drugs does impair driving, it merely reflects driving with a substance concentration at or above the analytical cut-off as decided by the toxicological partners of DRUID.

Table 4.12 and 4.13 show the prevalence of driving under the influence of the core substance groups by age. The total number (N) includes drivers for whom age was known (N=2993).

Table 4.12. Adjusted distribution of *core substance categories* by age, N=2993

Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	96.69 93.41 – 98.36	96.59 94.57 – 97.87	96.05 94.71 – 97.06	94.37 92.93 – 95.53	95.52 94.72 – 96.20
Alcohol	1.48 0.53 – 4.10	1.40 0.67 – 2.89	2.34 1.59 – 3.43	3.35 2.47 – 4.52	2.53 2.02 – 3.15
Amphetamine	0.00 0.00 – 1.71	0.10 0.01 – 0.98	0.00 0.00 – 0.36	0.00 0.00 – 0.32	0.02 0.00 – 0.16
Cocaine	–	–	–	–	–
THC	0.75 0.18 – 3.00	0.61 0.21 – 1.79	0.13 0.03 – 0.58	0.00 0.00 – 0.32	0.20 0.09 – 0.43
Illicit opiates	–	–	–	–	–
Benzodiazepines	0.46 0.08 – 2.53	0.06 0.00 – 0.91	0.53 0.24 – 1.17	0.59 0.29 – 1.20	0.47 0.28 – 0.79
Z-drugs	0.00 0.00 – 1.71	0.00 0.00 – 0.78	0.22 0.07 – 0.73	0.59 0.29 – 1.21	0.32 0.17 – 0.59
Medicinal opioids	0.00 0.00 – 1.71	0.90 0.36 – 2.20	0.56 0.26 – 1.21	1.10 0.65 – 1.86	0.79 0.53 – 1.18
Alcohol – drugs	0.00 0.00 – 1.71	0.34 0.08 – 1.37	0.13 0.03 – 0.59	0.00 0.00 – 0.32	0.10 0.03 – 0.30
Multiple drugs	0.62 0.14 – 2.80	0.00 0.00 – 0.78	0.05 0.00 – 0.44	0.00 0.00 – 0.32	0.06 0.02 – 0.24

Table 4.13. Adjusted distribution of *alcohol alone* by age (N=2993)

Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	1.26 0.41 – 3.77	1.19 0.54 – 2.61	1.84 1.19 – 2.83	2.74 1.96 – 3.82	2.05 1.60 – 2.62
0.5 – 0.79 g/L	–	–	0.21 0.06 – 0.71	0.50 0.23 – 1.08	0.28 0.14 – 0.54
0.8 – 1.19 g/L	–	0.21 0.04 – 1.16	0.29 0.10 – 0.84	0.11 0.02 – 0.51	0.18 0.08 – 0.41
1.2+	0.23 0.02 – 2.13	–	–	–	0.02 0.00 – 0.16

Alcohol is most prevalent among the age groups 34-50 and above 50 years. However, the highest concentrations at and above 1.2 g/L are only found for the young drivers aged 18-24, and for this age group, the prevalence is 0 for the concentrations between the legal limit (0.5 g/L) and 1.2 g/L.

For medicinal drugs, generally the prevalence is higher for drivers above 34 years, except for benzodiazepines that has got a high prevalence for the age group 18-24.

For THC, the prevalence increases by decreasing age. The same picture is found for multiple drug use.

Table 4.14 and 4.15 show the prevalence of driving under the influence of the core substance groups by age and gender. The total number of men for whom the age is known is 1975, and for women 1014.

Table 4.14. Adjusted distribution of *core substance categories* by gender and age

Men (N=1975)					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	95.92 91.37 – 98.12	96.06 93.27 – 97.72	95.55 93.71 – 96.87	93.15 91.25 – 94.66	94.63 93.55 – 95.54
Alcohol	1.31 0.35 – 4.76	2.19 1.06 – 4.50	3.25 2.15 – 4.89	4.50 3.30 – 6.11	3.47 2.75 – 4.37
Amphetamine	0.00 0.00 – 2.56	0.16 0.02 – 1.52	0.00 0.00 – 0.57	0.00 0.00 – 0.45	0.03 0.00 – 0.24
Cocaine	–	–	–	–	–
THC	1.13 0.28 – 4.50	0.96 0.32 – 2.79	0.20 0.04 – 0.93	0.00 0.00 – 0.45	0.30 0.14 – 0.66
Illicit opiates	–	–	–	–	–
Benzodiazepines	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
Z-drugs	0.00 0.00 – 2.56	0.00 0.00 – 1.22	0.15 0.03 – 0.85	0.60 0.26 – 1.38	0.31 0.14 – 0.67
Medicinal opioids	0.00 0.00 – 2.56	0.00 0.00 – 1.22	0.05 0.00 – 0.66	1.00 0.52 – 1.93	0.45 0.23 – 0.85
Alcohol – drugs	0.00 0.00 – 2.56	0.53 0.13 – 2.14	0.10 0.01 – 0.76	0.00 0.00 – 0.45	0.12 0.03 – 0.39
Multiple drugs	0.94 0.21 – 4.19	0.00 0.00 – 1.22	0.07 0.01 – 0.71	0.00 0.00 – 0.45	0.09 0.02 – 0.36
Women (N=1014)					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	98.14 91.90 – 99.59	97.50 93.98 – 98.99	96.87 94.68 – 98.17	97.22 94.98 – 98.48	97.21 96.01 – 98.06
Alcohol	1.86 0.41 – 8.10	0.00 0.00 – 2.15	0.84 0.30 – 2.30	0.66 0.20 – 2.15	0.70 0.34 – 1.43
Amphetamine	0.00 0.00 – 4.97	0.00 0.00 – 2.15	0.00 0.00 – 0.94	0.00 0.00 – 1.05	0.00 0.00 – 0.38
Cocaine	–	–	–	–	–
THC	0.00 0.00 – 4.97	0.00 0.00 – 2.15	0.00 0.00 – 0.94	0.00 0.00 – 1.05	0.00 0.00 – 0.38
Illicit opiates	–	–	–	–	–
Benzodiazepines	0.00 0.00 – 4.97	0.00 0.00 – 2.15	0.37 0.09 – 1.59	0.21 0.03 – 1.43	0.22 0.06 – 0.75
Z-drugs	0.00 0.00 – 4.97	0.00 0.00 – 2.15	0.33 0.07 – 1.53	0.58 0.16 – 2.03	0.34 0.12 – 0.92
Medicinal opioids	0.00 0.00 – 4.97	2.50 1.01 – 6.02	1.41 0.63 – 3.10	1.34 0.56 – 3.13	1.46 0.89 – 2.40
Alcohol – drugs	0.00 0.00 – 4.97	0.00 0.00 – 2.15	0.19 0.03 – 1.28	0.00 0.00 – 1.05	0.07 0.01 – 0.51
Multiple drugs	0.00 0.00 – 4.97	0.00 0.00 – 2.15	0.00 0.00 – 0.94	0.00 0.00 – 1.05	0.00 0.00 – 0.38

Generally, the prevalence is higher for men that for women, except for medicinal opioids, where women aged 25-34 show the highest prevalence of 2.50% (CI 1.01 – 6.02).

The prevalence of alcohol shows the same picture for men as for the total population, whereas for women, only drivers in the age group of 35-49 drive with alcohol over the legal limit, see table 4.15.

Table 4.15. Adjusted distribution of *alcohol alone* by gender and age

Men (N=1975)					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.96 0.21 – 4.23	1.87 0.85 – 4.06	2.60 1.64 – 4.10	3.63 2.56 – 5.11	2.80 2.16 – 3.62
0.5 – 0.79 g/L	–	–	0.34 0.10 – 1.14	0.71 0.33 – 1.54	0.42 0.22 – 0.82
0.8 – 1.19 g/L	–	0.33 0.06 – 1.81	0.32 0.09 – 1.11	0.16 0.03 – 0.73	0.23 0.09 – 0.55
1.2+	0.34 0.04 – 3.19	–	–	–	0.03 0.00 – 0.24
Women (N=1014)					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	1.86 0.41 – 8.10	–	0.58 0.18 – 1.92	0.66 0.20 – 2.15	0.60 0.28 – 1.29
0.5 – 0.79 g/L	–	–	–	–	0.00 0.00 –0.38
0.8 – 1.19 g/L	–	–	0.25 0.04 – 1.40	–	0.10 0.02 – 0.56
1.2+	–	–	–	–	0.00 0.00 – 0.38

Table 4.16 and 4.17 show the prevalence of driving under the influence of the core substance groups by time of the day and week.

Table 4.16. Adjusted distribution of core substance categories by day of the week and time of the day (N=3002)

4 categories: weekdays, weekday nights, week-end days, week-end nights

Period of the week	**Weekdays 04:00 – 21:59**	**Weekday nights 22:00 – 03:59**	**Weekend days 04:00 – 21:59**	**Weekend nights 22:00 – 03:59**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	95.96 95.03 – 96.72	96.55 89.46 – 98.93	94.51 92.65 – 95.92	92.24 83.94 – 96.44	95.52 94.72 – 96.20
Alcohol	2.25 1.69 – 2.97	2.46 0.63 – 9.10	3.31 2.25 – 4.84	2.45 0.64 – 8.89	2.53 2.02 – 3.15
Amphetamine	0.00 0.00 – 0.18	0.00 0.00 – 5.06	0.07 0.01 – 0.63	0.00 0.00 – 4.87	0.02 0.00 – 0.16
Cocaine	–	–	–	–	–
THC	0.24 0.10 – 0.56	0.00 0.00 – 5.06	0.00 0.00 – 0.51	1.22 0.20 – 6.99	0.20 0.09 – 0.43
Illicit opiates	–	–	–	–	–
Benzodiazepines	0.48 0.26 – 0.88	0.00 0.00 – 5.06	0.49 0.19 – 1.30	0.41 0.03 – 5.62	0.47 0.28 – 0.79
Z-drugs	0.29 0.13 – 0.63	0.00 0.0 – 5.06	0.46 0.17 – 1.26	0.00 0.00 – 4.87	0.32 0.17 – 0.59
Medicinal opioids	0.72 0.44 – 1.18	0.49 00.4 – 5.96	0.18 0.37 – 1.74	2.86 0.82 – 9.49	0.79 0.53 – 1.18
Alcohol – drugs	0.06 0.01 – 0.30	0.49 0.04 – 5.96	0.10 0.01 – 0.69	0.82 0.10 – 6.32	0.10 0.03 – 0.30
Multiple drugs	0.00 0.00 – 0.18	0.00 0.00 – 5.06	0.25 0.07 – 0.93	0.00 0.00 – 4.87	0.06 0.02 – 0.24

Table 4.17. Adjusted distribution of alcohol alone by day of the week and time of the day (N=3002)

4 categories: weekdays, weekday nights, week-end days, week-end nights

Period of the week	**Weekdays 04:00 – 21:59**	**Weekday nights 22:00 – 03:59**	**Weekend days 04:00 – 21:59**	**Weekend nights 22:00 – 03:59**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	1.94 1.43 – 2.63	1.97 0.44 – 8.36	2.36 1.49 – 3.70	2.04 0.48 – 8.27	2.05 1.60 – 2.62
0.5 – 0.79 g/L	0.14 0.05 – 0.42	0.49 0.04 – 5.96	0.61 0.25 – 1.47	0.41 0.03 – 5.62	0.28 0.14 – 0.54
0.8 – 1.19 g/L	0.16 0.06 – 0.45	–	0.28 0.08 – 0.98	–	0.18 0.08 – 0.41
1.2+	–	–	0.07 0.01 – 0.63	–	0.02 0.00 – 0.16

The highest prevalence of alcohol is found on weekend days. This part of the week is the only period where alcohol concentrations at and above 1.2 g/L are found.

It is interesting that neither in weekday nights or weekend nights, alcohol concentrations above 0.79 g/L were found.

Overall, the period weekend nights is the most prevalent period of the week, especially the prevalence of THC, medicinal opioids and alcohol combined with drugs are high in this time of the day and week.

4.5 Discussion

4.5.1 Representativeness

The road side samples have been collected in three regions of Denmark in numbers according to the population in the various regions and evenly distributed on urban and rural roads. But as only 20% of the traffic volume in Denmark is driven on urban roads, this means that drivers in urban traffic are overrepresented in the survey.

The samples were collected by season of the year and time of the day and week according to the distribution of seriously injured drivers. This means that there are deviations from the distribution of the traffic volume both for season and time period. However, the deviations in the time periods have been adjusted for by weighting the samples by the traffic fraction in the eight time periods in the calculation of prevalence.

In each planned session, the drivers in the survey were included randomly. The age distribution turned out to match the distribution of the traffic volume, whereas drivers aged 18-24 were underrepresented and drivers aged 35-49 slightly overrepresented. This is not adjusted for in the prevalence calculations.

4.5.2 Effects of non-response

The non-response rate in the survey was 4.6%, with an overrepresentation of men aged 18-24 and women aged 35-49 and an underrepresentation of both men and women aged 50 and above.

However, the size of the non-response is considered not to have any effect on the result.

4.5.3 Highlights

Alcohol is still the main problematic substance in drivers in the traffic in Denmark. Overall, the prevalence of alcohol is 2.53%, the prevalence of illicit drugs is 0.22%, the prevalence of medicinal drugs is 1.58% and the prevalence of combined use is 0.16%.

However, if only alcohol concentrations at and above the limit are considered, then the prevalence of illegal alcohol is 0.48%, with 0.68% for men and 0.10% for women. The nationwide road side survey that was carried out in Denmark 1985-1987 and comprised about 60.000 drivers from traffic outside urban areas, showed an overall prevalence of alcohol concentrations at and above 0.5 g/L of 1.45% for men and 0.24% for women. This indicates that the prevalence has decreased to less than half the prevalence in the mid-eighties (Behrensdorff et al. 1989).

Regarding the prevalence of illicit and medicinal drugs, a road side survey that was carried out in one police district in Denmark in year 2000 and comprised about 1000 drivers showed that about 1.3% of the drivers were positive for one of the following illicit drugs: Amphetamines, THC, cocaine or illicit opiates, whereas about 0.7% were positive for benzodiazepines (Behrensdorff, 2002). The former road side survey was also based on saliva samples, but the substances analysed for and cut-offs differed from the present study, especially for the illicit drugs where they were substantially lower in the former study whereas the cut-offs of benzodiazepines are comparable. Compared to the results of the present road side survey of DRUID in Denmark, it seems that the problem of medicinal drugs has increased. Due to the low cut-offs of the illicit drugs analysed for in the former study, it is not possible to compare the prevalence of illicit drugs.

Nevertheless, the information on drug use in the general population (Ravera and de Gier, 2008) indicates that cocaine use is increasing in Denmark and the use of sedatives and hypnotics has been fairly stable over the years in Denmark.

4.5.4 Conclusion

Highlights of the results for alcohol are:

- Only one fifth of the alcohol positive driving population had alcohol concentrations at or above the legal limit of 0.5 g/L in Denmark, that is about 0.5% of the driving population
- For women, only the age group 35-49 drove with alcohol over the limit. As for men, only the young drivers aged 18-24 drove with an alcohol concentration at 1.2 g/l and above.
- The most prevalent time of the day and week for drink driving was weekend-days between 04:00 and 21:59.

Highlights of the results for illicit drugs are:

- Illicit drugs alone were only found in male drivers.
- Of the illicit drugs analysed for in this study, only amphetamines and THC were found alone among the driving population. No cocaine or illicit opiates were found alone.
- However, cocaine was found in combination with THC and with alcohol.
- Amphetamines alone were only found in the age group 25-34, whereas THC was found among drivers aged 18-24 and 25-34 with a similar prevalence in the two age groups (app 1%) whereas the prevalence in the age group 35-49 was much lower.
- Amphetamines were only found on weekend-days between 04:00 and 21:59 whereas THC was found on week-days between 04:00 and 21:59 and weekend-nights between 22:00 and 03:59.

Highlights of the results for medicinal drugs are:

- Benzodiazepines were more prevalent among men, whereas medicinal opioids were more prevalent among women.
- Benzodiazepines and z-drugs were only found in drivers aged 35 and above
- Whereas medicinal opioids were only prevalent in male drivers aged 50 and above, this drug was found in all female age groups at 25 and above, with the highest prevalence among the age group 25-34.
- All three types of medicinal drugs were found in all days of the week. Benzodiazepines were also found in weekend-nights and medicinal opioids in all nights of the week, with the highest prevalence in weekend-nights.

4.6 Acknowledgements

DTU is very thankful for the cooperation of the traffic police in the three police districts Nordjylland, Sydøstjylland and Midt- and Vestsjælland, who contributed in all 192 sessions with stopping the drivers.

The personnel that were employed by DTU to carry out the saliva tests and interviews cooperated in a splendid way with on the one hand the demands of DTU for being out in all types of weather and during day and night and on the other hand with the police in ensuring the anonymity of the participating drivers.

Furthermore, the correct storing of the samples was very much facilitated, thanks to the participating hospital laboratories, where the saliva samples could be delivered at any time of the day and night.

Finally, we are grateful that Foreningen Østifterne co-funded the study with regard to the expenses for saliva samplers, travel to the control sites and courier service.

4.7 References

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Annex 4.1 Description of method for toxicological analyses of illicit compounds in oral fluid

Toxicological analyses of body fluids were performed by the DRUID partner UKHB: Section of Forensic Chemistry, Department of Forensic Medicine, Faculty of Health Sciences, University of Copenhagen.

Introduction
An ultra performance liquid chromatography tandem mass spectrometry (UPLC-MS/MS) method for detection of 29 drugs and illicit compounds in oral fluid (OF) was developed and validated. The drugs detected were the 21 core DRUID substances (see Annex 2 of part 1) and eight extra substances chosen for Denmark: tramadol, buprenorphine, nitrazepam, 7-aminonitrazepam, 7-aminoclonazepam, 7-aminoflunitrazepam, bromazepam and chlordiazepoxide.

Extraction procedure
A Gilson SPE robot (ASPEC XL4) (Gilson Inc., Columbus, Ohio, USA) equipped with Bond Elut Certify SPE (130 mg, 3 mL; Varian, Inc., Palo Alto, Ca, USA) columns was used for SPE. The columns were conditioned with 2 mL of methanol and 2 mL of purified water. OF samples (200 mg) spiked with 20 µL of internal standard solution were diluted with 5 mL of ammonium acetate (0.1 mol/L, pH 4.1)/methanol (v/v, 90:10) buffer and introduced into the SPE columns at a constant flow rate of 1 mL/min. The columns were washed with 2 mL of purified water followed by 2 mL of purified water/methanol (v/v, 95:5). The analytes were eluted with 3 mL of freshly prepared acetonitrile with 0.5% aqueous ammonium. The elution was carried out in two steps by eluting twice with 1.5 ml into one collection tube without intermediate drying of the columns. Eluates were evaporated at room temperature under a stream of nitrogen and redissolved in 200 µL of mobile phase (2 mmol/L ammonium acetate buffer, pH 6.2/methanol [v/v, 20:80]).

Internal standards
Deuterated internal standards were used for most of the compounds. Two major internal standard (IS) stock solutions (A and B) 1 mg/L were prepared monthly in methanol. A contained the following deuterated internal standards: OXZ, AMF, COD, COC, BZL, 6-AM, MDN, MAMF, DZM, MDA, ZOL, MDMA, TRM, MDEA and B: 7-AMF, 7-AMN, APZ, CLZ, 7-AMC, FLZ, BUP, NDZM, NTZ. For practical reasons, the deuterated internal standards of MOF (1 mg/mL), THC (10 mg/L) and ZOP (1 mg/L) were stored separately. Dilutions were freshly made in methanol to yield final concentrations of either 10 µg/L or 2.0 µg/L when spiked (20 µL) to 200 mg of OF, except ZOP, which was diluted with acetonitrile.

Chromatographic conditions
The chromatography was performed using an ACQUITY UPLC system (Waters Corporation, Milford, MA, USA). The column used was a 100 mm × 2.1 mm, 1.8 µm Acquity UPLC HSS T3 C_{18}, which was maintained at a column temperature of 35°C and a constant flow rate of 0.4 mL/min. The mobile phase was composed of solvents A (2 mmol/L ammonium acetate, pH 6.2) and B (100% methanol). The gradient program is shown in Table A4.1. The injection volume was 10 µL.

Table A4.1. UPLC gradient program (20 min total run time).

Time (min)	%A	%B
0.0	98	2
4.0	75	25
5.8	62	38
7.3	55	45
8.6	45	55
9.6	35	65
11.0	32	68
11.1	15	85
16.1	15	85
16.2	98	2

MS Spec conditions

Mass spectrometry was performed using a Quattro Premier XE triple quadrupole (Waters). Positive electrospray ionization mode (ESI^+) was used for all mass spectrometric analyses. The ionization parameters were: a capillary voltage of 1 kV and source and desolvation temperatures of 120 and 400°C, respectively. Cone and desolvation gas (N_2) flows were set at 1,100 and 100 L/h, respectively. Argon was used as the collision gas at a pressure of 4.21×10^{-3} mBar, corresponding to a flow of 0.18 mL/min. Retentiontime, collision energy etc. is shown in Table A4.2.

Table A4.2. Abbreviations, retention time, MRM transitions, and operating parameters for the analyzed drugs (MRM transitions are listed for each analyte with quantifier transition on top and qualifier transition below)

Compound	Abbreviation	Retention time (min)	MRM transitions (m/z)	Cone voltage (V)	Collision energy (eV)	IS
Det. window 1						
Morphine	MOF	4.63	286.16>201.09 286.16>165	43	24 38	morphine-d6
Amphetamine	AMF	5.92	135.9>118.81 135.9>90.70	16	9 16	Amphetamine-d5
MDA	MDA	5.95	180.2>104.8 180.2>162.93	15	21 11	MDA-d5
Benzoylecgonine	BZL	5.92	290.1>167.95 290.1>104.75	30	20 29	benzoylecgonine-d8
Det. window 2						
MDMA	MDMA	6.65	194.07>162.91 194.07>104.76	22	13 23	MDMA-d5
Methamphetamine	MAMF	6.74	149.97>90.74 149.97>118.84	20	18 10	methamphetamine-d5
MDEA	MDEA	6.88	208.11>162.93 208.11>104.78	22	13 24	MDEA-d5
6-Acetylmorphine	6-AM	6.53	328.09>164.93 328.09>211.03	43	38 25	6-Acetylmorphine-d6
Codeine	COD	6.50	300.13>164.95 300.13>215.1	46	40 25	codeine-d6
7-amino-nitrazepam	7-AMN	6.59	252.11>120.85 252.11>93.74	40	26 40	7-aminonitrazepam-d5
7-amino-clonazepam	7-AMC	6.66	286.04>120.8 286.04>222.04	40	30 25	7-aminoclonazepam-d4
Det. window 3						
7-amino-flunitrazepam	7-AMF	7.36	284.08>134.92 284.08>227.11	45	27 22	7-aminoflunitrazepam-d3
Tramadol	TRM	7.66	264.19>57.78 264.19>246.15	20	16 11	tramadol-d3
Det. window 4						
Cocaine	COC	8.51	304.11>182 304.11>81.75	32	20 34	cocaine-d3
Bromazepam	BRZ	9.44	315.90>181.94 315.90>209	37	32 26	diazepam-d5
Zopiclone	ZOP	9.38	388.90>244.96 388.90>216.96	18	18 36	zopiclone-d8
Det. window 5						
Clonazepam	CLZ	9.78	316.04>270.02 316.04>214	45	24 35	clonazepam-d4
Flunitrazepam	FLZ	9.89	314.06>268.13 314.06>239.15	40	25 32	Flunitrazepam-d3
Nitrazepam	NTZ	9.75	282.12>236.1 282.12>180.02	45	25 35	nitrazepam-d5

Det. window 6						
Alprazolam	APZ	10.33	309.06>205.02 309.06>281.03	47	41 25	alprazolam-d5
Oxazepam	OXZ	10.28	286.99>240.98 286.99>268.98	32	22 15	oxazepam-d5
Chlordiazepoxide	CLDZ	10.79	300.03>227.03 300.03>283.06	25	25 13	diazepam-d5
Lorazepam	LRZ	10.28	321>275.03 321>303	30	20 15	diazepam-d5
Zolpidem	ZOL	10.45	308.13>235.12 308.13>91.74	45	35 49	zolpidem-d6
Det. window 7						
Nordiazepam	NDZM	10.95	271.05>139.87 271.05>164.89	45	30 29	nordiazepam-d5
Diazepam	DZM	11.27	285.1>153.9 285.1>193.05	43	26 31	diazepam-d5
Methadone	MDN	11.39	310.21>265.15 310.21>104.81	25	15 27	methadone-d3
Det. window 8						
THC	THC	14.44	315.12>193.05 315.12>259.15	35	20 23	THC-d3
Buprenorphine	BUP	14.54	468.1>54.85 468.1>100.8	55	50 48	buprenorphine-d4

Calibrators
Calibrators were made by spiking 200 mg of OF mixed with 200 µL Statsure buffer solution with standard solutions containing all 29 compounds, yielding a final calibration range of: 0.5, 1.0, 10.0, and 100 µg/kg. (Badawi et al. 2009).

Quality control samples
Quality control samples (QCs) containing all compounds were prepared in pooled OF and stored at −80°C. The pooled OF was spiked with methanol or acetonitrile stock solutions of the compounds independently of the preparation of calibrator solutions.

Procedure for dilution of samples with high concentration
The highest standard (100 µg/kg) defined the upper limit of quantification for all of the analytes (UloQ). All of the samples with concentrations higher than the UloQ were diluted with purified water (1+9).

Validation parameters
Results of the validation parameters is shown in table 3. A weighted (1/x) linear regression fit was achieved for all compounds in the range 0.5 to 100 µg/kg (Table A4.3). The highest standard (100 µg/kg) defined the upper limit of quantification for all of the analytes (UloQ).

Table A4.3. Validation results for oral fluid mixed with Statsure buffer

Analyte	Correlation Coefficient R^2	LloQ (µg /kg)	Theoretical concentration (µg/kg)	Measured concentration (*n* = 8) (µg /kg)	Trueness Bias (%)	Precision CV (%)	Extraction Recovery (%) (SD) (*n*=6)	ME (%)
THC	0.9960	0.5	0.5 1 10 100	0.6 1.0 9.5 95.0	11.7 -1.8 -5.0 -5.3	12.2 4.5 6.2 4.5	33 (19)	2.1
Buprenorphine	0.9940	0.5	0.5 1 10 100	0.5 0.9 9.7 104.8	-7.7 -8.3 -3.3 4.8	7.2 2.5 3.7 3.7	91 (13)	-9.2
7-AMN	0.9953	0.5	0.5 1 10 100	0.5 1.0 10.3 100	-3.5 0.1 2.8 0.6	6.8 5.2 5.9 3.0	84 (7.1)	19
7-AMC	0.9944	0.5	0.5 1 10 100	0.5 1.0 9.1 103	4.5 -5 -8.9 2.8	10.9 11.9 5.9 2.4	88 (10)	36
7-AMF	0.9916	0.5	0.5 1 10 100	0.5 1.0 9.6 99	4.5 -4.9 -4.1 -0.7	5.0 8.9 6.7 4.1	87 (13)	36.1
Bromazepam	0.9920	0.5	0.5 1 10 100	0.5 0.9 9.3 96	3.0 -5.1 -6.8 -3.9	10.5 3.4 2.7 6.6	92 (23)	6.1
Zopiclone	0.9985	0.5	0.5 1 10 100	0.5 1.1 10.1 107	-7.2 10.3 1.3 7.3	15.0 7.2 7.0 2.3	106 (7.5)	8.0

Analyte	Correlation Coefficient R^2	LloQ (µg /kg)	Theoretical concentration (µg/kg)	Measured concentration (*n* = 8) (µg /kg)	Trueness Bias (%)	Precision CV (%)	Extraction Recovery (%) (SD) (*n*=6)	ME (%)
Nitrazepam	0.9986	0.5	0.5 1 10 100	0.5 0.9 98 103	6.5 -6.0 -2.4 2.5	5.4 12.5 6.5 6.1	88 (21)	-0.3
Oxazepam	0.9912	0.5	0.5 1 10 100	0.5 1.0 10.6 102	-5.2 0.6 5.6 1.5	9.9 3.1 1.8 2.7	87 (29)	-3.5
Clonazepam	0.9894	0.5	0.5 1 10 100	0.5 1.1 11.0 102	-1.5 6.1 7.1 2.4	9.5 8.7 6.0 3.4	99 (25)	16.8
Lorazepam	0.9874	0.5	0.5 1 10 100	0.5 1.0 11.2 91.4	-2.3 2.5 12.2 -8.6	10.4 5.8 5.1 1.4	85 (20)	-2.1
Chlordiazepoxide	0.9953	0.5	0.5 1 10 100	0.5 0.9 8.8 102	-0.2 -6.2 -12.3 2.3	8.1 6.8 7.7 3.1	91 (4.5)	-22.7
Alprazolam	0.9991	0.5	0.5 1 10 100	0.5 1.0 10.0 98	-1.0 -0.7 0.3 -1.9	8.5 3.4 3.9 3.9	91 (9.7)	9.5
Flunitrazepam	0.9947	0.5	0.5 1 10 100	0.5 1.1 11.8 96	-9.5 7.6 17.5 -2.4	11.7 6.4 6.1 5.4	100 (26)	19.6
Nordiazepam	0.9969	0.5	0.5 1 10 100	0.5 1.1 11.0 108	2.5 6.9 7.6 7.6	5.8 4.0 4.1 5.5	96 (22)	15.3
Diazepam	0.9963	0.5	0.5 1 10 100	0.5 1.0 10.0 103	2.0 -1,1 3.0 3.0	5.6 4.1 4.1 2.0	95 (9.8)	13.2
Zolpidem	0.9936	0.5	0.5 1 10 100	0.5 1.0 9.8 109	3.8 -1.5 -1.6 9.3	4.4 5.9 3.2 1.5	91 (4.6)	5.4
Methadone	0.9983	0.5	0.5 1 10 100	0.5 1.0 10.1 99.7	-8.7 -4.1 1.0 -0.3	6.0 1.5 3.9 1.3	88 (11)	-24.6
Tramadol	0.9981	0.5	0.5 1 10 100	0.5 1.1 10.2 108	5.2 4.7 1.7 8.0	8.2 3.4 3.4 4.1	93 (6.5)	-3.4
6-Acetylmorphine	0.9956	0.5	0.5 1 10 100	0.5 1.1 10.5 101	7.8 8.3 5.0 0.7	11.1 7.0 4.5 3.6	87 (16)	-1.7

Analyte	Correlation Coefficient R^2	LloQ (µg /kg)	Theoretical concentration (µg/kg)	Measured concentration (*n* = 8) (µg /kg)	Trueness Bias (%)	Precision CV (%)	Extraction Recovery (%) (SD) (*n*=6)	ME (%)
Benzoylecgonine	0.9939	0.5	0.5 1 10 100	0.5 1.0 9.6 97	1.0 2.6 -3.7 -3.0	11.9 5.1 5.4 2.2	47 (9.1)	12.6
Codeine	0.9958	0.5	0.5 1 10 100	0.5 1.0 10.0 100	2.0 -4.2 2.1 0.4	10.3 6.4 5.9 6.4	113 (13)	4.6
Cocaine	0.9917	0.5	0.5 1 10 100	0.5 1.1 9.8 104	1.8 5.5 -1.9 3.5	8.0 6.6 2.9 1.6	103 (20)	14.9
Morphine	0.9886	0.5	0.5 1 10 100	0.6 1.0 10.5 104	18.8 3.4 4.8 4.4	16.7 10.6 4.0 3.8	48 (21)	19.8
Amphetamine	0.9921	0.5	0.5 1 10 100	0.5 1.0 10.0 103	0 -1.2 2.8 2.7	16.4 5.1 3.4 2.6	69 (10)	-39
Methamphetamine	0.9992	0.5	0.5 1 10 100	0.5 0.9 10.1 98	7.5 -6.0 0.5 -2.2	13.2 4.5 5.8 4.1	76 (18)	8.7
MDA	0.9984	0.5	0.5 1 10 100	0.5 1.0 10.2 105	-0.7 1.0 1.8 4.9	7.1 4.2 3.6 2.9	78 (12)	-14.7
MDMA	0.9944	0.5	0.5 1 10 100	0.5 1.0 10.4 104	-3.2 0.4 3.6 4.2	9.6 5.1 4.1 3.1	72 (9.5)	-9.8
MDEA	0.9960	0.5	0.5 1 10 100	0.5 1.0 10.0 101	-0.7 -1.7 -0.3 1.3	6.0 3.1 1.7 4.5	92 (9.9)	-1.5

Ion suppression from OF was also tested by infusion experiments for all analytes using OF from five different drug-free volunteers. The experiments showed that there were no major ion suppression or enhancement in OF from any of the five volunteers. Ion suppression in synthetic OF and the buffer solution of the Saliva-Sampler was also tested (Badawi et al. 2009). No critical ion suppression was observed in the buffer solution, but the synthetic OF caused ion suppression of up to almost 100% for nine of the analytes (CLDZ, DZM, NDZM, FLZ, OXZ, APZ, ZOL, and MDON).

5 Country Report Spain

Authors: *Juan Carlos González-Luque[1], Mónica Colás[1], Javier Álvarez[2], Inmaculada Fierro[2], Trinidad Gómez-Talegón[2], Manuel López-Rivadulla[3]*

[1] Dirección General de Tráfico - National Traffic Directorate (DGT). Madrid.
[2] University of Valladolid.
[3] University of Santiago de Compostela.

5.1 Description of the roadside driver sample

5.1.1 Aims of the study

The main aim is to asses the prevalence of driving after psychoactive substance use (alcohol, illegal drug and medicines) in vehicle drivers on Spanish roads. Established secondary aims are as follows: to characterize the socio-demographic profile of drivers who consume substances and to explore the associations between alcohol consumption and that of other illicit drugs.

5.1.2 Study design

The study that was conducted was a descriptive cross-sectional study in which each subject gave samples on only one occasion. The target population were motor vehicle drivers, except bikes and vehicles of over 3,500 Kg, users of Spain's public roads, both rural and urban. The sample population was made up of recruited drivers from 4 regions and 32 different areas in the 128 control points used in the study, in accordance with the criteria set out below. Two biological saliva samples and one of breath were obtained from the participating drivers. The sample unit is the driver.
For each driver the following information was gathered:

a. Questionnaire with information on the place and time of the session control and on the selected drivers (see the questionnaire section below).
b. Information on risk exposure: Information was gathered concerning traffic volume per hour at each of the 128 points selected for the study by means of automatic traffic counters for along a week every two months during twelve month period, according to the habitual methodology [1].

In total 3,407 cases were recruited by using stratified sampling of municipalities based on population size. This number of cases, supposes aggregate results for the population as a whole, with a confidence level of 95% and an accuracy of within 1%. *Of these cases, the database sent to the DRUID database comprised 3,226 cases, after excluding heavy goods vehicle drivers and motorcyclists, as well as rejected cases, according DRUID WP2 agreements.*
The police controls were mandatory, while the study controls were voluntary subject to informed consent; however, the participation of drivers was requested while the same drivers were waiting for the results of the mandatory police tests, so refusals were much reduced. Two associated-researchers collaborated in the field with the police officers who were carrying out the mandatory controls in each of the 731 sessions of the study. When the first sample (screening test) was positive, a second one was mandatory, taken using the StatSure device (see below) in order to confirm the results. In this case, drivers' signatures for informed consent were not necessary as the information would belong to the police; the Ethics Committee only had to approve data anonymity control. When the screening test was negative, a second sample was requested on a voluntary basis and carried out after obtaining the corresponding informed consent (see Ethical issues).

Case (driver) selection in each session was done at random in accordance with the inclusion and exclusion criteria established in the study. Although participation was obligatory, the police officers stopped drivers on a random basis, depending on the saturation of the control point: when finishing with a selected case, the officers stopped the next vehicle that reached the control point. The field researchers ensured the random nature of recruitment.

5.1.3 Geographical distribution of sessions and cases

The country was divided into four big geographical regions (see Figure 5.1). Eight municipalities were chosen at random from each region using a systematic random sampling in each size-population strata of municipalities: <20,000; 20,000-100,000; 100,001-500,000 and >500,000 inhabitants.

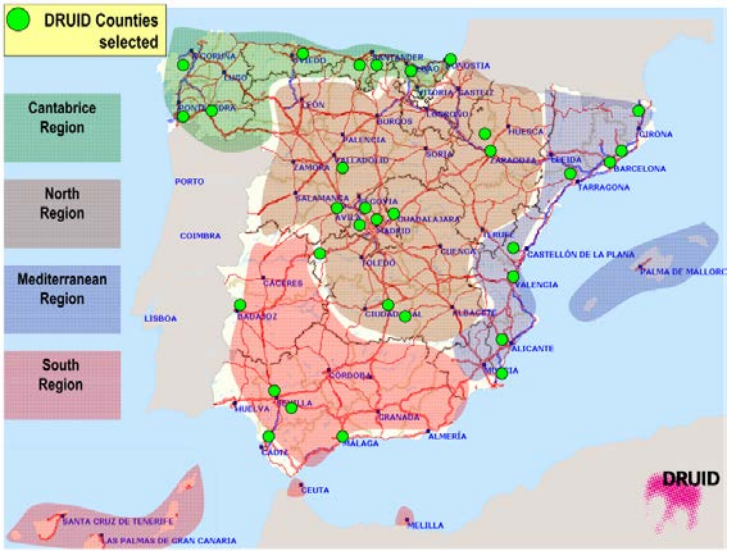


Figure 5.1. Geographical distribution of sessions and cases

From each of above strata, one municipality was assigned randomly to urban areas and the other to rural roads. Then, four control points were selected for each municipality in order to improve the study's representativeness and to reduce the controls predictability. Each of the four points represented a different level of volume of traffic. In total, therefore, **128 control points** were set up for the study on a national level. A certain number of sessions were assigned for each control point to be carried out during the period of the study. This assignation was done in accordance with the population size of each municipality, following the four divisions defined: populations of <20,000 inhabitants: 8 sessions; from 20,000 to 100,000, 12 sessions; from 100,001 to 500,000, 32 sessions; and >500,000, 40 sessions. Finally, 731 control sessions were carried out over the 11 month field study period, with an average of 4.5 samples obtained per session (Standard Deviation ±1.2).

The distribution of cases according to geographic location is shown in the Table 5.1

Table 5.1. Cases distribution according regions

Region	Type Road	#Sessions	#Cases data	DRUID
Cantabrice (3401)	Rural	91	379	
	Urban	93	433	
	Total	**183**	**812**	
Mediterranean (3402)	Rural	91	419	
	Urban	91	465	
	Total	**182**	**884**	
North (3403)	Rural	88	356	
	Urban	92	348	
	Total	**180**	**704**	
South (3404)	Rural	93	417	
	Urban	92	409	
	Total	**185**	**826**	
Road Type Total	**Rural**	363	1571	
	Urban	368	1655	
TOTAL		**731**	**3226**	

(Chi-square between groups: 3.9687; p>0.05)

5.1.4 Distribution over day and time

Four different time periods were established for the control sessions in order to take samples:

Period a (weekday: Monday through Friday): 7am to 23:59pm.
Period b (weekday: Tuesday through Friday): 24:00 to 6:59am.
Period c (weekend: Saturday/Sunday/Bank Holiday): 7am to 23:59pm.
Period d (weekend: Saturday/Sunday/Monday/Bank Holiday): 24:00 to 6:59am.

Additionally, the year was divided into two periods:

a. "Holiday" or "Bank Holiday" periods: when a large part of the population enjoys prolonged holiday periods, of either a national, regional or local nature, as this affects drivers' behaviour.
b. "Working" periods: the rest of the year.

In order to compare these data with those of other countries participating in WP2, these periods have been further broken down into the 8 periods set out in the Summary Report (Table 5.2). The total sample was distributed over the 4 periods used initially in the Spanish study, each one corresponding to an average of 851 cases (SD 30), in order to guarantee sufficient accuracy in all 4 periods. The differences in the sample distribution of the 8 periods initially designed for DRUID are because of a later categorization carried out to adapt to the DRUID periods.

Table 5.2. Distribution of cases according to time period

Periods according to Spanish study			Periods according to DRUID		
Time Period	Cases	%	Time Period	Cases	%
A	884	25.95 %	1	189	5.9%
B	831	24.39 %	2	339	10.5%
C	821	24.10 %	3	311	9.6%
D	871	25.55 %	4	615	19.1%
			5	299	9.3%
			6	251	7.8%
			7	362	11.2%
			8	860	26.7%
Totals	**3407**	**100%**		**3226**	**100%**

5.1.5 Distribution by sex and age

Distribution by sex and age is shown in Table 5.3. The differences observed, in the distribution by gender and age of the sample, are due to the real gender and age differences in exposition, according to the estimated information available in our country. This is why the sample was not standardized according to the census of drivers, as this would not fit the reality of the situation in Spain.

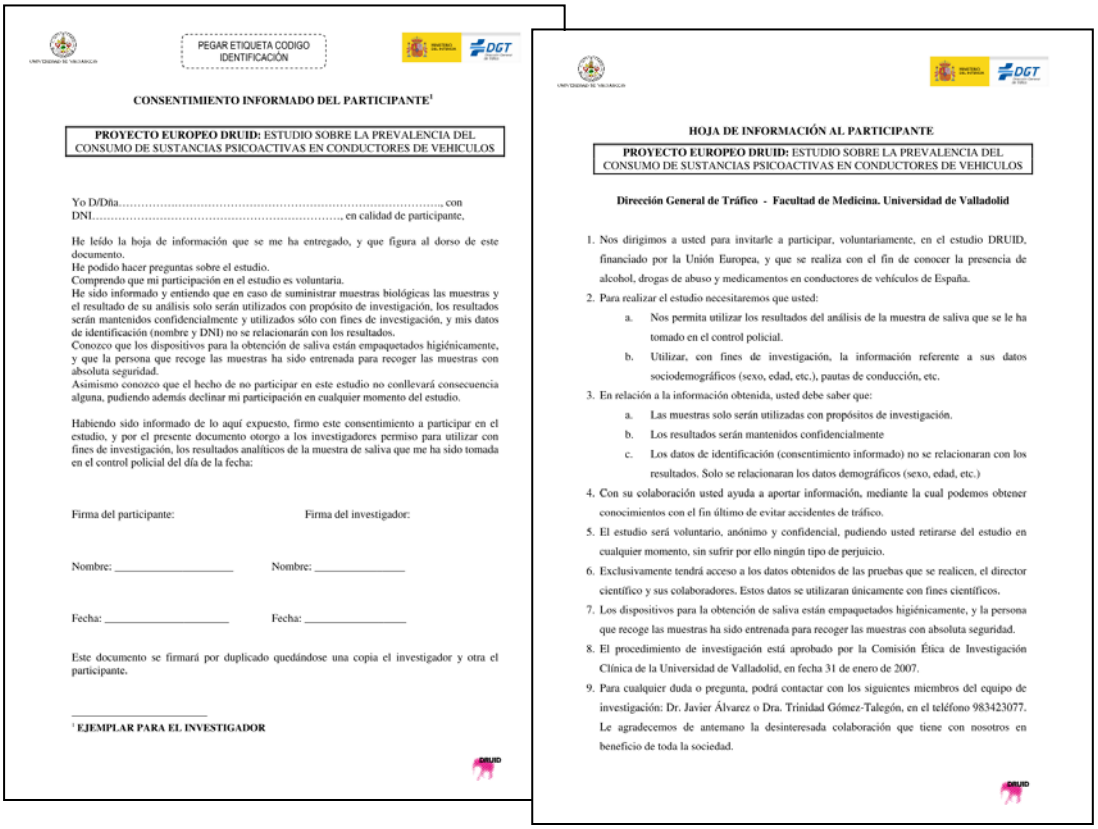
Table 5.3. Distribution of cases by sex and age

Age	Male	Female	TOTAL
18 to 24	**600**	**136**	**736**
Row %	81.5	18.5	100.0
Col %	22.9	22.4	22.8
25 to 34	**883**	**237**	**1120**
Row %	78.8	21.2	100.0
Col %	33.7	39.0	34.7
35 to 49	**778**	**169**	**947**
Row %	82.2	17.8	100.0
Col %	29.7	27.8	29.4
50+	**324**	**53**	**377**
Row %	85.9	14.1	100.0
Col %	12.4	8.7	11.7
NA	**33**	**13**	**46**
Row %	71.7	28.3	100.0
Col %	1.3	2.1	1.4
TOTAL	**2618**	**608**	**3226**
Row %	81.2	18.8	100.0
Col %	100.0	100.0	100.0

5.2 Roadside data collection and analysis

5.2.1 Ethical approval

The study was approved by the Research Ethics Committee of the University of Valladolid on January 31st 2007. The said Committee approved the design and aims of the study, as well as the documents comprising "Information for participants" and "Informed Consent" (see models below, figure 5.2), to be filled out by the drivers who volunteered to give a second biological oral fluid sample exclusively for research purposes (cases of negative screening test). In the case of those drivers whose first saliva test was positive, the Committee only had to approve the data anonymity control as the information belonged to the police. These documents guaranteed the sole research nature of the analysed samples, their confidential use and the prohibition of their use for sanctioning purposes.



PEGAR ETIQUETA CODIGO IDENTIFICACIÓN

CONSENTIMIENTO INFORMADO DEL PARTICIPANTE[1]

PROYECTO EUROPEO DRUID: ESTUDIO SOBRE LA PREVALENCIA DEL CONSUMO DE SUSTANCIAS PSICOACTIVAS EN CONDUCTORES DE VEHICULOS

Yo D/Dña....., con DNI....., en calidad de participante,

He leído la hoja de información que se me ha entregado, y que figura al dorso de este documento.
He podido hacer preguntas sobre el estudio.
Comprendo que mi participación en el estudio es voluntaria.
He sido informado y entiendo que en caso de suministrar muestras biológicas las muestras y el resultado de su análisis solo serán utilizados con propósito de investigación, los resultados serán mantenidos confidencialmente y utilizados sólo con fines de investigación, y mis datos de identificación (nombre y DNI) no se relacionarán con los resultados.
Conozco que los dispositivos para la obtención de saliva están empaquetados higiénicamente, y que la persona que recoge las muestras ha sido entrenada para recoger las muestras con absoluta seguridad.
Asimismo conozco que el hecho de no participar en este estudio no conllevará consecuencia alguna, pudiendo además declinar mi participación en cualquier momento del estudio.

Habiendo sido informado de lo aquí expuesto, firmo este consentimiento a participar en el estudio, y por el presente documento otorgo a los investigadores permiso para utilizar con fines de investigación, los resultados analíticos de la muestra de saliva que me ha sido tomada en el control policial del día de la fecha:

Firma del participante: Firma del investigador:

Nombre: _____ Nombre: _____

Fecha: _____ Fecha: _____

Este documento se firmará por duplicado quedándose una copia el investigador y otra el participante.

[1] **EJEMPLAR PARA EL INVESTIGADOR**

HOJA DE INFORMACIÓN AL PARTICIPANTE

PROYECTO EUROPEO DRUID: ESTUDIO SOBRE LA PREVALENCIA DEL CONSUMO DE SUSTANCIAS PSICOACTIVAS EN CONDUCTORES DE VEHICULOS

Dirección General de Tráfico - Facultad de Medicina. Universidad de Valladolid

1. Nos dirigimos a usted para invitarle a participar, voluntariamente, en el estudio DRUID, financiado por la Unión Europea, y que se realiza con el fin de conocer la presencia de alcohol, drogas de abuso y medicamentos en conductores de vehículos de España.
2. Para realizar el estudio necesitaremos que usted:
   a. Nos permita utilizar los resultados del análisis de la muestra de saliva que se le ha tomado en el control policial.
   b. Utilizar, con fines de investigación, la información referente a sus datos sociodemográficos (sexo, edad, etc.), pautas de conducción, etc.
3. En relación a la información obtenida, usted debe saber que:
   a. Las muestras solo serán utilizadas con propósitos de investigación.
   b. Los resultados serán mantenidos confidencialmente
   c. Los datos de identificación (consentimiento informado) no se relacionaran con los resultados. Solo se relacionaran los datos demográficos (sexo, edad, etc.)
4. Con su colaboración usted ayuda a aportar información, mediante la cual podemos obtener conocimientos con el fin último de evitar accidentes de tráfico.
5. El estudio será voluntario, anónimo y confidencial, pudiendo usted retirarse del estudio en cualquier momento, sin sufrir por ello ningún tipo de perjuicio.
6. Exclusivamente tendrá acceso a los datos obtenidos de las pruebas que se realicen, el director científico y sus colaboradores. Estos datos se utilizaran únicamente con fines científicos.
7. Los dispositivos para la obtención de saliva están empaquetados higiénicamente, y la persona que recoge las muestras ha sido entrenada para recoger las muestras con absoluta seguridad.
8. El procedimiento de investigación está aprobado por la Comisión Ética de Investigación Clínica de la Universidad de Valladolid, en fecha 31 de enero de 2007.
9. Para cualquier duda o pregunta, podrá contactar con los siguientes miembros del equipo de investigación: Dr. Javier Álvarez o Dra. Trinidad Gómez-Talegón, en el teléfono 983423077. Le agradecemos de antemano la desinteresada colaboración que tiene con nosotros en beneficio de toda la sociedad.

Figure 5.2. Models of "Information for participants" and "Informed Consent" used.

5.2.2 Body fluid collection

Oral fluid was used as a biological sample to determine substances. The procedure used was that described in the Summary Report, Annex 2, for obtaining oral fluid by means of the StatSure© Saliva SamplerTM from StatSure Diagnostic Systems, Inc. (Medford, NY, USA). The test tubes were sent to the participating laboratory refrigerated at all times (between 2 and 8 degrees centigrade, or frozen if transport was to take over 24 hours), using devices with frozen gel (thermovials Kern©) and isothermal boxes. Transport to the laboratory was by urgent courier from the municipality where the session was carried out.

5.2.3 Toxicological analysis of body fluids

Toxicological Laboratory of Santiago de Compostela University, Medicine Department, was in charge of sample analysis.

Saliva collection devices

The saliva collection devices consisted of a collector and a transport tube. The pad was able to collect approximately 1mL of oral fluid (blue indicator), and the transport tube contained 1mL of a buffer, so the sample was diluted 1:2.

Extraction

The calibrating standards were prepared by spiking blank oral fluid samples with the appropriate working solution volumes. After conditioning, the previously prepared samples were applied onto the SPE cartridges. Clean-up was accomplished and the cartridges were dried before elution. The elution solution was evaporated and the dry extract was re-dissolved. The sample was transferred into auto-sampler vials, and 20nL were injected into the LC-MS/MS.

Chromatography

Chromatographic separation was performed with an Atlantis dC18, reversed-phase column at 35ºC. The mobile phase, delivered at a flow rate of 0.3mL/min, was a gradient mode.

MS-MS

Best results were obtained with a capillary voltage of 3kV, source block temperature of 125ºC, desolvation gas (nitrogen) heated to 400ºC and delivered at 800L/h, and cone gas at 50L/h. Collision cell pressure was 3x10-6 Bar of argon. Data were recorded in the multiple reaction monitoring (MRM) mode. The MS method was divided into four MRM functions to obtain at least 15 acquisition points per peak.

Validation

The analytical validation was performed according to the recommendations of international organizations, FDA [2] and ICH [3], and of Shah et al. [4] and Peters and Maurer [5].

Calibration

The calibration range, with at least 7 levels, was 1-200ng/L for 6-AM, alprazolam, oxazepam, flunitrazepam, diazepam and THC, 5-200ng/L for morphine, codeine, amphetamine, methamphetamine, MDA, MDMA, MDEA, Benzoylecgonine, cocaine, zolpidem, difenhidramine and amitryptiline, and 1-100ng/L for zopiclone, clonazepam, nordiazepam and lorazepam. The within-day precision and accuracy, as well as the between-day precision and accuracy were satisfactory for all tested samples. But since required DRUID limits were satisfied, no further experiments were performed to determine the exact LOD and LOQ for each compound.

Confirmation

An LC-MS/MS method [9] was developed and fully validated for the simultaneous determination of 23 compounds (illegal drugs, medicines and their metabolites) taking into account the criteria for confirmation of compound identity. The calibration range (1-200ng/L) made it a useful confirmation method of DRUID cases.

5.2.4 Method of BAC quantification

After obtaining the oral fluid samples, the drivers were subjected to an alcohol breath test using the device Dräger© Alcotest 6810. When a positive result was obtained, in accordance with the national legal requirements, a second breath test was performed using the Dräger© Alcotest 7110 MKIII, for the purpose of evidence. In this case, the results of the first samples obtained were collected for research. Even though Spanish law envisages the possibility of contrasting blood sample results upon request by the person concerned or by criminal authorities, in this study there were no cases where this happened. The ethyl meters used measure the ethanol in milligrams per litre of air in breath. Result has been transformed into grams of ethanol per litre of blood following criteria of the WP2, by means of blood ethanol (gm/L) = ethanol in breath (mg/L) x 2.10.

5.2.5 Statistical Analysis

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

5.2.6 Interviews (types of collected data: sex, age, self-reported drug use, signs of impairment, etc.).

During each session, and for each one of the cases selected or rejected for the study, the following information was obtained, recorded in a questionnaire filled in by the researchers participating in the fieldwork:

- Socio-demographic data of the driver (sex, age, etc.).
- Day, hour and place where the control was carried out.
- Vehicle type.
- Number of vehicles occupants.
- Driving pattern.
- Signs of apparent intoxication in the driver.
- Recent history (the previous 2 weeks) of illicit drug or medicines consumption,
- Results of the alcohol breath test, in situ drugs in saliva test and drugs in saliva laboratory test.

5.3 Non-response

As already mentioned, drivers were obliged to submit to both the alcohol breath test and the drugs test, in accordance with the current penal and administrative laws. In compliance with the study's inclusion and exclusion criteria, rejection was considered as the following:

- Refusing to consent to the giving of the second oral fluid sample for research purposes, when the screening test was negative.
- When a sample could not be obtained due to an evident lack of saliva.
- Refusing to take the mandatory control tests.

Out of a total of 3,407 drivers in the total sample, 63 (1.8%) were rejection cases. The causes were as follows:

- Refusal to give a sample: 59 cases (93.7% of the rejections).
- Insufficient saliva: 3 cases (4.8% of the rejections).
- Refusal to submit to the legally established tests: 1 case (1.6% of the rejections).

The reasons for not giving a sample were as follows: 57.6% did not wish to participate, 27.1% gave no reason, 5.1% declared they did not have time and 10.2% gave other reasons (did not believe in such studies, did not trust the results, etc.). The distribution of case rejection was 53 men and 10 women; the average age was 38 (Standard Deviation: 14).

Due to the characteristics of the design and of the sampling, it is not reasonable to suppose that the cases of rejection should be related to any of the factors connected with the frequency of drug consumption. In fact, the socio-demographic and geographic characteristics of the rejection cases are quite in line with those of the sample population. No significant differences in sex and just ones in age appeared among rejected and recruited cases (Table 5.4).

Table 5.4. Age and Gender differences between rejected and not rejected cases (total sample population).

	Rejected	No rejected
Age*		
Obs	62	3299
Unknown age	1	45
Mean (years)	38.1935	34.3074
Std Dev	13.9011	11.6858
Gender**		
Male	53 (85.5%)	2723 (81.4%)
Female	10 (14.5%)	621 (18.6%)

* P value = 0,0428 between rejected and not rejected cases

** No statistically significant differences between rejected and not rejected cases

5.4 Results

Table 5.5. Adjusted general distribution of *core substance categories* (N=3174)

Substance category	Prevalence (%)	Confidence interval (%)
Negative	85.15	83.87 - 86.34
Amphetamines	0.11	0.04 - 0.30
Cocaine	1.49	1.12 - 1.97
THC	5.99	5.22 - 6.87
Illicit opiates	0.05	0.01 - 0.20
Benzodiazepines	1.40	1.05 - 1.87
Z-drugs	-	-
Medicinal opiates and opioids	0.19	0.09 - 0.41
Alcohol	3.92	3.30 - 4.66
Alcohol+drugs	1.14	0.83 - 1.58
Drugs-drugs combi	0.57	0.36 - 0.89

Table 5.6. Adjusted distribution of *core substance categories* by gender and age (N=3174)

Men

Age group Substance category	18-24 Prevalence (%) C.I. (%)	25-34 Prevalence (%) C.I. (%)	35-49 Prevalence (%) C.I. (%)	50+ Prevalence (%) C.I. (%)	In total Prevalence (%) C.I. (%)
Negative	78.25 74.28 - 81.75	78.64 75.68 - 81.33	87.30 84.85 - 89.41	89.90 86.67 - 92.42	83.30 81.81 - 84.70
Alcohol	2.41 1.36 - 4.24	3.55 2.48 - 5.06	4.31 3.12 - 5.92	6.81 4.78 - 9.62	4.14 3.43 - 4.98
Amphetamine	0.29 0.06 - 1.33	0.02 0.00 - 0.52	0.00 0.00 - 0.46	0.00 0.00 - 0.90	0.06 0.01 - 0.26
Cocaine	1.49 0.72 - 3.05	2.58 1.69 - 3.92	1.84 1.12 - 3.01	0.05 0.00 - 0.99	1.69 1.26 - 2.27
THC	14.93 11.99 - 18.45	11.27 9.27 - 13.64	2.39 1.54 - 3.67	0.05 0.00 - 0.99	7.22 6.28 - 8.29
Illicit opiates	0.00 0.00 - 0.82	0.00 0.00 - 0.47	0.15 0.03 - 0.74	0.00 0.00 - 0.90	0.05 0.01 - 0.24
Benzodiazepines	0.04 0.00 - 0.90	1.08 0.56 - 2.06	1.46 0.83 - 2.53	2.97 1.73 - 5.05	1.31 0.94 - 1.83
Z-drugs	-	-	-	-	-
Medicinal opioids	0.00 0.00 - 0.82	0.20 0.05 - 0.83	0.52 0.21 - 1.29	0.00 0.00 - 0.90	0.23 0.11 - 0.51
Alcohol – drugs	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
Multiple drugs	0.37 0.09 - 1.46	0.79 0.37 - 1.67	1.00 0.51 - 1.94	0.04 0.00 - 0.98	0.65 0.40 - 1.04

Women

Age group Substance category	18-24 Prevalence (%) C.I. (%)	25-34 Prevalence (%) C.I. (%)	35-49 Prevalence (%) C.I. (%)	50+ Prevalence (%) C.I. (%)	In total Prevalence (%) C.I. (%)
Negative	93.34 87.34 - 96.61	92.80 88.65 - 95.51	93.06 88.63 - 95.85	88.30 78.30 - 94.04	92.71 90.39 - 94.50
Alcohol	1.39 0.34 - 5.50	3.82 1.99 - 7.20	3.71 1.84 - 7.36	2.19 0.49 - 9.21	3.05 1.96 - 4.72
Amphetamine	0.86 0.15 - 4.67	0.29 0.04 - 2.22	0.09 0.00 - 2.09	0.00 0.00 - 5.56	0.30 0.08 - 1.13
Cocaine	0.16 0.01 - 3.45	0.23 0.02 - 2.11	1.70 0.61 - 4.63	0.00 0.00 - 5.56	0.65 0.26 - 1.65
THC	2.58 0.89 - 7.27	1.31 0.44 - 3.81	0.00 0.00 - 1.91	0.00 0.00 - 5.56	0.96 0.44 - 2.08
Illicit opiates	0.16 0.01 - 3.45	0.00 0.00 - 1.68	0.00 0.00 - 1.91	0.00 0.00 - 5.56	0.03 0.00 - 0.67
Benzodiazepines	0.00 0.00 - 3.16	1.24 0.41 - 3.71	1.06 0.30 - 3.70	9.51 4.49 - 19.03	1.78 1.00 - 3.16
Z-drugs	-	-	-	-	-
Medicinal opioids	0.00 0.00 - 3.16	0.00 0.00 - 1.68	0.00 0.00 - 1.91	0.00 0.00 - 5.56	0.00 0.00 - 0.61
Alcohol – drugs	0.28 0.02 - 3.68	0.31 0.04 - 2.25	0.37 0.05 - 2.58	0.00 0.00 - 5.56	0.28 0.07 - 1.10
Multiple drugs	1.24 0.28 - 5.27	0.00 0.00 - 1.68	0.00 0.00 - 1.91	0.00 0.00 - 5.56	0.23 0.05 - 1.03

	In total				
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	81.29	81.72	88.42	89.69	85.15
	77.93 - 84.25	79.25 - 83.96	86.31 - 90.24	86.68 - 92.08	83.87 - 86.34
Alcohol	2.20	3.61	4.19	6.19	3.92
	1.29 - 3.74	2.63 - 4.93	3.12 - 5.60	4.38 - 8.69	3.30 - 4.66
Amphetamine	0.40	0.08	0.02	0.00	0.11
	0.12 - 1.33	0.01 - 0.52	0.00 - 0.41	0.00 - 0.78	0.04 - 0.30
Cocaine	1.22	2.07	1.81	0.04	1.49
	0.60 - 2.48	1.36 - 3.13	1.16 - 2.83	0.00 - 0.86	1.12 - 1.97
THC	12.44	9.10	1.93	0.04	5.99
	10.01 - 15.37	7.50 - 11.01	1.25 - 2.97	0.00 - 0.86	5.22 - 6.87
Illicit opiates	0.03	0.00	0.12	0.00	0.05
	0.00 - 0.71	0.00 - 0.37	0.03 - 0.59	0.00 - 0.78	0.01 - 0.20
Benzodiazepines	0.04	1.11	1.38	3.84	1.40
	0.00 - 0.72	0.63 - 1.96	0.82 - 2.30	2.47 - 5.94	1.05 - 1.87
Z-drugs	-	-	-	-	-
Medicinal opioids	0.00	0.16	0.42	0.00	0.19
	0.00 - 0.65	0.04 - 0.65	0.17 - 1.05	0.00 - 0.78	0.09 - 0.41
Alcohol – drugs	1.82	1.52	0.90	0.15	1.14
	1.01 - 3.27	0.93 - 2.47	0.48 - 1.70	0.02 - 1.06	0.83 - 1.58
Multiple drugs	0.54	0.62	0.80	0.04	0.57
	0.19 - 1.54	0.29 - 1.31	0.41 - 1.57	0.00 - 0.85	0.36 - 0.89

Table 5.7. Adjusted distribution of *core substance categories* by day of the week and time of the day (N=3174)

Period of the week	**Weekdays 04:00 – 21:59**	**Weeknights 22:00 – 03:59**	**Weekenddays 04:00 – 21:59**	**Weekendnights 22:00 – 03:59**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	87.83	76.15	81.51	75.06	85.15
	86.36 - 89.16	68.04 - 82.73	78.66 - 84.06	67.79 - 81.14	83.87 - 86.34
Alcohol	2.40	8.22	5.78	11.24	3.92
	1.83 - 3.15	4.59 - 14.32	4.36 - 7.63	7.22 - 17.10	3.30 - 4.66
Amphetamine	0.00	0.00	0.38	0.23	0.11
	0.00 - 0.18	0.00 - 2.94	0.13 - 1.11	0.02 - 2.80	0.04 - 0.30
Cocaine	1.25	1.97	1.91	2.11	1.49
	0.86 - 1.82	0.61 - 6.15	1.16 - 3.12	0.76 - 5.72	1.12 - 1.97
THC	5.97	7.24	5.96	5.39	5.99
	5.04 - 7.07	3.88 - 13.11	4.52 - 7.83	2.81 - 10.07	5.22 - 6.87
Illicit opiates	0.00	0.00	0.16	0.12	0.05
	0.00 - 0.18	0.00 - 2.94	0.03 - 0.76	0.01 - 2.59	0.01 - 0.20
Benzodiazepines	1.36	0.49	1.77	0.82	1.40
	0.95 - 1.96	0.06 - 3.83	1.06 - 2.95	0.17 - 3.79	1.05 - 1.87
Z-drugs	-	-	-	-	-
Medicinal opioids	0.14	0.16	0.32	0.23	0.19
	0.05 - 0.41	0.01 - 3.25	0.10 - 1.01	0.02 - 2.80	0.09 - 0.41
Alcohol – drugs	0.66	4.11	1.37	4.10	1.14
	0.39 - 1.10	1.80 - 9.12	0.76 - 2.44	1.95 - 8.42	0.83 - 1.58
Multiple drugs	0.38	1.64	0.84	0.70	0.57
	0.20 - 0.75	0.46 - 5.67	0.40 - 1.76	0.13 - 3.60	0.36 - 0.89

Table 5.8. Adjusted general distribution of alcohol by concentration class (N=125)

Alcohol alone	Prevalence (%)	Confidence interval (%)
Alcohol 0.1 – 0.49 g/L	2.31	1.84 - 2.89
Alcohol 0.5 – 0.79 g/L	0.90	0.62 - 1.29
Alcohol 0.8 – 1.19 g/L	0.23	0.11 - 0.47
Alcohol 1.2+	0.49	0.30 - 0.80
In total	3.92	3.30 - 4.66

Table 5.9. Adjusted distribution of *alcohol alone* by gender and age (N= 125)

			Men		
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**
	C.I. (%)	**C.I. (%)**	**C.I. (%)**	**C.I. (%)**	**C.I. (%)**
0.1 – 0.49 g/L	1.25	2.37	2.15	3.87	2.31
	0.57 - 2.72	1.53 - 3.67	1.36 - 3.38	2.41 - 6.17	1.80 - 2.97
0.5 – 0.79 g/L	0.30	0.72	0.89	2.01	0.96
	0.07 - 1.35	0.33 - 1.58	0.44 - 1.80	1.04 - 3.84	0.65 - 1.41
0.8 – 1.19 g/L	0.18	0.27	0.09	0.84	0.29
	0.03 - 1.15	0.08 - 0.93	0.01 - 0.63	0.31 - 2.25	0.14 - 0.58
1.2+	0.68	0.19	1.18	0.09	0.58
	0.24 - 1.93	0.05 - 0.81	0.63 - 2.17	0.01 - 1.07	0.35 - 0.96
In total	2.41	3.55	4.31	6.81	4.14
	1.36 - 4.24	2.48 - 5.06	3.12 - 5.92	4.78 - 9.62	3.43 - 4.98
			Women		
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**
	C.I. (%)	**C.I. (%)**	**C.I. (%)**	**C.I. (%)**	**C.I. (%)**
0.1 – 0.49 g/L	0.95	2.25	3.45	1.87	2.28
	0.18 - 4.81	0.97 - 5.13	1.67 - 7.02	0.38 - 8.72	1.37 - 3.78
0.5 – 0.79 g/L	0.16	1.40	0.26	0.32	0.65
	0.01 - 3.45	0.49 - 3.95	0.03 - 2.39	0.02 - 6.15	0.26 - 1.66
0.8 – 1.19 g/L	-	-	-	-	0.00
					0.00 - 0.61
1.2+	0.28	0.18	-	-	0.12
	0.02 - 3.68	0.02 - 2.01			0.02 - 0.83
In total	1.39	3.82	3.71	2.19	3.05
	0.34 - 5.50	1.99 - 7.20	1.84 - 7.36	0.49 - 9.21	1.96 - 4.72
			In total		
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**	**Prevalence (%)**
	C.I. (%)	**C.I. (%)**	**C.I. (%)**	**C.I. (%)**	**C.I. (%)**
0.1 – 0.49 g/L	1.19	2.34	2.40	3.61	2.31
	0.57 - 2.44	1.58 - 3.46	1.62 - 3.53	2.28 - 5.66	1.84 - 2.89
0.5 – 0.79 g/L	0.27	0.87	0.77	1.79	0.90
	0.06 - 1.13	0.46 - 1.64	0.39 - 1.52	0.93 - 3.39	0.62 - 1.29
0.8 – 1.19 g/L	0.14	0.21	0.07	0.72	0.23
	0.02 - 0.92	0.06 - 0.73	0.01 - 0.51	0.27 - 1.95	0.11 - 0.47
1.2+	0.60	0.19	0.95	0.08	0.49
	0.22 - 1.63	0.05 - 0.70	0.51 - 1.76	0.01 - 0.92	0.30 - 0.80
In total	2.20	3.61	4.19	6.19	3.92
	1.29 - 3.74	2.63 - 4.93	3.12 - 5.60	4.38 - 8.69	3.30 - 4.66

Table 5.10. Adjusted distribution of *alcohol alone* by day of the week and time of the day (N=125)

Period of the week Alcohol alone	Weekdays 04:00 – 21:59 Prevalence (%) C.I. (%)	Weeknights 22:00 – 03:59 Prevalence (%) C.I. (%)	Weekenddays 04:00 – 21:59 Prevalence (%) C.I. (%)	Weekendnights 22:00 – 03:59 Prevalence (%) C.I. (%)	In total Prevalence (%) C.I. (%)
0.1 – 0.49 g/L	1.03 0.68 - 1.56	5.76 2.86 - 11.25	4.19 3.00 - 5.81	7.03 3.98 - 12.10	2.31 1.84 - 2.89
0.5 – 0.79 g/L	0.86 0.54 - 1.35	1.64 0.46 - 5.67	0.58 0.24 - 1.39	2.46 0.95 - 6.22	0.90 0.62 - 1.29
0.8 – 1.19 g/L	0.11 0.03 - 0.37	0.33 0.03 - 3.55	0.41 0.15 - 1.15	0.82 0.17 - 3.79	0.23 0.11 - 0.47
1.2+	0.41 0.21 - 0.79	0.49 0.06 - 3.83	0.61 0.26 - 1.44	0.94 0.22 - 3.98	0.49 0.30 - 0.80
In total	2.40 1.83 - 3.15	8.22 4.59 - 14.32	5.78 4.36 - 7.63	11.24 7.22 - 17.10	3.92 3.30 - 4.66

In Spain, 14.85% of drivers who participated in the present study showed concentrations in saliva equal to or over the specified DRUID cut off in at least one of the substances analyzed. The larger part of positive cases were due to cannabis, alcohol or cocaine, either alone or combined with other substances (Table 5).

The frequency of positive cases for some substance was greater among male drivers than among female drivers (6.70% and 7.29% respectively; X2=35.401, p<0.0001). Differences in rates of positive cases according to the age range for some substance were observed among the males but not among the females (X23=44.001; p<0.0001 and X23=2.195; p>0.05 respectively). Worthy of note is the high frequency of positive cases found among male drivers aged fewer than 35 (over 20%).

There were significant differences for the sample as a whole (Table 5.6) with respect to age in positive cases for alcohol (X23=11.403; p<0.05), cocaine (X23=10.670; p<0.05), THC (X23=122.176; p<0.0001), benzodiazepines (X23=30.841; p<0.0001) and the combination alcohol-drugs (X23=8.409; p<0.05). These age differences in males were not observed for cocaine.

The percentage of males who were positive for alcohol (Table 5.6) increased with age (taken with age ranges). The highest percentage was for males aged over 50 (6.8%). The opposite occurred for THC, with the highest percentage of positive cases among males aged 18-24 (14.9%). Among females, differences were only observed with respect to age in positive cases for benzodiazepines (X23=23.200; p<0.0001). 9.5% of female drivers aged over 50 were positive for benzodiazepines.

As for the positive cases for the various substances grouped by hours on workdays or weekends (Table 5.7), differences were observed for alcohol (X23=49.155; p<0.0001), amphetamines (X23=9.001; p<0.05) and the combination of alcohol + drugs (X23=27.765; p<0.0001). The percentage of positive cases for alcohol and alcohol + drugs combined is greater during the night than during the day, and is even larger at the weekends for both night and day. Positive cases for amphetamines were only found at weekends, during both night and day.

3.92% of drivers (table 5.8) showed positive levels of alcohol (BAC≥0.1 g/L) and were negative for the rest of the substances analyzed. 1.61% of drivers showed levels of alcohol equal to or over 0.5 g/L, the maximum BAC allowed in Spain for non-professionals drivers. There were no significant differences between males and females with regard to the levels of alcohol found (X23=3.670; p>0.05). There were differences among males for levels of alcohol found according to age (X29=19.387; p<0.05).

The positive cases in the different alcohol levels were distributed fairly homogeneously among the four time periods established (X29=10.788; p>0.05; Table 5.10).

5.5 Discussion

The study was designed so as to make it representative at a national level, but not separately to each of the 17 regions that make up Spain. The sample used in the study, the number and random nature of the tested drivers, the distribution of the tests according to time and days, which was done to determine which substances as well as the number of substances analyzed, all make this study the most ambitious study ever carried out so far in Spain concerning drugs and driving.

The characteristics of the sample, the low frequency of refusals (63 drivers), as well as the homogeneous nature of the socio-demographic and geographic characteristics of the drivers who participated in the study and those who refused to take part, indicate that there was no selection bias in the study.

The study shows that the consumption of psychoactive substances while driving is a frequent fact in Spain, affecting at least 15% of Spanish drivers. Apart from ethanol, 11% of drivers do so after having consumed substances that can affect their fitness to drive. Cannabis (THC) and cocaine were the two substances most frequently found. These data are consistent with those published by the Spanish Observatory on Drugs for the Spanish population as a whole, based on self-referred information, where the prevalence of consumption for cannabis and cocaine in the “previous month” was 7.2% and 1.9%, respectively [6]. In the general population of Castile and Leon (Spain), 9.7% of those who consumed cannabis during the “previous year” referred to driving under the effects of cannabis in the year prior to carrying out the survey [7]. Of the drivers who died due to a traffic accident in Spain in 2009, 30% showed levels of alcohol equal to or over 0.3 g/L. Of these, 22.4% were positive as well for illegal and/or medicinal drugs [8]. 12.35% of fatally injured drivers were positive for illegal drugs. The most frequent illegal drug found was cocaine, in 8.5% of fatally drivers, followed by THC (3.9%) and opiates and derivatives (3.5%).

Unlike for alcohol, in Spain there has up to now been no preventive policy for illegal drugs and driving. The tests carried out for this study were the first of a compulsory nature at state level. Thus, the disassociation between the use of drugs and driving in Spain will be predictably scarce.
As happens with consumption in the general population, the distribution by age shows differences between cannabis and cocaine, the latter being the most widely distributed substance with respect to both age and socio-cultural origin.
In addition, the experience of the prevalence study developed within the DRUID project has served to lay the foundations of the development of regulations and the real application of roadside drug controls, to raise awareness levels of the public to the problem and to support preventive interventions developed in this matter in Spain.

5.6 Acknowledgements

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Barcelona, Ejea de los Caballeros, Collado Villalba, Torrejón de Ardoz, Madrid, Manzanares, Écija, Jerez de la Frontera y Málaga. The laboratory staff of FORTOX Group from University of Santiago de Compostela, have contributed significantly to this survey. In particular we would like to thank researchers Marta Concheiro, Oscar Quintela, Ana de Castro and Angelines Cruz, who contributed substantially to the development of experimental work, and laboratory technicians Daniel Gonzalez and Salvador Blanco.
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6 Country report Finland

Authors: *Charlotta Engblom[1], Kaarina Langel[1], Tom Blencowe[1], Pekka Räty[2], Anna Pehrsson[1], Heikki Ihalainen[3], Lasse Lehtonen[4], Pirjo Lillsunde[1]*

[1]National Institute for Health and Welfare (THL), [2]Finnish Road Administration, [3]Ministry of Internal Affairs, [4]Hospital District of Helsinki and Uusimaa

6.1 Description of the roadside driver sample

6.1.1 Introduction

The aim of the survey was to form an estimate of alcohol and drug use among drivers in the Finnish general traffic flow. The material was collected in the counties of Uusimaa and Itä-Uusimaa, in southern Finland, and Pohjois-Savo in central Finland.
The survey was conducted in accordance with the guidelines for the roadside survey, as set out by the task leader for this survey.
The samples were collected in co-operation between the police and researchers. The police could not stop the traffic flow solely for the purposes of the research, so they stopped the drivers in the traffic flow and performed a breath test for the use of alcohol. During any given session the police stopped either all cars passing through the checkpoint, or if the volume of traffic was too great, only a manageable portion of traffic. For the DRUID survey the police picked vehicles from the traffic flow at random, without any presupposition about the drivers. They stopped mainly cars and vans but, in addition, some buses, trucks, motorcycles, mopeds and bicycles were also included to the survey. The demographics presented in the report are based on the whole survey population but only cars and vans are included in the international database. It was mandatory for the drivers to obey the directions of the police and to participate in the alcohol breath testing, whereas taking part in the survey was voluntary. The volume of passing traffic was recorded by video camera and the police counted all the breath alcohol tested drivers whether or not they participated in the survey, during each collection session.
The inclusion criteria for the respondents were that they should be driver of a motor vehicle passing through any of the collection sessions, or bicyclist in the proximity. As written consent was required for participation in the survey the drivers had to be over 18 years old. During a session, whenever a researcher was free, the police officers performing the alcohol screening would ask the driver if they had about 10 minutes to take part in a survey conducted by THL. The police officers were instructed not to mention drugs or drug testing when asking the drivers to participate. If the driver declined and was not suspected for any offence they were then free to leave. If the driver initially consented, they were directed to a researcher at the roadside. The researcher informed the driver about the survey and asked them to give a written informed consent to participate. The voluntary participation to the survey and written informed consent were compulsory requirements of the ethical advisory board. If the driver consented, an oral fluid sample was taken and a short interview was conducted. If the driver was suspected of DUI, they were taken into police custody. Depending on the location or type of DUI, the driver was taken as soon as possible to an evidential breath analyser or for blood sampling. If police procedure allowed for it, the suspected driver was asked to participate in the survey. Therefore not all alcohol positive cases were given the opportunity to participate.

6.1.2 Geographic distribution of drivers over the country

About 28% of the Finnish population lives in the research region of Uusimaa (the counties of Uusimaa and Itä-Uusimaa) in southern Finland, which includes the Helsinki area. In addition to the Uusimaa region a second research area, Pohjois-Savo in central Finland, was chosen. The geographical locations of the two research regions are shown in figure 6.1. Pohjois-Savo was chosen based on an earlier survey (1) of the distribution of DUI cases in Finland. The comparative distributions of survey samples and national traffic volumes are shown in table 6.1.

Table 6.1. Distribution of survey samples and traffic over regions

Regions	Survey sample fraction	Fraction of total traffic*
Uusimaa	0.684	0.856
Pohjois-Savo	0.316	0.144

* Based on population, data is weighted according to national traffic data for these regions

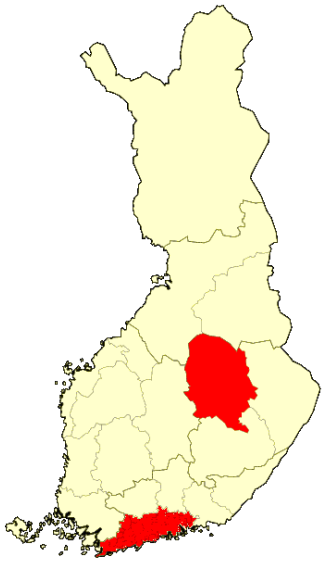


Figure 6.1. Finnish sample collection regions (highlighted red)

6.1.3 Distribution of drivers by road type

Initially five areas were targeted in both of the research areas (Uusimaa and Pohjois-Savo) and within each area six research sites were selected: two each on main roads, regional/connecting roads and municipal roads. There were two main requirements each site needed to fulfil. Assignment of research sites was restricted by the availability of a suitable roadside area to safely carry out the sampling and interviews. It was also necessary to establish a minimum expected volume of traffic to allow efficient sampling, this was set as 18 vehicles per session. Altogether there were 90 research sites. For the survey design the aforementioned three road categories was used. All the research sites were later reclassified as rural or urban roads. The road type distribution is shown in table 6.2.

Table 6.2. Road type distribution

Road type	Survey sample fraction	Fraction of total traffic*
Urban (type 1)	0.519	0.620
Rural (type 2)	0.481	0.380

* Traffic performance (vehicle-km)

6.1.4 Distribution of drivers by season

The collection sessions were held between 29th September 2007 and 7th June 2009. For the research area Uusimaa, a sample collection week was assigned for each season of the year, and for Pohjois-Savo, two sample collection weeks were assigned, one for autumn and one for summer. Additional collection days were also held throughout the year. The final distribution of the total sample collection was calculated for the quarters of the year (table 6.3).

Table 6.3. Quarterly distribution

Quarter of the year	Survey sample fraction	Fraction of total traffic*
Jan, Feb, Mar	0.121	0.223
Apr, May, Jun	0.460	0.261
Jul, Aug, Sep	0.170	0.275
Oct, Nov, Dec	0.249	0.241

* Traffic performance (vehicle-km)

6.1.5 Distribution of drivers by day of the week and time of the day

Based on the division of the week into time codes as proposed in the Deliverable 2.1.2 guidelines for roadside surveys, each research day was divided in three working periods, from 07:00 to 10:00, from 12:00 to 16:00 and from 20:00 to 01:00. The sessions were scheduled to last between 45-60 min. at each research site. The timing of the sessions was such that data were collected for all periods of the day for each road type. The exact time of the session was recorded. Small deviations from the timing plan, for practical reasons, resulted in samples also being collected outside the three aforementioned periods. The distribution of drivers, according to DRUID time codes, is shown in table 6.4.

Table 6.4. Distribution of drivers over DRUID road survey time periods

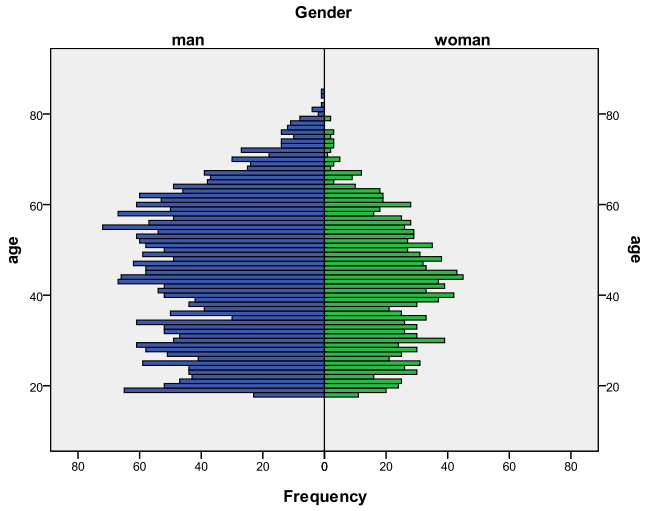
DRUID time period	Survey sample fraction	Fraction of total traffic*
Weekday 04:00-10:00	0.152	0.186
Weekday 10:00-16:00	0.316	0.289
Weekday 16:00-22:00	0.166	0.197
Weekday 22:00-04:00	0.079	0.033
Weekend 04:00-10:00	0.064	0.057
Weekend 10:00-16:00	0.130	0.088
Weekend 16:00-22:00	0.058	0.131
Weekend 22:00-04:00	0.036	0.021

* Traffic performance (vehicle-km)

Cooperation with the police necessitated certain limitations as to times of the day when sampling was possible, for this reason no roadside sampling was undertaken between 01:00-07:00. However, as can be seen from Table 6.4, the fraction of total traffic in Finland during three of the periods covering the night time (Weekday 22:00-04.00, Weekend 04:00-10:00 and Weekend 22:00-04:00) is very low and in the period Weekday 04:00-10.00 it is reasonable to assume that a considerable part of this traffic is constituted of drivers going to work (i.e. after 07:00). Analysis by a traffic statistician also suggested that sampling in the time period 01:00-07:00 would anyway be inefficient, yielding only a very small number of survey samples, so in effect the fact that there were no roadside sessions in this time period would not affect representativeness of the survey. Nonetheless, the prevalence studies for neighbouring countries, i.e. Sweden or Norway, which might reasonably be expected to show strong similarities to the Finnish DUI situation, could be used to estimate prevalences in the night time periods – provided there are sufficiently strong similarities in the compared countries for other time periods of the DRUID survey.

6.1.6 Distribution of drivers by gender and age

The total number of cases was 4192. The age was recorded for 4185 drivers and the gender was recorded for 4174 drivers. The youngest man in the survey was 18 and oldest 85. The youngest woman was 18 and the oldest was 79. The age distribution by gender is shown in graph 6.1.



Graph 6.1. Age distribution over gender

The distribution when categorising the drivers' ages into four groups is shown in table 6.5. The number of cases where gender and/or age data is missing is 25.

Table 6.5. Number of respondents per age group over gender

Age (yrs)	18-24	25-34	35-49	50+	Total
No. of males	318 (8%)	531 (13%)	782 (19%)	1179 (28%)	2810 (67%)
No. of females	152 (4%)	282 (7%)	519 (13%)	404 (10%)	1357 (33%)
Total	470 (11%)	813 (20%)	1301 (31%)	1583 (38%)	4167 (100%)

6.2 Roadside data collection and analysis

6.2.1 Ethical approval

The research survey plan was submitted to the coordinating ethical advisory board of the Hospital District of Helsinki and Uusimaa and approved. Signed informed consent was necessary for all respondents. The identity of the driver was not recorded.

6.2.2 Body fluid collection

Oral fluid was collected using the StatSure Saliva·Sampler^{TM} device (Annex 2). Any deviation from the normal collection procedure was recorded and entered to the database. Upon arrival to the laboratory, and within 6 hours of collection, the samples were frozen and stored at -18°C until analysis.

6.2.3 Toxicological analysis of body fluids

All samples were analysed at THL. Frozen OF samples were thawed and the weight was recorded for each sample. Any deviations noticed at this stage, e.g. part of collector missing, led to exclusion of the sample. The sample preparation procedure for OF samples is presented in Annex 6.I. 1 ml of sample was pipetted to test tubes. In some cases very little OF was collected and hence it was not possible to obtain 1 ml of sample for analysis. In these cases the volume of pipetted OF was noted and taken into account when calculating the results. LLE and/or SPE (MCX 3cc/60mg mixed-mode polymeric sorbent cartridges, Waters Oasis) were used for analyte extraction. The samples were silylized and analysed with GC–EI/MS or GC–NCI/MS. Further information on toxicological analysis is presented in Annex 6.I.

6.2,4 Method of BAC quantification

Oral fluid analyses for alcohol were not performed for the survey samples, because breath alcohol screening was performed at the roadside. The police routinely breath tested 99.9% of the drivers passing through the survey checkpoint during the survey sessions. The device used by the police for breath alcohol screening was the Alco-Sensor IIIR (Intoximeters Inc., Saint Loius, Missouri, U.S.). All ethanol results above zero were recorded for the drivers participating in the roadside survey. All results at, or above, the legal limit (0.5‰) were further confirmed using an evidential breath test or alcohol analysis of a blood sample, as per normal police procedure. The police also recorded the number of all drivers who gave a positive ethanol screening result below the legal limit during the roadside sessions, but these results were recorded as “below legal limit”.

6.2.5 Interviews

The interview form collected the following data:

- Gender
- Year of birth
- Year that first motor vehicle licence was achieved
- Whether or not the driver is currently in possession of a valid licence
- Whether or not the driver is a professional driver
- Type of vehicle
- Annual mileage (professionally and privately)
- Breath alcohol screening result (as measured and confirmed by the police officer)
- Time of oral fluid sample
- Ordinary collection (5 min limit) of oral fluid or other, any deviation recorded
- Time of possible blood sample in case of DUI
- Time and result of possible evidential breath analysis in case of DUI
- Self-reported use of alcohol, drugs or traffic hazardous medicinal drugs during the past 24 h

6.2.6 Statistical analysis

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

6.3 Non-response

6.3.1 Size and nature of non-response

In all there were 225 roadside survey sessions. The total number of non-consenting drivers was 5381, of which 5125 refused at the initial request to participate in the survey by the police and 256 refused after learning of the nature of the survey. The overall inclusion rate from the traffic flow was 39.6%. Data concerning non-consent rates are shown in table 6.6.

Table 6.6. Descriptive data of the roadside sessions

Type of information	Min.	Max.	Mean	No. of sessions data missing
Non-consent rate researcher	0%	33.4%	3.5%	1
Non-consent rate police	0%	84.6%	44.4%	2
Non-consent rate total	0%	84.6%	47.9%	2

The mean non-consent rate to the researchers was low at only 3.5%.

The respective refusal rates to police and researchers for sessions within each DRUID time code were determined **(**table 6.7). As can be seen the only periods where the refusal rate to the researchers was

above 4% were Weekday 04:00-10:00 and Weekday 10:00-16:00. These are both periods where the flow of traffic can be expected to include a large number of drivers travelling to and from work. The refusal rate to police, at the initial request to participate, was substantially higher in each time period.

Table 6.7. Comparison of DRUID refusal rate by time code

	Refusal rate		
Time period	Police	Researcher*	Overall
Weekday 04.00-10.00	44%	10%	49%
Weekday 10.00-16.00	43%	7%	47%
Weekday 16.00-22.00	66%	4%	68%
Weekday 22.00-04.00	65%	4%	66%
Weekend 04.00-10.00	45%	4%	47%
Weekend 10.00-16.00	45%	4%	47%
Weekend16.00-22.00	65%	2%	66%
Weekend 22.00-04.00	54%	4%	56%

*Refusal rates are shown as percentage of all drivers who proceeded to a researcher

The police, who initially asked the drivers to participate in the survey, did not record any information on the drivers at that stage, regardless of participation. Once the drivers had proceeded to a researcher, information, e.g. gender and age, for those who declined to participate at that stage was possible to record only if the non-respondent gave verbal consent. Hence, a direct comparison between the respondents and non-respondents in the survey cannot be made.
However, the demographics of the survey respondents can be compared to those from previous national research, '*henkilöliikennetutkimus'* (HLT), in Finland (table 6.8). The Finnish Road Administration conducted research in 2004 – 2005, estimating the age and gender of road users based on trip mileage reported by a large number of respondents (www.hlt.fi). Data from this research was weighted to correspond to the DRUID regional distribution (Uusimaa 68.4% and Pohjois-Savo 31.6%).

Table 6.8. Comparison of DRUID respondent age group and gender to weighted HLT distribution

	HLT					**DRUID**				
Age (yrs)	**18-24**	**25-34**	**35-49**	**50+**	**Total**	**18-24**	**25-34**	**35-49**	**50+**	**Total**
Males	4%	12%	27%	28%	**70%**	8%	13%	19%	28%	**67%**
Females	3%	7%	11%	10%	**30%**	4%	7%	13%	10%	**33%**
Total	**6%**	**18%**	**38%**	**37%**	**100%**	**11%**	**20%**	**31%**	**38%**	**100%**

A further comparison of the demographics of drivers sampled when the survey refusal rates were high and low was made (Annex 6.2). The two response groups showed strong similarities in their demographic make-ups. Statistically significant difference was seen for gender in the time period Weekday 04:00-10:00 only and for age groups in the time period Weekend 10:00-16:00 only.

6.3.2 Possible confounding effect of non-response

Although the overall refusal rate to participate was high, the majority of the refusals were received at the initial request to participate by the police, before the drivers learnt about the nature of the survey. At this point drivers were only asked by the police if they would spare 10 minutes of their time for the survey. Drivers were informed about the survey only when they had proceeded to a researcher. Hence it is reasonable to assume that those who refused at this stage did so because of lack of time. The refusal rate once the drivers had proceeded to a researcher was 2-10% for individual DRUID time codes, and only above 4% in periods when a large number of drivers were travelling to or from work. It therefore seems unlikely that there is any significant confounding effect of non-response due to drivers' reluctance to participate in an epidemiological survey of DUI.

The comparison of demographics of survey respondents to previous national data, table 6.8, shows that the distributions of age and gender, expressed as percentages of the total, for the two studies bear strong similarities. The sample of respondents in the DRUID survey can therefore be assumed to correspond well to the demographics of the road users in Finland, suggesting that no individual demographic group was more inclined to refuse to participate.
Furthermore, comparison of demographics for sessions with high and low participation levels in the survey (Annex 6.2) show that there is little difference in these two groups for the separate time codes as well.
Overall, it is probable there is little confounding effect, if any, to be expected due to the nature of the vast majority of the non-response group (i.e. ignorance of the purpose of the survey).

6.4 Results

Only drivers of cars and vans were included for the results, therefore 101 drivers of other vehicles were excluded. In addition 250 cases with incomplete results for the toxicological analyses were removed from the database. The total number of cases included was 3841. Prevalences presented are adjusted by weighting the results according to traffic flow. This adjustment was performed by SWOV Institute for Road Safety Research, the Netherlands**.** Results are presented according to substance categories and are shown as prevalence for the relevant drug category alone, i.e. not in the presence of other core substance categories. Prevalence of cases with alcohol-drugs and multiple drugs categories are also presented. No cases with illicit opioids were determined therefore prevalence for this substance category is not presented. Results for alcohol findings should be interpreted with some caution (see Section 6.5.1 Representativeness).

6.4.1 Adjusted general distribution of core substance categories

Table 6.9 shows the adjusted prevalences of core substance categories. As might be expected, after adjustment the vast majority of the cases (more than 97%) sampled from the general driving population were negative for all substances. The substances which were most prevalent were, in descending order, benzodiazepines, alcohol, opioids and Z-drugs. Cases with multiple drugs were also relatively prevalent, but this was not so much the case for the combination of alcohol and drugs.

Table 6.9. Adjusted general distribution of *core substance categories* (N=3841)

Substance category	Prevalence (%)	Confidence interval (%)
Negative	97.15	96.58 – 97.63
Alcohol	0.64	0.43 – 0.94
Amphetamines	0.05	0.02 – 0.19
Cocaine	0.03	0.01 – 0.16
THC	0.04	0.01 – 0.17
Benzodiazepines	0.79	0.56 – 1.13
Z-drugs	0.36	0.21 – 0.60
Medicinal opioids	0.56	0.37 – 0.85
Alcohol – drugs	0.08	0.03 – 0.23
Multiple drugs	0.29	0.16 – 0.52

6.4.2 Adjusted distribution of core substance categories according to gender and age

Table 6.10 shows the adjusted prevalence of substance categories according to age group for male and female drivers separately and both genders taken together. For male drivers only alcohol and benzodiazepines were prevalent across all age groups. Prevalence of benzodiazepines was also roughly equivalent to that of alcohol in each group except for the youngest drivers (18-24), where the prevalence of alcohol was significantly higher. The prevalence of alcohol in the age groups 18-24 and 25-34 also appears to be somewhat higher than for older male drivers. Contrastingly, alcohol was not prevalent at all for younger female drivers, but then appears to increase in prevalence in the older age groups 35-49 to 50+ (as is also seen in the male age groups, from 0.44% to 0.85%). Prevalences in these two female age groups were still lower than the respective male counterpart age groups. The next drug category most widely prevalent across female age groups was benzodiazepines, although

these were not seen in the age group 25-34. For Z-drugs, opioids and multiple drugs the pattern of distribution in age groups were broadly similar for both males and females; they tended to be prevalent in the age groups from 25 years up for the male drivers (except for Z drugs in the 35-49 group) and 35 years upwards for female drivers. Where Z-drugs and opioids were found in female age groups they were more prevalent than for the corresponding male groups, whilst multiple drug findings were more prevalent in the male age groups. Similarly, alcohol-drug prevalences were seen only in the male 35-49 and 50+ age groups and not at all in the female age groups. In the age groups 18-24 and 50+ some prevalence of THC was seen in male drivers and for female drivers amphetamines were observed in the 25-34 age group and cocaine in the 35-49 age group. These individual prevalence values were generally very low (below 0.5%), except for the amphetamines prevalence in the female 25-34 group (0.79%). The overall results suggest that drugs and alcohol are more prevalent in older female drivers (35 and over) and this is also generally true for male drivers, except for the aforementioned prevalence of alcohol and benzodiazepines. The prevalence of drugs and alcohol for both genders largely reflects that of the male drivers age groups, which is because of the dominance of male drivers in the study sample. Prevalence values were generally very low: only above 1% for 9 values - men with alcohol (18-24 & 25-34), benzodiazepines (25-34 & 50+) and opioids (25-34); women with Z-drugs (50+) and opioids (50+); both genders with benzodiazepines (50+) and opioids (50+). The highest individual prevalence value (1.46%) was seen for women with opioids (50+).

Table 6.10. Adjusted distribution of *core substance categories* by gender and age (N=3841)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	98.43 96.20 – 99.36	95.88 93.69 – 97.33	98.63 97.46 – 99.26	95.73 94.35 – 96.78	**96.86** **96.11 – 97.47**
Alcohol	1.08 0.37 – 3.11	1.19 0.53 – 2.62	0.44 0.15 – 1.27	0.85 0.45 – 1.60	**0.82** **0.54 – 1.26**
Amphetamines	0.00 0.00 – 1.35	0.00 0.00 – 0.80	0.00 0.00 – 0.55	0.00 0.00 – 0.35	**0.00** **0.00 – 0.15**
Cocaine	0.00 0.00 – 1.35	0.00 0.00 – 0.80	0.00 0.00 – 0.55	0.00 0.00 – 0.35	**0.00** **0.00 – 0.15**
THC	0.16 0.02 – 1.65	0.00 0.00 – 0.80	0.00 0.00 – 0.55	0.11 0.02 – 0.55	**0.06** **0.02 – 0.26**
Benzodiazepines	0.33 0.05 – 1.93	1.24 0.57 – 2.70	0.39 0.12 – 1.19	1.27 0.76 – 2.13	**0.92** **0.61 – 1.37**
Z-drugs	0.00 0.00 – 1.35	0.19 0.03 – 1.15	0.00 0.00 – 0.55	0.56 0.26 – 1.21	**0.27** **0.13 – 0.56**
Medicinal opioids	0.00 0.00 – 1.35	1.06 0.46 – 2.46	0.07 0.01 – 0.67	0.88 0.47 – 1.64	**0.59** **0.36 – 0.97**
Alcohol – drugs	0.00 0.00 – 1.35	0.00 0.00 – 0.80	0.18 0.04 – 0.87	0.17 0.04 – 0.65	**0.12** **0.04 – 0.35**
Multiple drugs	0.00 0.00 – 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**

Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	99.60 96.57 – 99.96	99.21 97.23 – 99.78	97.94 96.25 – 98.87	95.72 93.25 – 97.32	**97.70** **96.72 – 98.39**
Alcohol	0.00 0.00 – 2.71	0.00 0.00 – 1.44	0.35 0.09 – 1.38	0.45 0.12 – 1.74	**0.27** **0.10 – 0.74**
Amphetamines	0.00 0.00 – 2.71	0.79 0.22 – 2.77	0.00 0.00 – 0.78	0.00 0.00 – 0.96	**0.16** **0.05 – 0.57**
Cocaine	0.00 0.00 – 2.71	0.00 0.00 – 1.44	0.26 0.05 – 1.24	0.00 0.00 – 0.96	**0.10** **0.02 – 0.47**
THC	0.00 0.00 – 2.71	0.00 0.00 – 1.44	0.00 0.00 – 0.78	0.00 0.00 – 0.96	**0.00** **0.00 – 0.30**
Benzodiazepines	0.40 0.04 – 3.43	0.00 0.00 – 1.44	0.61 0.21 – 1.78	0.92 0.34 – 2.44	**0.56** **0.27 – 1.14**
Z-drugs	0.00 0.00 – 2.71	0.00 0.00 – 1.44	0.42 0.12 – 1.49	1.21 0.51 – 2.85	**0.53** **0.26 – 1.10**
Medicinal opioids	0.00 0.00 – 2.71	0.00 0.00 – 1.44	0.14 0.02 – 1.03	1.46 0.66 – 3.20	**0.50** **0.24 – 1.06**
Alcohol – drugs	0.00 0.00 – 2.71	0.00 0.00 – 1.44	0.00 0.00 – 0.78	0.00 0.00 – 0.96	**0.00** **0.00 – 0.30**
Multiple drugs	0.00 0.00 – 2.71	0.00 0.00 – 1.44	0.29 0.07 – 1.29	0.23 0.04 – 1.38	**0.18** **0.05 – 0.61**
In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	98.82 97.27 – 99.50	97.07 95.60 – 98.07	98.35 97.45 – 98.93	95.75 94.60 – 96.66	**97.15** **96.58 – 97.63**
Alcohol	0.72 0.25 – 2.09	0.76 0.34 – 1.69	0.40 0.17 – 0.96	0.74 0.41 – 1.32	**0.64** **0.43 – 0.94**
Amphetamines	0.00 0.00 – 0.90	0.28 0.08 – 1.00	0.00 0.00 – 0.32	0.00 0.00 – 0.26	**0.05** **0.02 – 0.19**
Cocaine	0.00 0.00 – 0.90	0.00 0.00 – 0.52	0.11 0.02 – 0.51	0.00 0.00 – 0.26	**0.03** **0.01 – 0.16**
THC	0.11 0.01 – 1.11	0.00 0.00 – 0.52	0.00 0.00 – 0.32	0.08 0.02 – 0.40	**0.04** **0.01 – 0.17**
Benzodiazepines	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**
Z-drugs	0.00 0.00 – 0.90	0.12 0.02 – 0.74	0.17 0.05 – 0.62	0.73 0.41 – 1.31	**0.36** **0.21 – 0.60**
Medicinal opioids	0.00 0.00 – 0.90	0.68 0.29 – 1.58	0.09 0.02 – 0.49	1.03 0.63 – 1.69	**0.56** **0.37 – 0.85**
Alcohol – drugs	0.00 0.00 – 0.90	0.00 0.00 – 0.52	0.11 0.02 – 0.51	0.12 0.03 – 0.47	**0.08** **0.03 – 0.23**
Multiple drugs	0.00 0.00 – 0.90	0.28 0.08 – 1.00	0.29 0.11 – 0.80	0.38 0.17 – 0.84	**0.29** **0.16 – 0.52**

6.4.3 Adjusted distribution of core substance categories by day of the week and time of the day

Table 6.11 shows the adjusted distribution of core substance categories by day of the week and time of the day. Only two substance categories, alcohol and benzodiazepines, appear to be prevalent in all four time periods. Notably, during weekend-days and, particularly, at night time (week or weekend, 22:00-03:59), the prevalence of alcohol is higher than that of benzodiazepines. However, during weekdays the prevalence of benzodiazepines is almost double that of alcohol. No other single drug categories were prevalent on weekend nights, although multiple drugs were observed. Z-drugs and opioids were prevalent in each of the other time periods. Amphetamines were prevalent only on weekend days (0.20%), cocaine on weekdays (0.05%) and THC on weekdays (0.05%) and weeknights (0.36%). The combination of alcohol-drugs was only seen for weekdays (0.12%), however drug-drug combinations were prevalent in all periods except weeknights; the prevalence on weekend periods was somewhat higher. Prevalence values were again low: generally below 0.5% except for 10

values – alcohol all periods except weekdays; benzodiazepines all periods except weeknights; opioids weekdays and weeknights; multiple drugs weekend days and weekend nights. The highest individual prevalences, and the only values over 1%, were for alcohol on weeknights (1.08%) and on weekend nights (2.03%). The combination of alcohol-drugs was rarely seen (weekdays: 0.12%). The relatively large confidence intervals seen for all substance categories on weekday nights and weekend nights seem to reflect the relatively low number of cases that were sampled in the time period 22:00 – 03.59.

Table 6.11. Adjusted distribution of *core substance categories* by day of the week and time of the day (N=3841)

4 categories: weekdays, weekday nights, week-end days, week-end nights

Period of the week	**Weekdays 04:00 – 21:59**	**Weeknights 22:00 – 03:59**	**Weekenddays 04:00 – 21:59**	**Weekendnights 22:00 – 03:59**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	97.04 96.31 – 97.63	97.13 92.57 – 98.93	97.47 96.33 – 98.26	96.59 89.84 – 98.91	**97.15** **96.58 – 97.63**
Alcohol	0.49 0.29 – 0.85	1.08 0.23 – 4.79	0.83 0.43 – 1.58	2.03 0.48 – 8.14	**0.64** **0.43 – 0.94**
Amphetamines	0.00 0.00 – 0.15	0.00 0.00 – 2.94	0.20 0.05 – 0.70	0.00 0.00 – 4.76	**0.05** **0.02 – 0.19**
Cocaine	0.05 0.01 – 0.24	0.00 0.00 – 2.94	0.00 0.0 – 0.36	0.00 0.00 – 4.76	**0.03** **0.01 – 0.16**
THC	0.05 0.01 – 0.23	0.36 0.03 – 3.60	0.00 0.00 – 0.36	0.00 0.00 – 4.76	**0.04** **0.01 – 0.17**
Benzodiazepines	0.91 0.61 – 1.35	0.36 0.03 – 3.60	0.57 0.26 – 1.23	0.71 0.08 – 6.03	**0.79** **0.56 – 1.13**
Z-drugs	0.46 0.26 – 0.80	0.36 0.03 – 3.60	0.15 0.03 – 0.62	0.00 0.00 – 4.76	**0.36** **0.21 – 0.60**
Medicinal opioids	0.69 0.43 – 1.09	0.72 0.12 – 4.21	0.27 0.09 – 0.82	0.00 0.00 – 4.76	**0.56** **0.37 – 0.85**
Alcohol – drugs	0.12 0.04 – 0.35	0.00 0.00 – 2.94	0.00 0.00 – 0.36	0.00 0.00 – 4.76	**0.08** **0.03 – 0.23**
Multiple drugs	0.20 0.09 – 0.46	0.00 0.00 – 2.94	0.52 0.23 – 1.17	0.68 0.07 – 5.97	**0.29** **0.16 – 0.52**

6.4.4 Adjusted general distribution of alcohol alone by concentration

Table 6.12 shows the adjusted general distribution of alcohol by concentration level. As previously mentioned these results should be interpreted with some caution (see Section 5.1 Representativeness). As can be seen blood alcohol levels of between 0.1 and 0.49 g/L are most prevalent, accounting for almost 60% of all alcohol positive cases (adjusted). The prevalence of the other three blood alcohol concentration levels studied was much lower (e.g. 0.13% for 1.2 g/L and higher) and in fact almost zero for cases in the range 0.8-1.19 g/L.

Table 6.12. Adjusted general distribution of alcohol alone by concentration (N=3841)

Alcohol alone	**Prevalence (%)**	**Confidence interval (%)**
Alcohol 0.1 – 0.49 g/L	0.38	0.23 – 0.63
Alcohol 0.5 – 0.79 g/L	0.10	0.04 – 0.27
Alcohol 0.8 – 1.19 g/L	0.02	0.00 – 0.14
Alcohol 1.2+ g/L	0.13	0.05 – 0.30
In total	0.64	0.43 – 0.94

6.4.5 Adjusted distribution of alcohol alone by gender and age

Table 13 shows the adjusted general distribution of cases with alcohol alone according to age and gender. Of the four concentration ranges studied prevalence of alcohol cases below the legal limit (i.e. 0.1-0.49 g/L) is highest for both male and female drivers. For male drivers these concentrations are prevalent in all age groups, varying between 0.18% (35-49 age group) and 0.68% (25-34 age group). In female drivers they are observed only in the older drivers, i.e. 35-49 (0.35%) and 50+ (0.22%) age groups. The most notable other findings in male drivers were a prevalence of 0.74% for blood alcohol

at, or above, 1.2 g/L in drivers aged 18-24 and of 0.50% for concentrations in the range 0.5-0.79 g/L in the 25-34 age group. Other prevalence values ranged from 0.08% to 0.18%. For all age groups no prevalence was recorded in either one or two of the concentration levels studied. For female drivers the only prevalence recorded above the legal limit was for concentrations at, or above, 1.2 g/L in drivers aged 50+ (0.23%), which was equivalent to that for cases below the legal limit in the same age group. No prevalence was recorded in 13 of the 16 age – concentration level cells. The prevalence values for both genders were reflective of those for male drivers.

Table 6.13. Adjusted distribution of *alcohol alone* by gender and age (N= 3841)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.35 0.06 – 1.97	0.68 0.24 – 1.92	0.18 0.04 – 0.87	0.62 0.29 – 1.29	**0.48** **0.27 – 0.83**
0.5 – 0.79 g/L	-	0.50 0.15 – 1.65	-	0.15 0.04 – 0.61	**0.16** **0.06 – 0.40**
0.8 – 1.19 g/L	-	-	0.13 0.02 – 0.79	-	**0.04** **0.01 – 0.22**
1.2+ g/L	0.74 0.21 – 2.59	-	0.13 0.02 – 0.79	0.08 0.01 – 0.51	**0.15** **0.06 – 0.40**
In total	1.08 0.37 – 3.11	1.19 0.53 – 2.62	0.44 0.15 – 1.27	0.85 0.45 – 1.60	**0.82** **0.54 – 1.26**
Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	-	-	0.35 0.09 – 1.38	0.22 0.03 – 1.36	**0.20** **0.06 – 0.63**
0.5 – 0.79 g/L	-	-	-	-	**0.00** **0.00 – 0.30**
0.8 – 1.19 g/L	-	-	-	-	**0.00** **0.00 – 0.30**
1.2+ g/L	-	-	-	0.23 0.04 – 1.38	**0.07** **0.01 – 0.43**
In total	0.00 0.00 – 2.71	0.00 0.00 – 1.44	0.35 0.09 – 1.38	0.45 0.12 – 1.74	**0.27** **0.10 – 0.74**
In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.23 0.04 – 1.32	0.44 0.15 – 1.23	0.25 0.08 – 0.73	0.51 0.25 – 1.02	**0.38** **0.23 – 0.63**
0.5 – 0.79 g/L	-	0.32 0.10 – 1.06	-	0.11 0.03 – 0.45	**0.10** **0.04 – 0.27**
0.8 – 1.19 g/L	-	-	0.08 0.01 – 0.46	-	**0.02** **0.00 – 0.14**
1.2+ g/L	0.49 0.14 – 1.74	-	0.08 0.01 – 0.46	0.12 0.03 – 0.47	**0.13** **0.05 – 0.30**
In total	0.72 0.25 – 2.09	0.76 0.34 – 1.69	0.40 0.17 – 0.96	0.74 0.41 – 1.32	**0.64** **0.43 – 0.94**

6.4.6 Adjusted distribution of alcohol alone by day of the week and time of the day

Table 6.14 shows the adjusted distribution of cases with alcohol alone according to the time that they were recorded. Cases in the range 0.1-0.49 g/L were most prevalent in any individual time period and these were also the only cases for which a prevalence value was recorded in each period. Prevalence was higher at night (22:00-03:59) than daytime (04:00-21:59) and the prevalence on weekend nights was especially high (2.03%). The lowest value was for weekdays (0.27%). Weekdays were also the only period in which a prevalence value was recorded for all alcohol concentration levels studied, which may reflect the fact that these were the periods when there was most traffic flow during the

survey sessions. Prevalence values recorded in this period were also lowest for each concentration level in comparison to other time periods, when a value was recorded. The prevalence values for cases above the legal limit were between 0.04% (0.8-1.19 g/L) and 0.11% (at, or above 1.2 g/L). Although no prevalence of alcohol cases was recorded above 0.79 g/L on weeknights or at, or above, the legal limit on weekend nights these were still the periods when the total prevalence of cases with alcohol alone were highest (1.08% and 2.03% respectively). Total prevalence on weekend days was also higher than for weekdays (0.83% vs. 0.49%), although no prevalence was recorded between 0.8-1.19 g/L. The absence of prevalence values, particularly in the night time periods is attributable to the relatively low traffic flows in these periods.

Table 6. 14 Adjusted distribution of *alcohol alone* by day of the week and time of the day (N=3841)

4 categories: weekdays, weekday nights, week-end days, week-end nights

Period of the week	**Weekdays 04:00 – 21:59**	**Weeknights 22:00 – 03:59**	**Weekenddays 04:00 – 21:59**	**Weekendnights 22:00 – 03:59**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.27 0.13 – 0.55	0.72 0.12 – 4.21	0.50 0.22 – 1.15	2.03 0.48 – 8.14	**0.38** **0.23 – 0.63**
0.5 – 0.79 g/L	0.08 0.02 – 0.29	0.36 0.03 – 3.60	0.13 0.03 – 0.59	-	**0.10** **0.04 – 0.27**
0.8 – 1.19 g/L	0.04 0.01 – 0.21	-	-	-	**0.02** **0.00 – 0.14**
1.2+ g/L	0.11 0.03 – 0.33	-	0.20 0.05 – 0.70	-	**0.13** **0.05 – 0.30**
In total	0.49 0.29 – 0.85	1.08 0.23 – 4.79	0.83 0.43 – 1.58	2.03 0.48 – 8.14	**0.64** **0.43 – 0.94**

6.5 Discussion of results

6.5.1 Representativeness

The collection sessions were planned by a statistician of the Finnish Road Administration to give a representative sample of the national Finnish traffic flow. The comparison of age and gender distribution of the survey population with previous national research (HLT) from 2004-2005, in Section 6.3.1, shows that the demographics of the two studies show strong similarities. Therefore it is apparent that the demographics of the survey population are indeed largely representative of the national traffic flow. Similarly the evaluation of age and gender of respondents (Annex 6.2) suggests that the high rate of refusal to participate in the survey for some collection sessions did not significantly affect the demographics of respondents. Although there was no sample collection between the hours 01:00-07:00 this was not deemed to affect the representativeness of the survey due to the low levels of traffic in this period.

The issue of alcohol positive cases also deserves further attention. Drunk driving cases above the legal limit 0.5‰ were detained for further examination by the police. Not all these cases were asked by police if they wished to participate in the survey, and in some cases participation was not possible (see Section 6.1.1.). Nonetheless, the percentage of alcohol positive cases above the legal limit included in the survey results (0.31%) was higher than that recorded for all traffic during DRUID sessions (0.20%), since these drivers were actually enthusiastic to take part in the survey when police procedure allowed it. Contrastingly, the percentage of cases which were alcohol positive, but below the legal limit, in all traffic passing through the check point (0.76%) was higher than that of drivers included in the survey results (0.44%). The prevalence of all ethanol positive (i.e. above zero) screening results for all drivers passing through the checkpoint (all drivers prevalence, N=36109) and those included in the survey results (DRUID prevalence, N=3841) are shown in Figure 2. The most significant differences seen are for weekday 16:00-22:00, weekend 04:00-10:00 and weekend 10:00-16:00: for all these periods the prevalence in all drivers is noticeably higher than that for drivers included in the DRUID survey results.

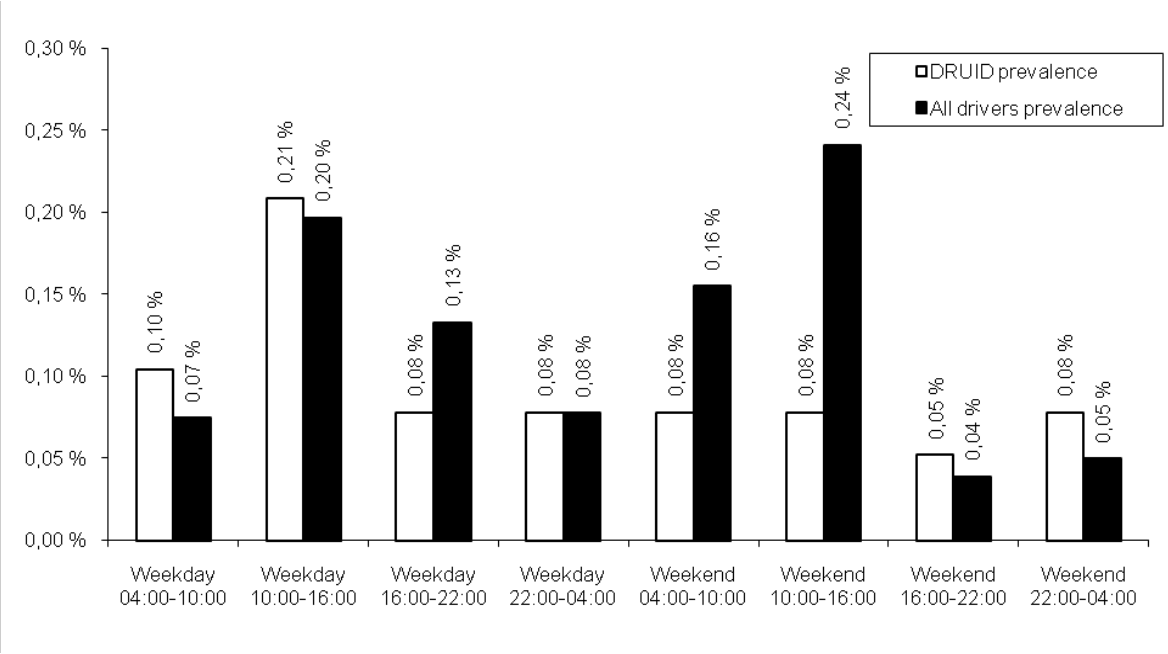


Figure 6.5. Prevalence of ethanol positive screening results (unadjusted)

In Finland, the prevalence of DUI cases in Uusimaa region has been systematically studied for several decades. A recent report on drunk driving cases in Finland (2), called “Profile of a drunk driver and recidivism risk factors. Findings on the prevalence and development of drunk driving in roadside testing in Uusimaa 1990–2008”, has been published online and it contains, among other things, comprehensive statistics on the prevalences of DUI cases over the aforementioned time period.

6.5.2 Effects of non-response

Due to the requirements of the ethical advisory board participation in the Finnish roadside survey was voluntary. The resulting high non-response rate raised concerns that drivers who had used drugs would not participate. However, for the reasons presented in section 6.3.2, it seems that this was not necessarily a valid concern; the participation rate of drivers after learning about the purpose of the survey was very high. Furthermore, as a part of the police roadside procedure, which was prior to participating in the survey, the drivers were observed for signs of possible DUI. During the survey there was in fact only one driver who the police suspected of drug driving, who actually participated in the survey. In addition, the analytical findings for all drivers who originally participated in the DRUID survey (N=4192) show that there was quite a high number of cases (7%), which were positive (above the analytical cut-off) for a substance other than alcohol (including those not recorded for the DRUID survey, full listing see Annex I). Of these, 9 cases (0.21%) showed some indication of illegal drug use.

6.5.3 Most important results

As shown in table 6.9, overall the prevalence values presented are quite low (more than 97% of cases were negative). The predominant findings in the Finnish DRUID survey sample are for benzodiazepines, or the similar acting Z-drugs, and cases with alcohol alone or medicinal opioids. Use of alcohol together with another drug was comparatively uncommon. Prevalence of alcohol or benzodiazepines alone and alcohol–drug or multiple drug combinations were generally higher among the male drivers compared to female drivers, whilst the reverse was true for Z-drugs and medicinal opioids. Findings for the illicit drugs amphetamines, cocaine and THC were clearly more isolated: in total, five cases out of 3841 were positive for illegal drugs (0.13%, unadjusted). It is apparent that, aside from alcohol alone, when both genders are considered together the prevalence values for the substance categories/combinations studied are lowest, or even zero, for the youngest age group (18-24 years). For female drivers prevalence values above zero are almost exclusively in the age groups 35-49 and 50+ years for all categories or combinations studied. For male drivers there are no such clear trends: prevalence values for many of the categories (e.g. benzodiazepines and opioids) appear to fluctuate with age group – one notable exception is alcohol alone which is clearly more prevalent in male drivers below 35 years of age. Concerning individual prevalence values according to time period,

the key findings appear to be for benzodiazepines on weekdays and for alcohol alone on nights and weekend periods, particularly weekend nights. Other notable results were comparatively high prevalence values for medicinal drugs, e.g. opioids and Z-drugs, on weekdays and nights as opposed to weekend periods. Contrastingly, the reverse was true for multiple drug combinations. It is emphasised that confidence intervals for the night time periods (22:00-03:59) were significantly wider than the day time periods.
Regarding the results for alcohol alone positive cases according to concentration, almost 60% of these cases were below the legal limit (0.5‰). Among male drivers alcohol concentrations below 0.5 g/L were prevalent in all age groups and there was a noticeably high prevalence of cases with a concentration of 1.2 g/L, or more, in those aged under 25 years. For female drivers total prevalence (for all age groups) of alcohol alone was lower at all concentration levels and prevalence values were only observed in drivers aged above 34 years. Cases with alcohol alone were most prevalent at night and particularly on weekend nights. The blood alcohol concentrations of cases in these periods were all in the lowest two BAC concentration groups studied (i.e. below 0.8 g/L).
Alcohol results should be interpreted with some caution due to the fact that these cases were not always asked to participate in the study as randomly as the other drivers due to reasons mentioned in Section 6.1.1 (concerning the normal police procedure in DUI cases). In addition, a number of cases, which were excluded from the database due to incomplete results for the toxicological analyses, were also found to be positive for some substance(s). Principal findings in this group were six alcohol positive cases and one benzodiazepine and Z-drug positive case – the total number of drug (other than alcohol) positive cases, including additional substances (see Annex 6.1), was seven.

6.6 Acknowledgements

The research team is deeply indebted to Commissioner Kari Rantala of National Traffic Police, Chief Inspector Pasi Kemppainen, head of the Helsinki unit and Chief Inspector Petri Pahkin, head of the Kuopio unit. The work of all participating police officers in this survey is also highly appreciated. The research team would especially like to express their gratitude to Officers Eija-Maija Viirret and Jussi Pohjonen for their help with organising the survey sessions.
All the personnel in the laboratory of the Alcohol and Drug Analytics Unit have contributed significantly to this survey. In particular we would like to thank assistant researcher Kari Ariniemi and laboratory manager Teemu Gunnar, who were instrumental in the development of the analytical methods used, and laboratory technicians Riitta Husso and Pirjo Vuori. The work of a number of laboratory interns has been valuable to the execution of the roadside sessions and analysis of samples. The research team is especially thankful to laboratory technician Outi Saimanen. Thanks must also go to Jari Haukka, of the Finnish Road Administration, for invaluable assistance in the survey design and Antti Impinen for his work in managing the data and insights in statistical testing.

6.7 References

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Annex 6.1

Calibration standards for analysis were made by spiking 0.5 ml of blank OF with stock solution containing all analytes. A blank OF sample was included in every run. For the standard preparation, blank OF was collected from laboratory personnel, frozen and thawed. Deuterated analogues of the analytes were used as internal standards. A LLOQ sample was run in every analysis as a quality control sample. For samples with concentrations higher than the ULOQ, it was not possible to make a subsequent analysis with a dilution because of the low initial sample volume available for analysis. In these cases, the results were extrapolated from the calibration curve.

The OF samples were analysed with Agilent Technologies GC–MS systems. The analysis on EI mode was carried out with two devices: 6890N Network GC System with 5975B Mass Selective Detector (Fraction 1, see Figure 1 and 6890 GC System with Dean's Switch and 5973 MSD (Fraction 2). The analysis on NCI mode was carried out with a 6890N Network GC System with 5975B MSD (Fraction 3). GC-MS parameters are presented in figure 2. Retention times and the ions monitored in all three methods are presented in table 1. Ethanol was analysed only from the external quality control samples with a headspace–GC method previously described by Langel et al. 2008 (1).

The OF analysis method has been fully validated. Validation results for all analytes are listed in table 2. For linearity experiments, six replicates at six concentration levels were analysed in order to obtain a linear calibration model. The inverse of the squared concentration was used as a weighting factor. For analysis of ethanol (for quality control samples), the linearity was tested at nine concentration levels and in seven replicates. For precision and accuracy calculations, three concentration levels were chosen (LLOQ, medium concentration, ULOQ; and for ethanol low, medium and high concentration) for testing. Three replicates were prepared and measured against a calibration curve on five different days. From these results, precision and accuracy were calculated. For selectivity experiments, 10 blank OF samples from different persons were analysed to see if there were any selectivity problems. The selectivity of the methods was found to be very good for all analytes.

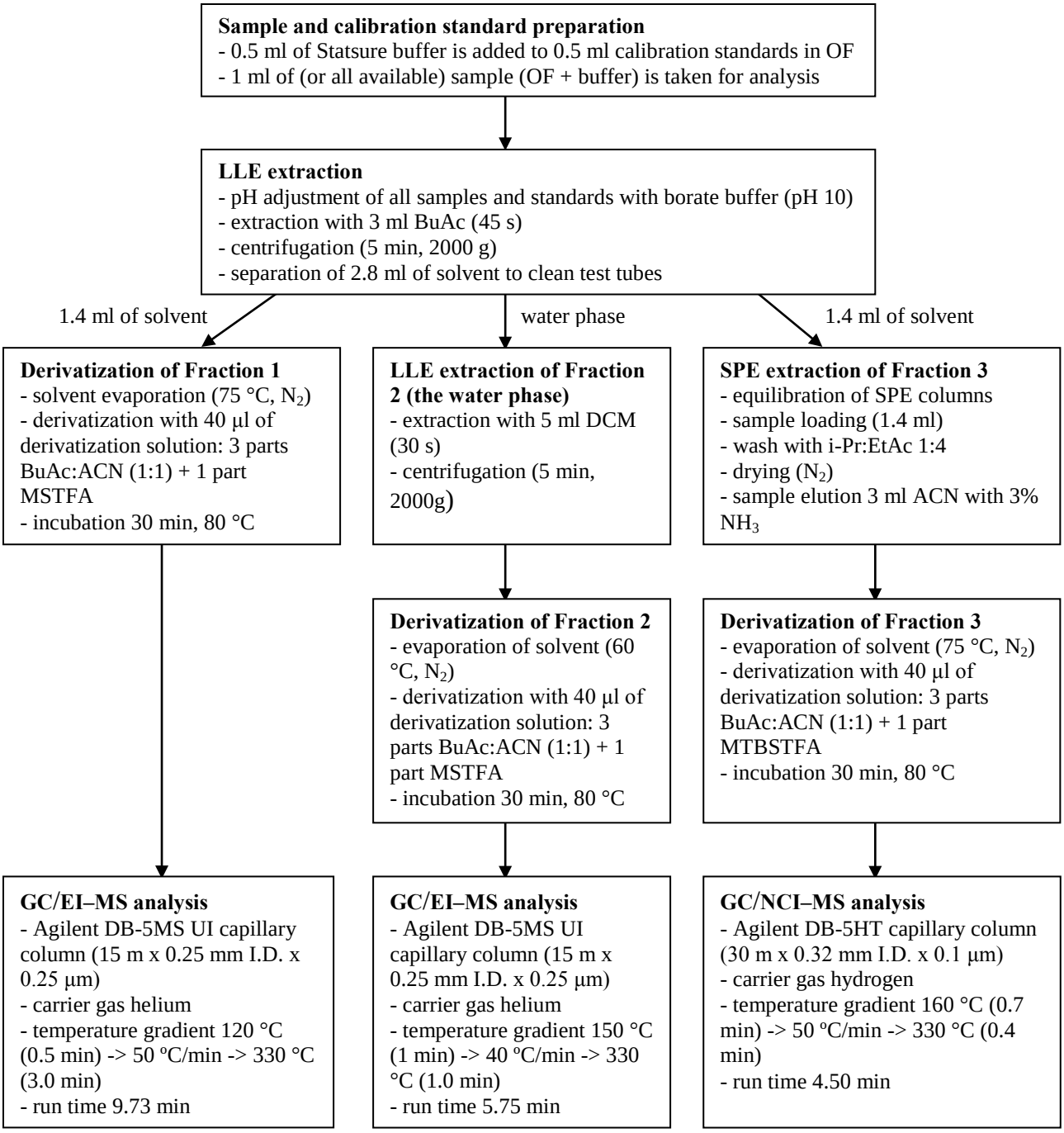

Figure 1. Flow chart of the sample preparation and analysis method for OF samples. Fraction 1: illicit drugs and medicinal drugs other than benzodiazepines, Fraction 2: benzoylecgonine, Fraction 3: benzodiazepines.

Table 1. Retention times (RT) of the analytes and the ions monitored (quantifier in bold) for all three methods.

Analyte	RT [min]	SIM ions [m/z]		Analyte	RT [min]	SIM ions [m/z]
Fraction 1, GC–EI/MS						
Amphetamine	1.401	**116**, 91, 192		Carbamazepine	4.893	**193**, 194, 195
Methamphetamine	1.729	**130**, 91, 206		Mirtazapine	4.903	**195**, 194, 208
Ecgonine methyl	2.538	**182**, 271, 240		THC	5.062	**371**, 386, 387
Carisoprodol	2.610	**160**, 176, 187		Promazine	5.105	**58**, 284, 238
MDA	2.775	**116**, 100, 236		Citalopram	5.330	**324**, 238, 208
MDMA	3.081	**130**, 131, 250		Clomipramine	5.309	**269**, 268, 270
MBDB	3.379	**144**, 145, 250		Codeine	5.369	**371**, 343, 313
MDEA	3.411	**144**, 145, 264		Ethylmorphine	5.449	**357**, 385, 384
PCP	3.797	**200**, 242, 243		Morphine	5.466	**429**, 414, 287
Orphenadrine	3.941	**58**, 165, 178		Chlorprothixene	5.569	**58**, 221, 222
Tramadol	3.962	**58**, 245, 335		Chlorpromazine	5.573	**318**, 272, 320
Fluoxetine	4.095	**219**, 262, 381		Levomepromazine	5.611	**328**, 228, 329
Methadone	4.521	**72**, 165, 178		6-acetylmorphine	5.664	**399**, 287
Dextropropoxyphene	4.634	**58**, 208, 193		Zolpidem	6.329	**235**, 236, 220
Amitriptyline	4.712	**58**, 202, 203		Hydroxyzine	6.526	**201**, 203, 165
Cocaine	4.757	**182**, 303, 198		Norbuprenorphine	6.894	**468**, 500, 524
Mianserine	4.778	**264**, 193, 220		Thioridazine	6.920	**98**, 370, 258
Doxepin	4.820	**58**, 178, 202		Buprenorphine	7.343	**450**, 482, 451
Fraction 2, GC–EI/MS						
Benzoylecgonine	4.896	**361**, 82, 240				
Fraction 3, GC–NCI/MS						
Diazepam	2.835	**284**, 286		Nitrazepam	3.325	**395**, 396
Nordiazepam	2.911	**234**, 384		Temazepam	3.396	**414**, 282
Midazolam	3.089	**325**, 327		Lorazepam	3.506	**302**, 304
Flunitrazepam	3.121	**313**, 314		Clonazepam	3.522	**429**, 431
Bromazepam	3.183	**79**, 429		Alprazolam	3.626	**308**, 310
Phenazepam	3.285	**314**, 312		Zopiclone	3.824	**143**, 246
Oxazepam	3.302	**268**, 270				

Table 2. Validation data for DRUID core substances and for the extra substances analysed in Finland.

Analyte	Internal standard	Linearity range* [ng/mL]	R^2	Tested concentrations [ng/mL]	Precision [%] high/mid/low	Accuracy (bias) [%] high/mid/low
DRUID core substances						
6-acetylmorphine	6-acetylmorphine-d_6	1-50	0.9989	50/5/1	8.6/5.5/16.8	12.8/4.9/14.8
Alprazolam	Alprazolam-d_5	0.5-25	0.9904	25/5/0.5	11.8/6.0/10.3	-9.2/8.4/0.9
Amphetamine	Amphetamine-d_{11}	25-1250	0.9999	1250/125/25	7.2/6.2/5.2	7.4/7.2/5.8
Benzoylecgonine	Benzoylecgonine-d_3	10-500	0.9927	500/100/10	12.0/8.8/18.8	-0.8/-2.1/-9.4
Clonazepam	Clonazepam -d_4	0.5-25	0.9993	25/5/0.5	6.5/5.5/15.0	3.1/4.1/-3.7
Cocaine	Cocaine-d_3	10-500	0.9999	500/50/10	6.0/5.0/8.5	7.9/4.7/4.6
Codeine	Codeine-d_6	5-250	0.9998	250/25/5	8.6/7.0/6.0	9.7/4.1/5.9
Diazepam	Diazepam-d_5	0.5-25	0.9974	25/5/0.5	6.5/6.9/13.0	9.3/4.2/0.2
Flunitrazepam	Clonazepam -d_4	0.2-10	0.9980	10/2/0.2	9.3/7.2/17.4	4.4/-2.6/-10.4
Lorazepam	Oxazepam-d_5	0.2-10	0.9930	10/2/0.2	9.6/9.1/13.7	-8.0/-3.2/2.7
MDA	MDMA-d_5	25-1250	0.9995	1250/125/25	9.5/9.8/9.5	4.1/3.1/9.2
MDEA	MDMA-d_5	25-1250	0.9933	1250/125/25	9.3/11.4/10.6	-0.2/7.4/-1.3

MDMA	MDMA-d_5	25-1250	0.9990	1250/125/25	8.5/7.2/7.2	6.1/8.9/4.5
Methadone	Methadone-d_9	20-1000	0.9996	1000/100/20	11.6/9.7/11.3	13.9/7.8/13.1
Methamphetamine	Methamphetamine-d_{14}	25-1250	0.9990	1250/125/25	7.6/8.5/9.3	4.5/10.8/5.7
Morphine	Morphine-d_6	5-250	0.9970	250/25/5	7.2/13.8/13.9	3.8/5.6/-2.4
Nordiazepam	Nordiazepam-d_5	0.5-25	0.9988	25/5/0.5	4.0/7.5/11.3	1.0/-3.8/-3.1
Oxazepam	Oxazepam-d_5	0.5-25	0.9995	25/5/0.5	6.1/2.0/2.2	5.8/1.2/0.6
THC	THC-d_3	1-50	0.9996	50/5/1	7.9/7.0/13.2	8.9/5.8/-0.0
Zolpidem	Cocaine-d_3	10-500	0.9940	500/50/10	8.6/13.9/10.1	12.6/-9.2/1.1
Zopiclone	Alprazolam-d_5	10-500	0.9900	500/100/10	15.8/17.5/11.5	0.1/-0.3/0.0
Ethanol	t-ButOH	0.1-6.0**	0.9999	3.0/1.5/0.5	3.0/1.9/2.9	-1.6/-2.8/1.0
Extra substances						
Amitriptyline	Cocaine-d_3	20-1000	0.9993	1000/100/20	7.0/5.6/9.5	9.9/2.5/4.8
Bromazepam	Nordiazepam-d_5	1-50	0.9925	50/10/1	12.1/11.5/13.1	16.5/-6.5/6.7
Buprenorphine	Buprenorphine-d_4	0.5-25	0.9992	25/2.5/0.5	6.9/7.4/8.8	12.3/6.6/5.5
Carbamazepine	Cocaine-d_3	20-1000	0.9962	1000/100/20	10.7/12.6/15.1	6.3/-1.6/1.9
Carisoprodol	MDMA-d_5	50-2500	0.9999	2500/250/50	9.7/12.2/13.1	-1.6/-4.4/1.3
Chlorpromazine	Cocaine-d_3	20-1000	0.9987	1000/100/20	8.8/8.8/12.5	11.7/5.9/8.4
Chlorprothixene	Cocaine-d_3	20-1000	0.9977	1000/100/20	9.1/8.7/12.8	17.7/6.7/10.8
Citalopram	Cocaine-d_3	10-500	0.9973	500/50/10	8.7/10.3/14.1	17.2/-1.3/7.2
Clomipramine	Cocaine-d_3	20-1000	0.9990	1000/100/20	9.0/9.2/11.2	9.7/1.7/5.6
Dextropropoxyphene	Cocaine-d_3	20-1000	0.9999	1000/100/20	9.0/7.8/9.5	13.1/4.6/7.1
Doxepin	Cocaine-d_3	20-1000	0.9985	1000/100/20	8.3/8.6/8.0	15.0/3.3/8.2
Ecgonine methyl ester	Cocaine-d_3	20-1000	0.9981	1000/100/20	12.6/10.1/11.9	19.2/8.7/15.5
Ethylmorphine	Codeine-d_6	5-250	0.9999	250/25/5	7.7/9.5/7.1	4.5/2.1/0.4
Fluoxetine	Codeine-d_6	10-500	0.9994	500/50/10	15.9/13.8/15.8	13.5/-0.1/-5.6
Hydroxyzine	Cocaine-d_3	5-250	0.9994	250/25/5	7.4/9.5/10.4	13.4/-1.7/2.9
Levomepromazine	Cocaine-d_3	10-500	0.9993	500/50/10	7.9/7.1/7.2	11.3/2.9/5.1
MBDB	MDMA-d_5	25-1250	0.9936	1250/125/25	6.9/11.4/11.7	-7.7/10.0/4.1
Mianserine	Cocaine-d_3	10-500	0.9994	500/50/10	6.8/6.8/9.0	11.7/4.8/5.5
Midazolam	Midazolam-d_4	0.5-25	0.9860	25/5/0.5	6.6/4.6/12.7	2.8/4.8/-8.8
Mirtazapine	Cocaine-d_3	10-500	0.9988	500/50/10	9.2/8.1/8.5	15.4/3.9/9.9
Nitrazepam	Clonazepam-d_4	0.5-25	0.9987	25/5/0.5	6.4/3.1/17.9	12.2/5.9/-10.6
Norbuprenorphine	Buprenorphine-d_4	0.5-12.5	0.9881	12.5/2.5/0.5	16.4/12.1/15.8	8.4/-1.5/11.4
Orphenadrine	Cocaine-d_3	10-500	0.9943	500/50/10	8.4/9.7/12.9	14.5/1.8/9.4
PCP	Cocaine-d_3	5-250	0.9995	250/25/5	7.1/8.7/8.4	9.6/6.1/7.8
Phenazepam	Oxazepam-d_5	1.25-25	0.9990	25/5/1.25	10.9/5.3/7.8	7.5/6.7/-0.8
Promazine	Cocaine-d_3	10-500	0.9984	500/50/10	8.0/8.6/9.7	15.6/0.5/6.4
Temazepam	Temazepam-d_5	0.5-25	0.9993	25/5/0.5	6.4/2.4/4.2	3.8/2.7/6.6
Thioridazine	Cocaine-d_3	25-1250	0.9994	1250/125/25	7.9/15.1/8.2	13.0/-4.1/-0.1
Tramadol	Codeine-d_6	10-500	0.9993	500/50/10	8.0/11.1/19.0	4.1/2.7/-4.4

* linearity range is from LLOQ to ULOQ

** ‰.

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Annex 6.2

To compare the sessions where most drivers participated in the study to those with a lower inclusion rate, refusal rates for individual sessions were grouped as high and low. The low and high refusal rates were determined as 0 – 47.9 % and 48.0 – 84.6 % respectively. The respective distributions of age groups according to the DRUID time codes are shown in table 1. Respective distributions according to gender are shown in table 2. Comparison was made by χ^2-test for the cross tabulations. Statistically significant difference was seen for age groups in the time period Weekend 10:00-16:00 (χ^2 = 8.050, p= 0.045) (denoted [1]) only and gender in the time period Weekday 04:00-10:00 (χ^2 = 6.095 p= 0.014) (denoted [2]) only.

Table 1. Distribution of age groups according to time period

		Age group (years)				
Time code	Refusal rate	18-24	25-34	35-49	50+	All
Weekday 04.00-10.00	low high	7.4 % 3.8 %	16.6 % 17.4 %	28.2 % 36.9 %	47.9 % 41.9 %	100 % 100 %
Weekday 10.00-16.00	low high	9.5 % 8.1 %	14.7 % 15.7 %	25.9 % 30.9 %	49.9 % 45.3 %	100 % 100 %
Weekday 16.00-22.00	low high	14.6 % 13.0 %	25.1 % 24.2 %	31.4 % 32.7 %	28.9 % 30.0 %	100 % 100 %
Weekday 22.00-04.00	low high	23.4 % 24.0 %	27.7 % 28.8 %	25.5 % 28.8 %	23.4 % 18.5 %	100 % 100 %
Weekend 04.00-10.00	low high	4.5 % 6.7 %	12.5 % 15.6 %	27.3 % 35.2 %	55.7 % 42.5 %	100 % 100 %
Weekend 10.00-16.00[1]	low high	8.9 % 3.9 %	18.6 % 16.9 %	33.5 % 43.8 %	39.1 % 35.4 %	100 % 100 %
Weekend 16.00-22.00	low high	27.9 % 17.9 %	23.0 % 23.9 %	31.1 % 29.3 %	18.0 % 28.8 %	100 % 100 %
Weekend 22.00-04.00	low high	38.4 % 28.0 %	28.3 % 28.0 %	20.2 % 28.0 %	13.1 % 16.0 %	100 % 100 %

Table 2. Distribution of gender according to time code

Time code	Refusal rate	Gender: male	Gender: female	All
Weekday 04.00-10.00[2]	low	77.9 %	22.1 %	100 %
	high	67.7 %	32.3 %	100 %
Weekday 10.00-16.00	low	70.1 %	29.9 %	100 %
	high	67.1 %	32.9 %	100 %
Weekday 16.00-22.00	low	63.6 %	36.4 %	100 %
	high	56.4 %	43.6 %	100 %
Weekday 22.00-04.00	low	69.0 %	31.0 %	100 %
	high	74.0 %	26.0 %	100 %
Weekend 04.00-10.00	low	78.2 %	21.8 %	100 %
	high	67.0 %	33.0 %	100 %
Weekend 10.00-16.00	low	68.2 %	31.8 %	100 %
	high	63.7 %	36.3 %	100 %
Weekend 16.00-22.00	low	65.6 %	34.4 %	100 %
	high	65.2 %	34.8 %	100 %
Weekend 22.00-04.00	low	74.7 %	25.3 %	100 %
	high	64.0 %	36.0 %	100 %

7 Country report Hungary

Authors: *László Institóris, Anita Réka Tóth, [+]Attila Molnár, Zsófia Árok, Tibor Varga*

Department of Forensic Medicine, University of Szeged
[+]Police Headquarter County Csongrád, Szeged, Hungary

7.1 Introduction:

The traffic safety in Hungary was better in the middle of the decade compared to the catastrophic situation in 1990-91. In the year of 2000 the registered number of road accidents resulting in injuries was 17493, from which 1200 people died. The rate of accidents while driving under the influence of alcohol was 11.8 % (1). Since then, the accident-rate has somewhat stabilized. In 2007, 20635 road accidents occurred leading to injuries and 1232 people died. The rate of accidents while driving under influence of alcohol also increased moderately (13.8 %). As the result of law amendments introduced in 2009 and increased police enforcement the situation improved, the number of accident-related death reduced below 1000 in this year.

The frequency of drunk-driving was examined in the south-east region of Hungary in the frame of a roadside survey in 1999. According to the results, 1.04% of the stopped drivers tested positive for alcohol. The frequency was two times higher in the night hours and on the weekends compared to the daylight hours and weekdays (2). The police regularly conduct two broad enforcement campaigns per year, on the Monday after Easter and in December. During these campaigns, the frequency of drunk-driving was found to be 0.3 – 0.4 %. In case of blood alcohol concentration below 0.8 g/l, 12-14 thousand civil offence procedures are conducted yearly. For blood alcohol concentration above 0.8 g/l 10090 criminal procedures were conducted in 2009 (3). Driving under the influence of drugs and alcohol has been prohibited in Hungary since 1999 and 2865 procedures have been launched by the traffic safety authorities in the last 10 years; however, driving under influence of licit and illicit drugs could only be proved with toxicological analysis in 669 cases in the last decade (4). There was no examination targeting the frequency of occurrence of the driving under influence of licit and illicit drugs.

7.1.1 Description of the roadside sampling

The survey – acting upon a part of the territory of the culpability study – was conducted in a southern east Hungarian region, Csongrád County (population: 424849 persons, Fig. 7.1). The traffic safety of the county can be considered average. Due to its geographic location there is significant international transit traffic. During planning, the sampling locations both in urban and suburban areas were jointly appointed with the traffic safety authority on the basis of traffic density and accident frequency.

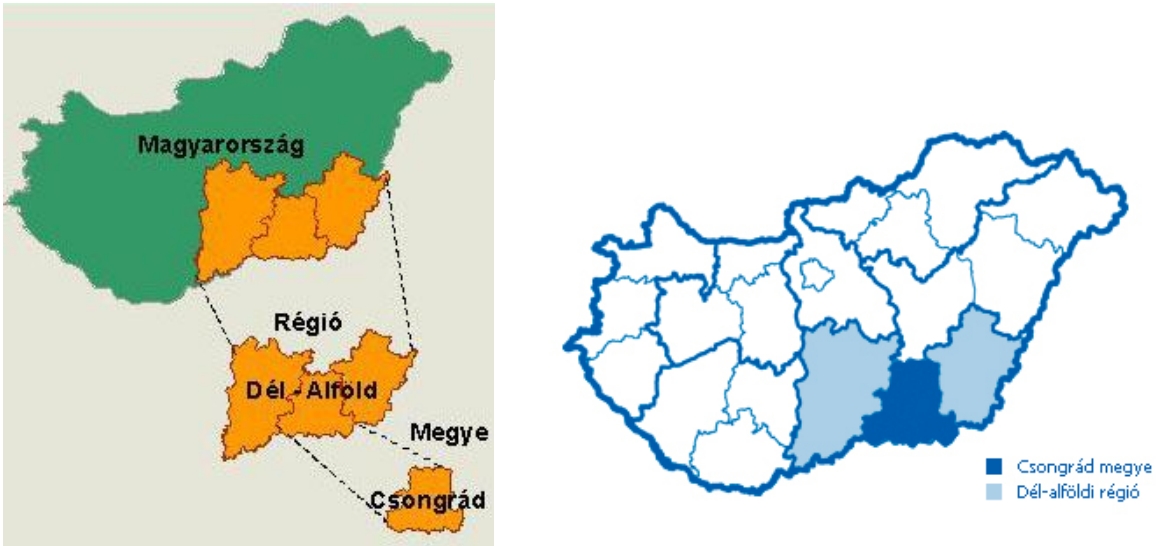

Figure 7.1. The map of Hungary and Csongrád County

The sampling was done by a group of 4-5 persons. Two traffic policemen stopped the traffic, controlled the documents and determined the breath alcohol-level. Drivers were informed about the purpose and the procession of the examination. After obtaining informed consent, the interview, physical examination and oral fluid sampling were done by one or two MD(s). In all groups a university student was responsible for the actual traffic counting. An examination period lasted about 1 – 1.5 hours and 15-30 samples were gathered. Depending on traffic density 2 (weekday, daytime, highway exit) to 68 % (out of built-up area, night) of drivers were examined. Samplings took place, all together, on 101 occasions.
Although, the examinations were started on the 1st of February 2008, only a few cases were analyzed until 2009 due to the unpreparedness of the toxicology laboratory. In spite of ethic's approval and expressed informed consent of participants, at the end of 2008, a nationwide newspaper alleged that illegal DNA sampling had occurred so examinations had to be suspended for approximately 2 months. After this, the purpose and the method of examinations were presented in a nationwide media campaign, after which we were permitted to continue sampling. Therefore, the sampling was not continuous and balanced with respect to the fourth quarter.
In spite of these limitations the sample can be considered representative of the country – with exception of the capital. More than the two-thirds of the samples (2197, 72.89 %) were gathered on main roads, with the remainder gathered on side-roads.
The distribution of responder drivers according to age, gender, road type, season, and DRUID time periods is presented in Table 7.1 to 7.4. There were 5 persons below the age of 18 - their data were excluded from the data processing.
Traffic counting data did not allow to group data according to DRUID periods as we only had data in cases of peripheral and built-up areas. In respect of other altering the weighted statistical figures were calculated based on international data.

Table 7.1. Distribution of responder drivers by gender and age

Age	Male	Female	Total
18-24	188	84	272
25-34	641	243	884
35-49	690	238	928
50+	541	113	654
Altogether	**2060**	**678**	**2738**

Table 7.2. Distribution of responder drivers by road type

Road type	Urban	Rural	Total
	1966	772	**2738**

Table 7.3. Distribution of responder drivers by season

Season	
Dec.-Feb.	262
March-May	1062
June-Aug	1187
Sept.-Nov	227
Total	**2738**

Table 7.4. Distribution of responder drivers by time period

DRUID time period	
1 Weekday 04:00-09:59	299
2 Weekday 10:00-15:59	1377
3 Weekday 16:00-21:59	318
4 Weekday 22:00-03:39	194
5 Weekendday 04:00-09:59	102
6 Weekendday 10:00-15:59	97
7 Weekendday 16:00-21:59	212
8 Weekendday 22:00-03:39	139
Total	**2738**

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

7.2 Roadside data collection and analysis

Before the start of the examination the permission of the Regional Research Ethics Committee was obtained what was indicated on the information leaflet given to the persons examined and also on the written consent form.

Breath alcohol level was determined in all cases. The examination was carried out by a fuel cell device (LION 400 type), the control examination of the positive cases was carried out by a SERES 679TH ethylometer functioning on the principal of infrared spectrography. A conversion factor of 1:2100 was applied to express the results as g/l blood concentration.
Following alcohol determination a short interview took place with the cooperating persons. The parameters examined are presented in Annex 7.1. After the examination of physical symptoms, the oral fluid sampling was done using a Statsure device. According to our experience in more than 90% of the cases the collection of the oral fluid sample exceeding 1 ml was obtained within 2 minutes (discolouration of the indicator). In a few cases sampling lasting 5 minutes did not result in the discolouration of the indicator and in these cases there was only about 0.7 ml oral fluid available for analysis. The samples were stored in cool bag on +4 C^0 and delivered within an hour to the toxicology laboratory.

The conditions of sample processing, GC-MS analyses, the validation procedure and its results are described in Annex 7.1.

7.3 Non-response

After police control and breath testing, 372 persons (12.28 %) refused cooperation in further examinations. Among these, the number of females was relatively higher (female 13.9 %, male 11.8 %, of all cases). Among non-responders, the 35-49 age-group was over represented (64.4 %), and their rate was higher on weekdays and weekend afternoons (3. and 7. time periods). Cooperation was influenced by the weather as well. The rate of the non-responders during the winter months was between 17.6 – 42.9 %, and between 6.1 – 14.7 % in the spring and summer..

Table 7.5. Distribution of non responders according by age and gender

Age	Male	Female	Total
18-24	15	6	21
25-34	54	23	77
35-49	116	52	168
50+	82	24	106
Altogether	**267**	**105**	**372**

Table 7.5. Distribution of non responders according by age and gender

DRUID time period	
1	38
2	200
3	54
4	5
5	12
6	12
7	40
8	11
Total	**372**

As illicit drug consumption is most common below age 35, and as licit drug and alcohol consumption is more frequent over 50, we think that the number of non-responders does not have significant influence on the sample's evaluation. It is worthwhile to note that there was no full street blockade during the sampling – vehicles were pulled over at random – which made it possible for a portion of drivers to avoid the control. Keeping this in mind, mostly with respect of alcohol, it is not possible to exclude underrepresentation in the sample.

7.4 Results

Analytical results of the core substance groups weighed for time period are presented in Table 7.6. Although 5 amphetamine group positive cases (2 males and 3 females) were found these data are excluded from the calculations as their concentration was below the recommended DRUID cut-off (Annex 2).

Table 7.6. Adjusted general distribution of *core substance categories* (N=2738)

Substance category	Prevalence (%)	Confidence interval (%)
Negative	97.68	97.04 – 98.18
Amphetamines	-	-
Cocaine	0.04	0.01 – 0.21
THC	0.19	0.08 – 0.44
Illicit opiates	-	-
Benzodiazepines	1.50	1.11 – 2.03
Z-drugs	0.07	0.02 – 0.26
Medicinal opioids	0.11	0.04 – 0.32
Alcohol	0.15	0.06 – 0.38
Alcohol – drugs	-	-
Multiple drugs	0.27	0.13 – 0.54

Distribution of core substance categories according to age, gender, and time period are shown in Tables 7.7 and 7.8.

Table 7.7. Adjusted distribution of core substance categories by gender and age (N=2738)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	96.81 93.10 - 98.55	98.31 97.00 – 99.05	98.94 97.86 – 99.47	96.46 94.52 – 97.73	97.92 97.21 – 98.45
Amphetamine	-	-	-	-	-
Cocaine	0.00 0.00 – 2.09	0.08 0.01 – 0.73	0.07 0.01 – 0.68	0.00 0.00 – 0.72	0.05 0.01 – 0.28
THC	0.58 0.11 – 3.13	0.49 0.17 – 1.39	0.15 0.03 – 0.82	0.00 0.00 – 0.72	0.26 0.11 – 0.59
Illicit opiates	-	-	-	-	-
Benzodiazepines	2.61 1.09 – 6.12	0.96 0.45 – 2.05	0.41 0.14 – 1.23	3.06 1.90 – 4.90	1.46 1.02 – 2.07
Z-drugs	0.00 0.00 – 2.09	0.00 0.00 – 0.58	0.00 0.00 – 0.55	0.00 0.00 – 0.72	0.00 0.00 – 0.19
Medicinal opioids	0.00 0.00 – 2.09	0.08 0.01 – 0.73	0.05 0.00 – 0.63	0.19 0.03 – 1.07	0.09 0.02 – 0.34
Alcohol	0.00 0.00 – 2.09	0.00 0.00 – 0.58	0.38 0.12 – 1.18	0.28 0.06 – 1.21	0.20 0.08 – 0.51
Alcohol – drugs	-	-	-	-	-
Multiple drugs	0.00 0.00 – 2.09	0.08 0.01 – 0.73	0.00 0.00 – 0.55	0.00 0.00 – 0.72	0.02 0.00 – 0.23

Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	100.00 95.10 – 100.00	95.74 92.40 – 97.65	96.73 93.66 – 98.34	97.86 93.44 – 99.32	96.94 95.35 – 97.99
Amphetamine	-	-	-	-	-
Cocaine	0.00 0.00 – 4.90	0.00 0.00 – 1.56	0.00 0.00 – 1.56	0.00 0.00 – 3.08	0.00 0.00 – 0.56
THC	0.00 0.00 – 4.90	0.00 0.00 – 1.56	0.00 0.00 – 1.56	0.00 0.00 – 3.08	0.00 0.00 – 0.56
Illicit opiates	-	-	-	-	-
Benzodiazepines	0.00 0.00 – 4.90	1.46 0.54 – 3.89	2.05 0.87 – 4.72	2.14 0.68 – 6.56	1.63 0.91 – 2.89
Z-drugs	0.00 0.00 – 4.90	0.80 0.21 – 2.92	0.00 0.00 – 1.56	0.00 0.00 – 3.08	0.28 0.08 – 1.05
Medicinal opioids	0.00 0.00 – 4.90	0.21 0.02 – 1.96	0.21 0.02 – 1.96	0.00 0.00 – 3.08	0.15 0.03 – 0.84
Alcohol	0.00 0.00 – 4.90	0.00 0.00 – 1.56	0.00 0.00 – 1.56	0.00 0.00 – 3.08	0.00 0.00 – 0.56
Alcohol – drugs	-	-	-	-	-
Multiple drugs	0.00 0.00 – 4.90	1.79 0.73 – 4.37	1.01 0.31 – 3.24	0.00 0.00 – 3.08	1.00 0.48 – 2.07

Total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	97.74 95.08 – 98.98	97.62 96.39 – 98.43	98.37 97.34 – 99.00	96.72 95.05 – 97.84	97.68 97.04 – 98.18
Amphetamine	-	-	-	-	-
Cocaine	0.00 0.00 – 1.49	0.06 0.01 – 0.54	0.05 0.01 – 0.51	0.00 0.00 – 0.59	0.04 0.01 – 0.21
THC	0.41 0.08 –2.22	0.36 0.13 – 1.02	0.11 0.02 – 0.61	0.00 0.00 – 0.59	0.19 0.08 – 0.44
Illicit opiates	-	-	-	-	-
Benzodiazepines	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
Z-drugs	0.00 0.00 – 1.49	0.22 0.06 – 0.80	0.00 0.00 – 0.41	0.00 0.00 – 0.59	0.07 0.02 – 0.26
Medicinal opioids	0.00 0.00 – 1.49	0.11 0.02 – 0.63	0.09 0.01 – 0.57	0.16 0.03 – 0.87	0.11 0.04 – 0.32
Alcohol	0.00 0.00 – 1.49	0.00 0.00 – 0.43	0.28 0.09 – 0.88	0.23 0.05 – 0.99	0.15 0.06 – 0.38
Alcohol – drugs	-	-	-	-	-
Multiple drugs	0.00 0.00 – 1.49	0.54 0.23 – 1.28	0.26 0.08 – 0.84	0.00 0.00 – 0.59	0.27 0.13 – 0.54

Table 7.8. Adjusted distribution of *core substance categories* by day of the week and time of the day (N=2738)

4 categories: weekdays. weekday nights. week-end days. week-end nights

Period of the week	**Weekdays 04:00 – 21:59**	**Weeknights 22:00 – 03:59**	**Weekend days 04:00 – 21:59**	**Weekend nights 22:00 – 03:59**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	97.39 96.59 – 98.01	97.42 90.02 – 99.37	98.38 97.09 – 99.10	100.00 93.12 – 100.00	97.68 97.04 – 98.18
Amphetamine	-	-	-	-	-
Cocaine	0.05 0.01 – 0.29	0.00 0.00 – 5.75	0.00 0.00 – 0.59	0.00 0.00 – 6.88	0.04 0.01 – 0.21
THC	0.11 0.03 – 0.38	0.00 0.00 – 5.75	0.48 0.17 – 1.38	0.00 0.00 – 6.88	0.19 0.08 – 0.44
Illicit opiates	-	-	-	-	-
Benzodiazepines	1.69 1.21 – 2.36	2.06 0.44 – 9.20	0.99 0.47 – 2.09	0.00 0.00 – 6.88	1.50 1.11 – 2.03
Z-drugs	0.10 0.03 – 0.36	0.00 0.00 – 5.75	0.00 0.00 – 0.59	0.00 0.00 – 6.88	0.07 0.02 – 0.26
Medicinal opioids	0.13 0.04 – 0.41	0.52 0.04 – 6.69	0.00 0.00 – 0.59	0.00 0.00 – 6.88	0.11 0.04 – 0.32
Alcohol	0.16 0.06 – 0.46	0.00 0.00 – 5.75	0.15 0.03 – 0.85	0.00 0.00 – 6.88	0.15 0.06 – 0.38
Alcohol – drugs	-	-	-	-	-
Multiple drugs	0.37 0.18 – 0.75	0.00 0.00 – 5.75	0.00 0.00 – 0.59	0.00 0.00 – 6.88	0.27 0.13 – 0.54

Results for alcohol alone are presented in Tables 7.9-7.11.

Table 7.9. Adjusted general distribution of alcohol by concentration class (N=2738)

Alcohol alone	Prevalence (%)	Confidence interval (%)
Alcohol 0.1 – 0.49 g/L	0.05	0.01 – 0.24
Alcohol 0.5 – 0.79 g/L	0.02	0.00 – 0.18
Alcohol 0.8 – 1.19 g/L	0.00	0.00 – 0.14
Alcohol 1.2+	0.08	0.02 – 0.28
In total	0.15	0.06 – 0.38

Table 7.10 Adjusted distribution of *alcohol alone* by gender and age (N=2738)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	-	-	-	0.28 0.06 – 1.21	0.07 0.02 – 0.31
0.5 – 0.79 g/L	-	-	0.07 0.01 – 0.68	-	0.02 0.00 – 0.23
0.8 – 1.19 g/L	-	-	-	-	0.00 0.00 – 0.19
1.2+	-	-	0.31 0.09 – 1.07	-	0.11 0.03 – 0.37
In total	0.00 0.00 – 2.09	0.00 0.00 – 0.58	0.38 0.12 – 1.18	0.28 0.06 – 1.21	0.20 0.08 – 0.51
Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	-	-	-	-	0.00 0.00 – 0.56
0.5 – 0.79 g/L	-	-	-	-	0.00 0.00 – 0.56
0.8 – 1.19 g/L	-	-	-	-	0.00 0.00 – 0.56
1.2+	-	-	-	-	0.00 0.00 – 0.56
In total	0.00 0.00 – 4.90	0.00 0.00 – 1.56	0.00 0.00 – 1.56	0.00 0.00 – 3.08	0.00 0.00 – 0.56
In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	-	-	-	0.23 0.05 – 0.99	0.05 0.01 – 0.24
0.5 – 0.79 g/L	-	-	0.05 0.01 – 0.51	-	0.02 0.00 – 0.18
0.8 – 1.19 g/L	-	-	-	-	0.00 0.00 – 0.14
1.2+	-	-	0.23 0.07 – 0.80	-	0.08 0.02 – 0.28
In total	0.00 0.00 – 1.49	0.00 0.00 – 0.43	0.28 0.09 – 0.88	0.23 0.05 - 0.99	0.15 0.06 – 0.38

Table 7.11. Adjusted distribution of *alcohol alone* by day of the week and time of the day (N=2738)

4 categories: weekdays. weekday nights. week-end days. week-end nights

Period of the week	**Weekdays 04:00 – 21:59**	**Weeknights 22:00 – 03:59**	**Weekend days 04:00 – 21:59**	**Weekend nights 22:00 – 03:59**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.03 0.00 – 0.24	-	0.15 0.03 – 0.85	-	0.05 0.01 – 0.24
0.5 – 0.79 g/L	0.03 0.00 – 0.24	-	-	-	0.02 0.00 – 0.18
0.8 – 1.19 g/L	-	-	-	-	0.00 0.00 – 0.14
1.2+	0.11 0.03 – 0.38	-	-	-	0.08 0.02 – 0.28
In total	0.16 0.06 – 0.46	0.00 0.00 – 5.75	0.15 0.03 – 0.85	0.00 0.00 – 6.88	0.15 0.06 – 0.38

7.5 Discussion

7.5.1Representative quality of the sample

The sampling took place only in Csongrád County because the Hospital Study was planned also in this area, and the area of culpability study also encompasses it.

The status of this region, with respect to chronic alcohol and illicit drug consumption is worse than the nationwide average. According to data from legal proceedings against illegal drug users, the nationwide average related to 100 000 inhabitants was 39.45 in 2008 and 47.45 in 2009, these values in Csongrád County were 63.23 and 60.94, respectively.

This can be explained by the border proximal geographical location of the County and the presence of intermediate and advanced institutions which leads to the relatively high number of youth residing in Csongrád County. It is also possible that in Csongrád County police activity is more focused on illicit drugs than in other counties. The higher frequency of illicit drug consumption is also supported by the fact that illicit drug related mortality is the second highest in the country after Budapest.

However, the traffic safety situation is better than the nationwide average which is demonstrated by lower frequency of traffic accidents and accidents resulting in death, and also the lower number of accidents that occurred under the influence of alcohol (Table 7.12).

Summarizing the above mentioned for the whole country we must count on more cases driving under influence of alcohol and less under influence of illicit drugs than it is demonstrated by our data. Our results do not represent the situation in Budapest as significantly different traffic situation, alcohol and drug consumption habits exist there.

As it has already been mentioned, according to our opinion the 12.28 % non-responders (primary female and of the 35-49 age-group) does not influence the results significantly.

Table 7.12. The rate of traffic accidents, traffic fatalities, and the accidents caused by drunk drivers related to 100 000 inhabitants (2008).

County	Traffic accidents	Traffic fatalities	Accidents caused by drunk drivers
Budapest	222.58	4.82	11,63
Bács-Kiskun	166.57	11.62	24,92
Baranya	171.96	8.83	27,48
Békés	177.06	11.68	25,48
Borsod	140.62	6.62	21,42
Csongrád	**161.75**	**6.37**	**19,33**
Fejér	198.55	10.50	27,30
Győr-Sopron	193.29	12.60	20,70
Hajdu-Bihar	223.98	9.38	25,01
Heves	159.36	9.78	22,09
Jász-Szolnok	181.86	12.53	20,29
Komárom	210.74	11.76	34,65
Nógrád	147.95	3.33	19,98
Pest	191.21	9.12	27,78
Somogy	205.85	12.00	36,31
Szabolcs	185.29	8.06	31,17
Tolna	170.72	13.84	23,49
Vas	221.08	6.49	23,29
Veszprém	214.88	10.79	26,27
Zala	190.26	11.31	29,14
All together	190.87	8.86	23,31

7.5.2 Alcohol

Information about the occurrence of drunk driving is only available from statistics derived from police investigations. According to these, in 2009 13.8 % of the parties at fault in an accident were drunk which is likely underrepresented as many accidents caused only property damage or resulted in slight injuries so no police measure took place. According to the data specifically on Csongrád County in 1994-95, 56 % of accident victims who died within 6 hours and 34 % of the accident wounded who were treated at emergency departments were drunk. These rates of drunkenness among driver who died or were injured in a vehicle accident were 56 % and 38 %, respectively (5). These rates have not changed significantly in the last few years. Between 2000 and 2005, 39 % of the deceased in traffic accidents and 36 % of the drivers injured lethally were drunk. The average blood alcohol concentration was 2.09 g/l and 1.86 g/l respectively (6-7).

No nationwide survey has been prepared concerning the frequency of driving under influence of alcohol. However, according to the criminal statistics, criminal procedures were launched against 10090 persons in 2009 due to driving under the influence of alcohol (the blood alcohol concentration was higher than 0,8 g/l), while the detection of lower blood- or air alcohol concentration resulted in civil charges laid against 11925 vehicle drivers (12). In 1999 roadside survey was carried out solely in Csongrád County. Alcohol could be detected in 1.04 % of the examined drivers' exhaled air (2). The frequency of occurrence was higher on weekends and at night, and was highest in males. The frequency was one of the lowest in Europe, with lower figures announced only in Scandinavian countries. According to nationwide statistical data, law amendments (zero tolerance) and increased police activity resulted in the decrease of drunk-driving over the last few years. During the Easter campaign of 2010, drunkenness could be proved in only 0.4% of the stopped drivers.

Our results show comparably lower frequency of drunk-driving with respect to the last decades. The traffic safety measures introduced in the last years, the widespread use of air-alcohol determination and increased police activity likely have a role in this trend. It should be considered that present examinations were carried out on street passages showing increased traffic, however driving under alcohol influence typically occurs around pubs and on side-roads. During the campaign there was no full street cut-off, so drivers noticing the stoppage had the opportunity to avoid it. In spite of this, the

results suggest that the strict legal regulation was successful and driving under influence of alcohol has reduced among vehicle drivers.

Trends found with time of the day, age and gender agree with former examination results and data in other states. The frequency of drunkenness is more frequent in males, over the age of 35, most common in suburban areas, on weekends and in the night hours.

The air alcohol concentration we found was also really low (equal to 0,998 g/l blood concentration on average) which complies with the former data, as well. Although the blood alcohol concentration noted in cases of lethal traffic accidents was around 2.0 g/l (noted by road surveys in other states as well), the levels found in average drivers were significantly lower. These data show that only a small portion of drivers consume alcohol; however, this population is responsible for many fatal- and injurious motor vehicle accidents.

7.5.3 Medicines

A significant portion of the adult population in Hungary suffers from a psychological sickness, primary depression where the frequency of occurrence is around 10 % according to some surveys. There is no nationwide representative survey on the subject, however; the number of persons abusing medicine in Hungary was estimated around 100 thousand by Bauer 20 years ago (8). Based on statistical data of the amount of prescribed medicines (National Health Insurance Institution) it can be estimated that benzodiazepine derivatives were consumed regularly by 100-130 thousand people in 2009. Depression and different personality disorders occur with frequency of 6.8/10000 among persons sent for a disability examination (10). According to a survey of 14-16 year-olds, the life-time prevalence of medicine consumption without medical provision is 21.4 %, more than half the time medication was taken with alcohol (12).
Previously, no representative survey has been conducted to determine the sedative consumption of drivers. Over the last decade, in Csongrád County, in 2.04 % of fatally injured traffic accident victims (5.3 % in drivers, 2.5 % in passengers) we detected the presence of sedatives, mainly benzodiazepine derivatives (7). These figures are slightly lower than data from West-European countries, however; in drivers suspected of driving under the influence of drugs, sedatives were only found in the blood and urine of 3.56 % (4).
The low frequency reported in this population does not comply with the figures found in fatal accident victims and is much lower than the data stated in the bibliography. This can be explained by the fact that pre-screening of the samples was done using the FPIA method which employs a cut-off level (e.g. 40 ng/ml benzodiazepines) that is above therapeutic range, so it is possible a significant number of impaired drivers were not recognized.
The present examination showed benzodiazepines and Z-drugs in 0.71 % of oral fluid samples (the prevalence was 0.61 % in males and 1.12 % in females). The occurrence was higher in females and those over the age of 35. The frequency of consumption increased with age which corresponds with gender and age trends in psychiatric illness as well as sedative drug related-suicide. Occurrence was higher during the daylight hours on both weekdays and the weekend. This means – bearing in mind the occurrence rate of metabolites – that the observed medication found in our testing was due to the daytime use of these medications, taken in order to reduce stress, and not due to typical night time usage for the aid of relaxation or sleep. It can be recognized, from the interviews, that in most positive cases, consumption was not on medical provision and regularly; however, even a single instance of consumption significantly raises the risk of an accident.
During examination of fatal accident victims, we recognized that benzodiazepines occurred with alcohol in two-thirds of the cases which significantly increases the risk of accident by synergist effect. However, in our present examinations, common presence of medicine and alcohol was found only in one case.

7.5.4 Medicinal opiates

These kinds of medications are indicated for those suffering from degenerative locomotor diseases, which occur more frequently with age. Diseases of the ICD XIII group occurred with a frequency of 2.4/10000 among persons sent for a disability examination (10). With respect to usage of medical opiates by drivers, we have no previous data and neither was blood or urine level of medicinal opiates determined in our examinations of fatal accident victims.

In our current survey, the prevalence was 2.8 % and the frequency was almost the double in females compared to males. The frequency of consumption increased with age which corresponds with the occurrence of the degenerative locomotor diseases. The frequency – both on weekdays and weekends – was the highest before noon, which corresponds to consumption at the start of work and daily physical activity.

7.5.5 Illicit Drugs

Unfortunately, we only have a vague estimation with respect to the frequency of illicit drug usage. The number of regular drug users is estimated to be around 30-40 thousand; the amount of occasional users may be much higher than this.
According to a survey of 14-16 year olds, the life-long prevalence of illicit drug usage among them is 15.9 %, most frequently THC (14.1 %), followed by the consumption of amphetamine derivatives. The consumption of cocaine has grown over recent years and in the last 1-2 years the drugs GHB and mephedrone have become more common (11). 4317 new drug addicted persons were treated by healthcare institutions in 2009; however, mortality is quite low. Drug overdose resulted in death in less than 40 instances nationwide and there is a downward trend over the last decade (13). The presence of illicit drugs in fatal accident victims has been examined regularly in Csongrád County for 15 years. The frequency of occurrence is 0.56 % and the presence of illicit drug effect at the time of accident could be proved in 0.8 % of drivers lethally injured (7). Blood- and urine samples of 2865 drivers were examined who were suspected of driving under the influence of drugs between 2000 and 2009. The presence of illicit drugs or their decomposition elements could be proved from urine 2133 times and 669 times from the blood. The drug most frequently found was THC; the next most frequent were amphetamine derivatives. Cocaine usage has increased in the last years, and the rate of politoxicomania is rather high (4).
During our present examinations the presence of illicit drugs could be proved in 29 cases, which is 1.06 % frequency. The most common is THC, followed by the consumption of cocaine. Politoxicomania was frequent, e.g. heroine consumption could be proved only together with other substances. Trends based on gender and age showed the consumption of illicit drugs is more frequent in young males. It deserves attention that during the interviews drug consumption before driving was admitted by only four persons who confessed using THC.

In summary, our examinations executed during the roadside survey show that the formerly low alcohol consumption has decreased, and it is consumed primarily by males and over the age of 35. Compared with alcohol, one order of magnitude more medications (primarily benzodiazepines) could be identified, which indicates not only to the spread of consumption but also the fact that inhabitants do not recognize these medicines' effects with reference to increased risk of accident. It deserves attention that - according to the interviews - most of the medicine-consumers use the medications occasionally and not regularly, based upon medical provision. The presence of illicit drugs – compared to frequency of alcohol consumption – is relatively high. The ratio of frequency, of the different various substances, agrees with the nationwide ratios of illicit drug consumption. Drug use was most frequent in young males, however in case of amphetamine derivatives there was no difference found between the genders. The higher use of illicit drugs by youth and compared to the frequency of driving under influence of alcohol corresponds with the high prevalence of illicit drug use noticed in youth by the ESPAD examinations. Besides the spread of illicit drug consumption, the high frequency of driving under the influence of illicit drugs can also be explained by the lack of roadside enforcement and by the fact that – as opposed to alcohol – only a small number of drivers consuming illicit drugs are recognized and punished.

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7.7 Acknowledgements

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Annex 7.1

QUESTIONNAIRE FOR ROAD-SIDE SURVEY (USZ 34)

No:……

Sex: male female
Age: ……..year
Date and time: 200…year……month…....day…..hour……..minute
Type of the road: city outskirts
main-road side-road
Type of vehicle: car lorry bus motorbike. others
Driving experience:……..year
Distance/year:…….km
Distance of the previous drive:……..km

Chronic illnesses:……...
Regular medicine consumptions:……
Date and type of the last medicine consumption…….....
……..
Last alcohol consumption date:……..
quantity:……..…dl beer,…….dl wine……..dl spirit
Illegal drug consumption……....
Last illegal drug consumption date:…….....
type……

Clinical symptoms

Alcoholic odour	non	uncertain	certain
Pupils:	narrow	normal	dilated
Reaction of pupils:	normal	damaged	
Conjunctivae:	anaemic	normal	red
Nystagmus:	non	horizontal	vertical
Romberg-sign:	negative	uncertain	positive
Finger-nose probe:	negative	uncertain	positive
Orientation:	orientated	uncertain	disturbed
Memory:	normal	partly disturbed	disturbed
Pulse: ……../min.			

Breath alcohol concentration:negative positive (……. mg/l)

……
physician

Analysis of the oral fluid samples

Materials All materials were analytical or HPLC grade: Na_2HPO_4, H_3PO_4, $NaHCO_3$, KOH, CH_2Cl_2 – Merck; acetonitrile (ACN), butyl-acetate (BuOAc) – Scharlau, Germany; HFBA, MTBSTFA, MSTFA Sigma-Aldrich (USA); standards and deuterated analogs of 1 mg/ml or 0.1 mg/ml – Promochem (USA), except some non-deuterated standards of GC-MS grade which were the precious donation of the producers: Zopiclone, Zolpidem, Alprazolam (Sanofi-Aventis), Midazolam, Clonazepam (Roche), Tramadol (TEVA).

Sample collection: Oral fluid (OF) samples for the Road Side Survey (RSS) were collected by Statsure device. The average weight of the devices was calculated as the average of ten container + plug + stick without wrapper (7.93 ± 0.03). The buffer was separately stored at 4 ^oC and 1 ml was added into the container just before OF collection and the container was closed. The samples were kept in cool bag during collection, then in refrigerator until weighing and filtration (within 12 hours after collection). 200 µl of the filtered samples was stored in a 2 ml cryogenic tube (Brand Gmbh, Germany) for determination of amphetamines, the other part in another tube for determination of the other compounds. All samples were stored at - 80 ^oC until analysis. As the quantity of the OF collected generally differ from 1 ml (1 g), a correction factor was calculated for the positive samples by the formula:

F = 2/(weight of the sample in the container with sticker and plug - 7.93).

Sample processing

I. Amphetamines (AMF, MA, MDA, MDMA, MDEA)

To 200 µl OF sample (containing Statsure) 50 µl bicarbonate buffer, 10 µl ISTD solution, and 0.5 ml extraction-derivatization reagent were added during mixing by Vortex. Mixing was continued for an additional 15 seconds and the samples were centrifuged (3000 rpm, 5 minutes). 50 µl from the upper phase was transferred into 32 x 11,6 mm GC vial with 200 µl insert (VWR Int., Germany), capped, and measured by GC-MS in EI mode.

Bicarbonate buffer: 8.5 ml cc $NaHCO_3$ solution + 1.5 ml 10 M KOH (daily prepared); ISTD: mixture of D-5 analogs of AMF, MA, MDMA, and MDEA in a 5 µg/ml concentration each in methanol; Extraction-derivatization reagent: 485 µl toluene + 15 µl HFBA (daily prepared)

II. Other DRUID core substances, midazolam, temazepam, nitrazepam, 7-amino clonazepam, ketamine, and tramadol.

To 1 ml OF sample 0.5 ml phosphate buffer (pH=9), 10 µl ISTD and 5 ml butyl-acetate were added in a 12 ml capped centrifuge tube (Brand, Germany), and extracted for 30 seconds with a Multi-Pulse Vortexer (Glas-Col, USA). After centrifuge (3000 rpm, 5 minutes) 4.5 ml organic phase was transferred into clean tubes and evaporated at 60 ^oC by pressed air in a TurboVap LV Concentration Workstation (Caliper LifeSci., USA). The samples were reconstituted with 75 µl acetonitrile (ACN), and 30 – 30 µl were measured into GC vials. To the first sample (S1, used to determine illicit drugs other than amphetamines, plus ketamine, zolpidem, oxazepam, temazepam, and tramadol) 15 µl MSTFA was added, capped, and analyzed by GC-MS in EI mode (on-line derivatization) within 16 hours after sample processing. The other (S2, for analysis of other benzodiazepines and zopiclone) was dried at room temperature with nitrogen stream, capped and stored under nitrogen at –20 ^oC until derivatization and analysis.

Following the extraction with butyl-acetate the lower phase (what still contained 0.5 ml butyl-acetate) was re-extracted with 4 ml CH_2Cl_2. After centrifuging (3000 rpm, 5 minutes) 3.5 ml of the lower phase was transferred to a clean tube and evaporated at room temperature by pressed air. The residue was dissolved in 75 µl ACN by vortex, 60 µl was transferred into a GC vial, 30 µl MSTFA was added, and capped. The samples were analyzed by GC-MS in EI mode (S3, benzoyl-ecgonine).

The analysis for benzodiazepines and zopiclone was performed from the S2 samples. After warming to room temperature, 45 µl ACN : MTBSTFA = 2:1 solution was injected into the vials through the septum by a Hamilton syringe and vortexed six times for 2 seconds. Derivatization was effected at 80 ^oC in a multi-block heater (Barnstead Int. USA) for 30 minutes. After cooling to room temperature the samples were analyzed by GC-MS in NCI mode within 8 hours after derivatization.

When the concentration of a compound exceeded the upper limit of linearity, the ready GC sample was diluted up to 5-fold by acetonitrile and measured again. The results were multiplied by the degree of dilution.

Standard stock solutions

Separate stock solutions were used for amphetamines (AMF, MA, MDA, MDMA, and MDEA) and for the other substances. The amphetamine standards contained 1000, 750, 500, 250, 125, 100, 50, and 20 ng in 20 µl volume (spiking volume) of each compound in methanol. Thus the concentration of the substances in the lowest concentration stock (Std 1) was equal to the DRUID cut off. The standard solutions for the other substances were prepared in similar way. The highest standard (Std 8)

contained 2000 ng of morphine, codeine, methadone, and temazepam, 1000 ng of cocaine, BZE, nitrazepam, zolpidem, zopiclone, midazolam, and ketamine, 500 ng of 6-MAM, THC-COOH, tramadol, diazepam, oxazepam, and 7-amino-clonazepam, 100 ng of THC, alprazolam, clonazepam, nordiazepam, and lorazepam in 25 µl spiking volume in acetonitrile. As the presence of methanol promotes the decomposition of zopiclone, and as all compounds in the Promochem standards are dissolved in methanol, the adequate quantities of these components were measured into volumetric flask and evaporated with nitrogen stream at room temperature. The substances were resolved in acetonitrile (ACN), and the other components were added in ACN solution. Seven other calibration standards were prepared from Std 8 using the following dilution factors: 1.3, 2.0, 4.0, 8.0, 20, 40, and 100.
All calibration curves were calculated with the reciprocal concentrations of the substances.

GC-MS analysis

The analyses were performed with an apparatus consisting of a 6890N Network GC system, a 5975B inert XL MSD equipped with turbo pump, interchangeable EI and CI ion source, a 7683B autosampler (Agilent, Palo Alto CA, USA), and an Agilent MSD Chemstation data system (G 1701DA D.03.00.611).
Amphetamines
Analysis of amphetamines was performed in EI mode (EI, positive ions, 70 eV) using a DB-5MS column of 25 m x 0.25 mm x 0.25 µm (J & W Sci. Inc, USA), a glass wool packed liner (Agilent, Cat. No.5062-3587), and Helium 6.0 (Messer, Germany) as carrier gas. The temperature of inlet, transfer line, ion source, and quadrupole was adjusted to 250, 300, 230, and 150 ^{o}C, respectively. The initial temperature of the oven was 110 ^{o}C with a hold time of 2 minutes, and increased 45 ^{o}C/min to 320 ^{o}C with a final hold time of 1 minute. 2 µl sample was injected in splitless mode using a constant 1.5 ml/min He flow rate. The run time was 7.67 min. The MS spectra and peak location of the HFB derivatives of each analyte were determined in full scan mode (50-550 amu), MS detection was performed in SIM (selected ion monitoring) mode. SIM ions and retention times are presented in Table 1.

S1 substances
Illicit drugs (other than amphetamines), tramadol, zolpidem, temazepam, and oxazepam were also analyzed in EI mode using DB-5MS column of 15 m x 0.25 mm x 0.25 µm (J & W Sci. Inc, USA), and a double gooseneck liner (Agilent 5181-3315). The temperature of inlet, transfer line, ion source, and quadrupole was 280, 300, 230, and 150 ^{o}C, respectively. The initial temperature of the oven was adjusted to 120 ^{o}C with a 1 min. hold time, increased 60 ^{o}C/min to 220 ^{o}C, 20 ^{o}C/min to 290, then 40 ^{o}C/min to 320 ^{o}C with a 1 min hold time and to 330 ^{o}C with a final hold time of 1 min. The total run time was 9.17 minutes. 2 µl sample was injected in pulsed splitless mode (injection pulse was 23 psi until 0.2 min) with a constant 1.3 ml/min He flow rate. MS spectra, retention times, and SIM ions of the TMS derivatives and the non-derivatized compounds were determined as described for amphetamines (Table 1).

S 2 Benzoyl-ecgonine (BZE)
BZE was analyzed in the same way as S1 samples except the oven heating parameters. The initial temperature was 160 ^{o}C with a hold time of 0.5 minutes and was increased by 50 ^{o}C /min. to 220 ^{o}C, 10 ^{o}C/min. to 236 ^{o}C, 50 ^{o}C/min. to 330 ^{o}C with a final holding time of 1 minute. The run time was 6.18 min.

S 3 Other benzodiazepines and zopiclone
The analysis was performed on a 30 m x 0.32 mm x 0.10 µm DB-5HT (J & W Sci. Inc, USA) capillary column using a double gooseneck liner (Agilent 5181-3315) in negative chemical ionization (NCI) mode, adjusting the methane flow rate to 25 ml/min. The temperature of inlet, transfer line, ion source, and quadrupole was 250, 300, 200, and 150 ^{o}C, respectively. 2 µl sample was injected in pulsed splitless mode (30 psi, 0.8 min.) with a constant He flow rate of 2.4 ml/min. The initial oven temperature was 150 ^{o}C which was hold for 0.8 min, then increased 50 ^{o}C/min to 350 ^{o}C with a final hold time of 1 minute. The run time was 5.8 minutes.

The cut-off values used for the GC-MS analysis are presented in Table 1. Due to comparison the data with those of the Hospital study and with the other National Reports the recommended cut-offs of the oral fluid samples were used for the evaluation and statistical analysis.

Table 1. 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 for OF lower than the original DRUID cut-off in oral fluid, therefore the cut-off of blood hhas been raised
[3] no positive cases; cut-off of MDMA used for MDEA

The R_ts, SIM ions, and the linearity range of the substances are presented in Table 2.

Table 2. Retention time, SIM ions and linearity range of the substances measured

			SIM ions			Lin. Range	ISTD
	Compound	Rt	**T**	Q1	Q2	(ng/ml)	(ng/ml)
AMFs	AMF-D5-HFB	3.700	**244**	123			50
	AMF-HFB	3.710	**240**	118	169	20 - 500	
	MDA-HFB	4.830	**135**	162		20 - 500	
	MA-D5-HFB	4.130	**258**	213	169		50
	MA-HFB	4.140	**254**	210	118	20 - 500	
	MDMA-D5-HFB	5.140	**258**	213	164		50
	MDMA-HFB	5.150	**254**	210	162	20 - 500	
	MDEA-D5-HFB	5.232	**273**	408			50
	MDEA-HFB	5.240	**268**	240	403	20 - 500	
S1	ketamine-D4	3.045	**184**	213	186		25
	ketamine	3.050	**180**	209	182	10-1000	
	methadone-D9	3.743	**78**	303			50
	methadone	3.764	**72**	294	165	20-2000	
	cocaine-D3	3.970	**185**	306			50
	cocaine	3.976	**182**	303	272	10-1000	
	THC-D3	4.366	**374**	389			25
	THC	4.375	**371**	386	387	1-100	
	codeine-D6-TMS	4.717	**377**	349			50
	tramadol-TMS	3.258	**58**	245	335	5-500	
	codeine-TMS	4.735	**196**	178	343	20-2000	
	zolpidem	5.950	**235**	307	236	10-1000	
	morphine-D6-2TMS	4.873	**435**	420			50
	morphine-2TMS	4.892	**429**	414	401	20-2000	
	6-MAM-D3-TMS	5.108	**402**	290	327		50
	6-MAM-TMS	5.109	**399**	340	287	5-500	
	temazepam-D5-TMS	5.230	**348**	262			100
	temazepam-TMS	5.238	**343**	257	357	20-2000	
	oxazepam-2TMS	4.448	**429**	430	431	5-500	
S2	BZE-D3	3.395	**364**	243	85		50
	BZE	3.404	**240**	82	361	25-750	
S3	diazepam-d5	3.463	**289**	291			100
	diazepam	3.468	**284**	285	286	5-375	
	nordiazepam	3.530	**234**	235	384	1-75	
	temazepam-d5	4.014	**419**	421	287		100
	temazepam	4.020	**414**	416	282	20-1500	
	midazolam	3.739	**325**	326	327	20-1000	
	oxazepam	3.920	**268**	270	384	5-375	
	lorazepam	4.129	**302**	304		1-75	
	7-aminoclon-d4	4.054	**253**	367			50
	7-aminoclonazepam	4.059	**249**	363		5-375	
	zopiclone	4.331	**143**	246		10-750	
	clonazepam-d4	4.149	**433**	435			50
	clonazepam	4.151	**429**	431		1-75	
	nitrazepam	3.950	**395**	396		10-750	
	alprazolam-d5	4.313	**313**	315			50
	alprazolam	4.312	**308**	309	310	1-75	

Validation procedure

Linearity and intraday precision Using 8 calibration standard concentrations, five calibration curves were measured within one day for each group of substances. The linearity was checked by the R^2 value of their average curve calculated by a least squares regression model (criteria: R^2 should be > 0.98). Intraday precision was characterized by repeatability (RSD%) and accuracy (bias%) of the values re-calculated by the average curve related to the nominal concentrations. The limit of acceptability was 15% for accuracy and 20% for bias.

Selectivity The peak areas of the SIM ions of all substances in Std 1 (cut off concentrations) were compared to that of the disturbing or overlapping matrix peaks of five blank samples. The limit of acceptability was an at least three times difference for the target, and at least a two times difference for the qualifier ions.

Inter-day precision Triplicates of the highest, middle, and lowest concentration standards with daily calibration curves were measured in 5 separate days. The concentrations of the samples were always calculated against their daily calibration curves. Inter-day precision was characterized by the repeatability (RSD) and accuracy (bias). The limits of acceptability were 15% for bias and 20% for RSD.

Extraction recovery
1. Amphetamines Six OF samples (with matrix) were spiked with 20 µl 100 ng/ml concentration standard + 10 µl ISTD, processed and measured as described. To examine the effect of matrix on extraction recovery six other samples were prepared in which OF was replaced with distilled water (no matrix). Extraction recovery was calculated as percentage of the "no matrix" samples.
2. Other substances Six OF samples were spiked with Std 4 standard and ISTD as described. 6 other empty samples were extracted with butyl-acetate and centrifuged. Then 4.5 ml organic phase was spiked with 90% quantity of Std 4 and ISTD (total). Recovery was calculated as percentage of the "total" samples. Recovery of BZE was determined in the same way spiking the methylene chloride phase before evaporation with 15,6 µl Std 4 and 7.8 µl ISTD in the "total" samples.
Stability The stability of the processed samples, containing matrix, was tested by analyzing 8 replicates at the medium concentration level (Std 4). After derivatization the samples were combined, then divided into 7 vials and were injected in 4 hours intervals. The acceptable limit of degradation was a 20% decrease in the concentration of a substance.

Validation results

The linearity, selectivity, intra- and inter-day precision data fulfilled the validation criteria for all substances. The extraction recovery varied between 54.4 and 109 %, and was below 70% only for lorazepam, midazolam and benzoyl-ecgonine. All substances proved to be stable for 24 hours after sample processing except Zopiclone and Zolpidem (Table 3). As a consequence, the sample preparation and the measurement was timed in the way that all samples were analyzed within 8 hours after processing.

Table 3. Stability results of Zolpidem and Zopiclone

Substances	**% of the 0 hours sample**					
	4	**8**	**12**	**16**	**20**	**24**
zolpidem	102.86	100.19	84.58	79.56	76.53	71.96
zopiclone	93.02	87.92	31.06	12.74	16.19	21.13

8 Country Report Italy

Authors: *Santo Davide Ferrara (TFA-UNPD), Donata Favretto (TFA-UNPD), Massimo Montisci (TFA-UNPD), Susanna Vogliardi (TFA-UNPD), Giulia Stocchero (TFA-UNPD), Guido Viel (TFA-UNPD), Rafi El Mazloum (TFA-UNPD), Colette Case (TFA-UNPD)*

8.1 Description of the roadside driver sampling

8.1.1 Introduction and objectives

The aim of the roadside survey was to assess prevalence of drivers who drive in the general traffic in the Veneto region (five different districts) within the North-East sector of Italy, which accounts for approximately 4.8 million people, under the influence of alcohol and/or other psychoactive substances. The survey was carried out in close co-operation with the local and state police. Briefly, the roadside protocol included:

- Stopping the drivers at randomly selected sites and times;
- Carrying out a breath-test for alcohol using a screening device (compulsory for all stopped drivers);
- Administering (to the stopped drivers) a questionnaire on relevant socio demographic behavioural, physical and driving characteristics, skills
- Applying a clinical protocol (elaborated by our group specifically) which included clinical anamnesis, psycho-behavioural examination based on the DSM IV – R, medical-physical examination (for signs of impairment);
- Collecting:
    - A total of 1310 saliva samples were collected which were later analysed for prevalence of benzodiazepines, opiates, amphetamine, cannabis, cocaine, ecstasy and alcohol in our laboratory;
    - A total of 987 blood samples were collected which were later analysed for prevalence of benzodiazepines, opiates, amphetamine, cannabis, cocaine, ecstasy and alcohol in our laboratory.

Originally we planned on obtaining approximately 3000 saliva samples with an additional 10% of blood samples (about 300) after the roadside stops. During the 3 year course of roadside sampling, and based on the various work package meetings held, we modified this to allow for a more appreciable sampling of blood thus allowing for a better standard of comparison between blood and saliva samples which would be indispensable for studying conversion factors between the diverse biological samples. Due to the increase of blood sampling (which took more time than saliva sampling) the total number of samples was lower than initially planned. It was considered very valuable to be able to compare blood samples of the controls to blood samples in the hospitals instead of saliva in the controls to blood in the hospitals for the case control study.
The results of the survey will serve as reference data (controls) for the relative risk estimation (odds ratio calculation) of alcohol and other psychoactive substances in “case-control studies” i.e. hospital studies. In this population based case-control study, cases are formed by seriously injured car drivers and controls are representative samples of drivers from the driving population in the hospital's catchment area.

The unweighted control sample could not be considered to be representative of all drivers who participated in road traffic in the five districts of Veneto Region at all days of the week and all times of the day, since the sample distribution over different times and days was not equal to the distribution of traffic volumes. The most probable cause was the regular sampling capacity of the research team, regardless of the traffic volumes that vary significantly by day of the week (weekdays versus weekend) and by time of the day. Furthermore, the police exhibited the preference for enforcement activities during high-risk hours, i.e. the night time hours with low traffic volumes. So, in order to ensure that the control sample was representative of the whole week, results have to be weighted based on traffic flow distribution over the various days of the week and times of the day.

8.1.2 Geographic distribution of drivers over the country

Control drivers were stopped at random from moving traffic in five different districts of the Veneto region in North-East portion of Italy. Veneto is a large region of Italy that covers a total area of 18,398.9 km^2 that can be divided into four areas: the northern Alpine zone, the hill zone, the lower plain, and the coastal territory. The following specific districts were included in our survey: Padova, Rovigo, Treviso, Venice, and Vicenza, accounting for more than 8% of the entire population in Italy (see also Table 8.1).

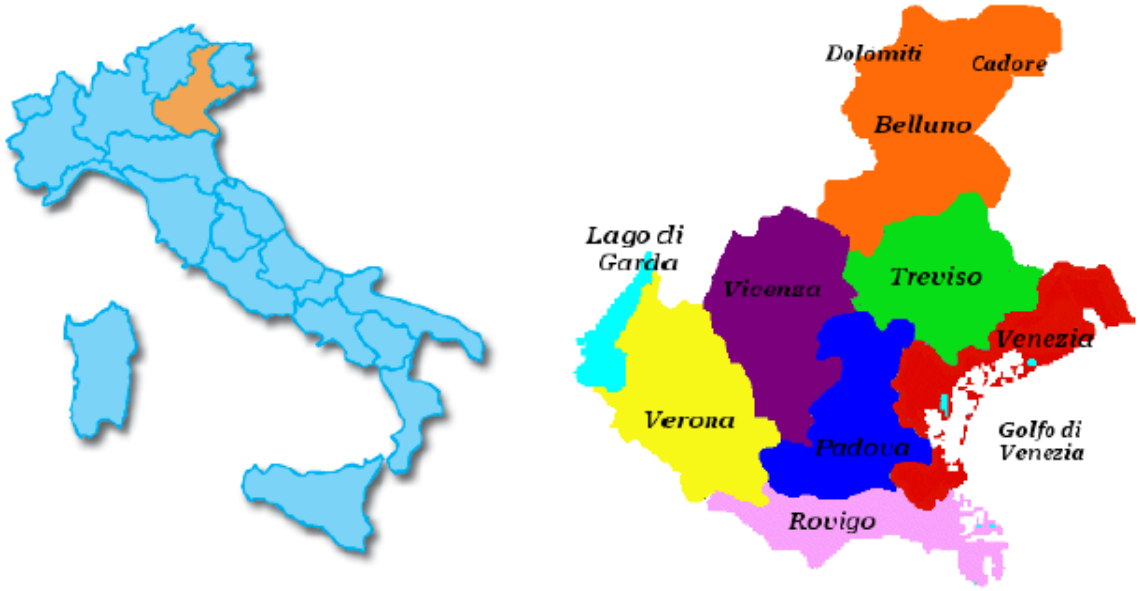

Figure 8.1 Survey regions

The choice of these districts was based on the geographical distribution of population over the country. The five provinces cover all the geographical areas and reflect the Italian general topography. The social and economic structure of the region comprises agricultural, industrial and tourism activities thus representing a good model of the Italian socioeconomic configuration as well. Recently, epidemiological studies on the prevalence of drugs and alcohol in the Italian general population and driving population, has disclosed that approximately 10 % of the driving population has consumed alcohol before driving. The prevalence of drug use has been calculated to be in the range 4 - 6 %. These data are in agreement with the calculated prevalence in our survey, allowing to infer that the survey region is reasonably representative for Italy as a whole.

Table 8.1. Geographic distribution of drivers over the country

Region Code	Region	count	fraction
03901	1-Padova	341	0,26
03902	2-Venezia	319	0,24
03903	3-Vicenza	224	0,17
03904	4-Treviso	214	0,16
03905	5-Rovigo	212	0,16
Total		*1310*	*1,00*

8.1.3 Distribution of drivers by road type

In each district an average of 20 different research sites were selected, distributed over the different areas in the each district. The main selection criteria included:

- ⇒ putative traffic flow,
- ⇒ lack of possibilities for drivers to avoid the research site stop,
- ⇒ enough room on the road for the research and police teams and their vehicles,
- ⇒ safe working conditions.

The research sites were selected among rural and urban roads.

8.1.4 Distribution of drivers by season

159 roadside survey sessions were conducted during the period February 2008 - August 2009. In each season of the DRUID time periods at least one roadside survey session took place. The distribution of sampled drivers in the different seasons is reported in Table 8.2. As may be inferred, all seasons have a quite comparable distribution but in the autumn the number of samples is lower. This can be ascribed to the fact that in the period of the road survey (February 2008 - August 2009) autumn months (month 10 - 12) were sampled only once.

Table 8.2. Distribution of drivers by season

Season	Count	Fraction
1 - month 1-3 (winter)	368	0,28
2 - month 4-6 (spring)	373	0,28
3 - month 7-9 (summer)	363	0,28
4 - month 10-12 (autumn)	206	0,16
	1310	*1,00*

8.1.5 Distribution of drivers by day of the week and time of the day

According to the DRUID definition of time periods (see Figure 8.2), Table 8.3 shows the distribution of drivers by day of the week and time of the day (8 DRUID Time Period categories).

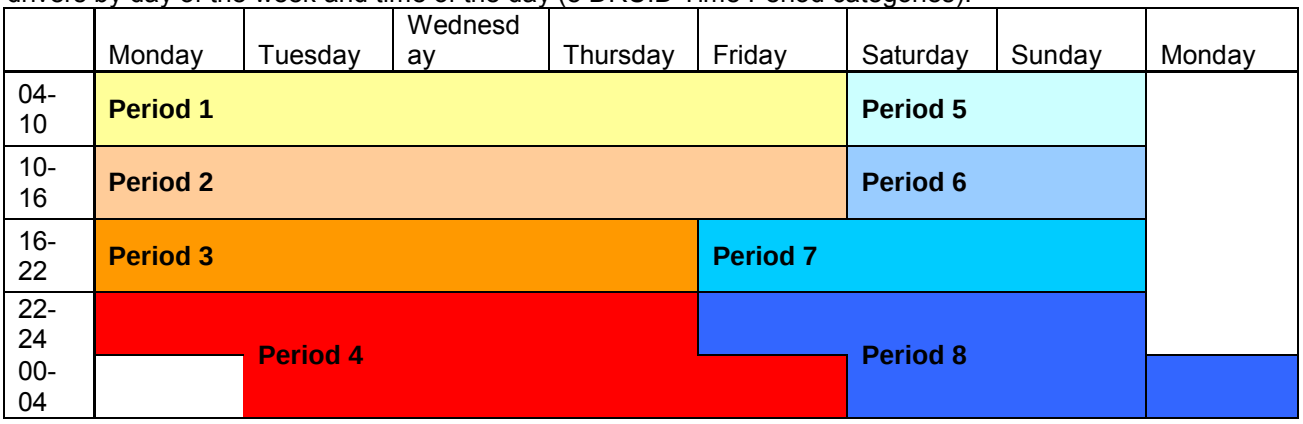

Figure 8.2. Definition of time periods

Table 8.3. Distribution of drivers by day of the week and time of the day (8 DRUID Time Period categories)

Time period	Count	Fraction
1 Weekday 04:00-09:59	71	0,05
2 Weekday 10:00-15:59	113	0,09
3 Weekday 16:00-21:59	87	0,07
4 Weekday 22:00-03:39	329	0,25
5 Weekendday 04:00-09:59	105	0,08
6 Weekendday 10:00-15:59	17	0,01
7 Weekendday 16:00-21:59	71	0,05
8 Weekendday 22:00-03:39	517	0,39
Total	*1310*	*1,00*

Categories 4 and 8 have a higher ratio of stops and sampling. As previously explained, the reason for this was that the police had a preference for enforcement activities during high-risk hours, i.e. the night time hours and the week-end period. Analogously, the low number of samples in period 6 can be ascribed to the scarce preference for enforcement activities during the low-risk periods such as Sunday mid-day hours.

8.1.6 Distribution of drivers by gender and age

According to the DRUID definition of the categories, Table 4 shows the distribution of drivers by gender and age. As may be seen, and as expected from the composition of the Italian driving population, the number of males is higher. The low numbers in both the 50+ groups could be considered as a selection issue (a higher risk population seems to have been preferred by the police enforcement activities) and not a representation of the distribution of traffic, considering that in the general driving population in Italy the percentage of drivers over 50 years old is about 39 % (men) and 26 % (women). However, the number of travels/day in this group of drivers is lower than the other groups (data collected by ISTAT, the Italian National Institute of Statistics).

Table 8.4. Distribution of drivers by gender and age

Gender – age	Count	Fraction
F - 18-24	75	0,06
F - 25-34	120	0,09
F - 35-49	100	0,08
F - 50+	22	0,02
M - 18-24	245	0,19
M - 25-34	362	0,28
M - 35-49	336	0,26
M - 50+	50	0,04
Total	*1310*	*1,00*

8.2 Roadside data collection and analysis

8.2.1 Ethical approval

The present study is conform the Italian Law and the rules of the Medical Ethical Committee..

8.2.2 Driver selection, interviews and medical examination

Drivers were stopped by the police at the request of the acting research coordinator. All subjects were breath tested for alcohol by a police officer, using a screening breath test analyzer. Positive results were confirmed by a Breathalyzer *"Draeger Alcotest 7410 Plus device"*. The breath test was compulsory for all stopped drivers.

As soon as a medical doctor was ready for interviewing and blood 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. The drivers who agreed to cooperate signed a written consensus form and were interviewed (gender and age of the subject, assumption of drugs and/or medicines). Besides the interview, 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 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.

8.2.3 Body fluid collection

Subjects were requested to produce samples of blood and saliva, collected by a medical doctor. The most suitable arm for venipuncture was assessed and a tourniquet was applied to the upper arm. The skin at the puncture site was cleaned with a sterile non-alcoholic disinfectant wipe or swab and the needle was inserted into the antecubital vein. The tourniquet was removed and 3 mL of blood were collected in a 3.0 mL BD grey Vacutainer®. After withdrawing the needle from the arm, a pad was

placed over the puncture site and the subject was instructed to press firmly on the pad for 2 – 3 minutes; samples were kept 2-8 °C until analysis.
Saliva samples were collected using a Statsure device, as specified by the DRUID research protocol. The level of the buffer solution was checked against the line on the side of the tube before collection began. The collection pad was placed under the tongue and when the indicator window turned blue, the pad was removed from the mouth and placed into the collection/transport tube. If the driver was unwilling or unable to furnish a blood specimen, only a saliva sample was collected. After collection the devices were weighted and stored at -20 °C until analysis.

8.2.4 Toxicological analysis of body fluids

The toxicological analysis (4 - 7) were performed at the TFA-UNIPD laboratory. Two in-house methods were developed, validated and used for the analysis of 31 drugs and metabolites in blood and saliva. The first method was used for the analysis of illicit drugs and medicines excluding THC and THC-COOH. The second method was used for the analysis of THC and THC-COOH. Both methods are described in Annex I to this report.
Blood alcohol concentration was determined by Breathalyzer *"Draeger Alcotest 7410 Plus device"* and a conversion factor of 1: 2100 has been applied to comply with the project guidelines. Saliva alcohol concentration was determined by a headspace gas-chromatography method, described in the Annex I as well.

8.2.5 Statistical Analysis

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

8.3 Non-response

In Italy, legal regulations specify that, in order to assess DUI of alcohol and/or drug, drivers can be asked for medical examination (comprising an interview and a physical examination) and body fluid collection (saliva, blood or urine) that are performed by a physician in the presence of a Police Officer. Although the decision to participate to the control is voluntary strictly speaking, since the alternative is a formal admission of driving under the influence of drugs and/or alcohol with the consequent execution of the full sentence. participation is somewhat forced.
In our survey, control drivers were stopped at random from moving traffic by a Police Officer. Due to the fact that refusing to participate to either the interview or the body fluid collection had legal consequences, we did not register any non-response. All the stopped drivers agreed to participate to the interview and to the withdrawal of one (blood or saliva) or two biological matrices (blood and saliva). Therefore no confounding effect due to non response was observed.

8.4 Results

In the following tables are reported the results obtained by the adjustment procedure, according to 8.2.5.
As may be inferred from Table 8.5, 84.99 % of stopped drivers tested negative for all substances, the prevalence for alcohol being 8.59% (alcohol only) and the use of drugs and/or medicinal drugs accounting for 5.41 %. Considering that benzodiazepines and medicinal opiates/opioids are not prohibited substances in Italy when used as prescription drugs, the use of illicit drugs accounts for nearly 3.9 %. Among drugs, the most represented is Cocaine, followed by THC and illicit opiates. Combination of alcohol with drugs exhibits a prevalence of 1.01 %, drug/drug combinations account for 1.22 %.

Table 8.5. Adjusted general distribution of *core substance categories* (N=1310)

Substance category	Prevalence (%)	Confidence interval (%)
Negative	84.99	82.95 - 86.82
Amphetamines	-	-
Cocaine	1.25	0.78 - 2.01
THC	1.15	0.70 - 1.89
Illicit opiates	0.30	0.12 - 0.78
Benzodiazepines	0.97	0.57 - 1.67
Z-drugs	-	-
Medicinal opiates and opioids	0.53	0.25 - 1.09
Alcohol	8.59	7.19 - 10.23
Alcohol+drugs	1.01	0.59 - 1.71
Drugs-drugs combi	1.22	0.75 - 1.97

Table 8.6. Adjusted distribution of *core substance categories* by gender and age (N=1310)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	84.87 79.91 – 88.77	89.85 86.23 – 92.60	80.43 75.99 – 84.22	87.26 74.30 – 94.19	85.13 82.79 – 87.21
Amphetamines	-	-	-	-	-
Cocaine	1.57 0.61 – 3.99	1.12 0.43 – 2.87	2.33 1.20 – 4.49	0.21 0.00 – 8.47	1.62 1.01 – 2.61
THC	0.04 0.00 – 1.58	0.44 0.10 – 1.86	2.62 1.40 – 4.86	0.00 0.00 – 8.08	1.10 0.61 – 1.96
Illicit opiates	0.04 0.00 – 1.58	0.00 0.00 – 1.09	1.08 0.41 – 2.80	0.00 0.00 – 8.08	0.39 0.15 – 1.02
Benzodiazepines	2.38 1.10 – 5.11	0.00 0.00 – 1.09	0.42 0.10 – 1.81	0.00 0.00 – 8.08	0.75 0.37 – 1.50
Z-drugs	-	-	-	-	-
Medicinal opiates and opioids	0.00 0.00 – 1.51	0.00 0.00 – 1.09	0.84 0.29 – 2.45	0.00 0.00 – 8.08	0.30 0.10 – 0.88
Alcohol	9.48 6.44 – 13.74	5.38 3.46 – 8.27	10.08 7.37 – 13.66	12.32 5.54 – 25.20	8.39 6.82 – 10.27
Alcohol+drugs	0.11 0.01 – 1.72	1.55 0.69 – 3.48	1.24 0.50 – 3.01	0.21 0.00 – 8.47	1.02 0.56 – 1.86
Drugs-drugs combi	1.51 0.58 – 3.91	1.66 0.75 – 3.63	0.95 0.34 – 2.60	0.00 0.00 – 8.08	1.30 0.76 – 2.21
Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	83.05 71.87 – 90.39	76.83 66.79 – 84.54	89.76 83.65 – 93.75	84.76 66.45 – 93.98	84.53 80.11 – 88.12
Amphetamines	-	-	-	-	-
Cocaine	0.15 0.00 – 6.10	0.11 0.00 – 4.55	0.00 0.00 – 2.65	0.00 0.00 – 13.07	0.06 0.00 – 1.32
THC	2.71 0.67 – 10.25	2.83 0.86 – 8.90	0.03 0.00 - 2.72	0.00 0.00 – 13.07	1 32 0.52 – 3.29
Illicit opiates	0.00 0.00 – 5.82	0.00 0.00 – 4.35	0.00 0.00 – 2.65	0.00 0.00 – 13.07	0.00 0.00 – 1.21
Benzodiazepines	6.11 2.35 – 14.99	1.77 0.41 – 7.32	0.00 0.00 – 2.65	0.00 0.00 – 13.07	1.69 0.74 – 3.81
Z-drugs	-	-	-	-	-
Medicinal opiates and opioids	0.00 0.00 -5.82	0.00 0.00 – 4.35	2.76 1.07 – 6.96	0.00 0.00 – 13.07	1.24 0.48 – 3.19
Alcohol	7.98 3.44 – 17.41	18.35 11.54 – 27.91	3.21 1.33 – 7.58	15.24 6.02 – 33.55	9.22 6.49 – 12.94

Alcohol+drugs	0.00 0.00 – 5.82	0.11 0.00 – 4.56	2.12 0.72 – 6.05	0.00 0.00 – 13.07	0.99 0.34 – 2.82
Drugs-drugs combi	0.00 0.00 – 5.82	0.00 0.00 – 4.35	2.12 0.72 – 6.05	0.00 0.00 – 13.07	0.95 0.32 – 2.77
In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	84.51 80.08 – 88.09	87.31 83.84 – 90.12	83.08 79.53 – 86.13	86.34 76.32 – 92.53	84.99 82.95 – 86.82
Amphetamines	-	-	-	-	-
Cocaine	1.29 0.50 – 3.25	0.92 0.36 – 2.35	1.67 0.86 - 3.22	0.13 0.00 – 5.51	1.25 0.78 – 2.01
THC	0.57 0.15 – 2.19	0.91 0.35 – 2.33	1.89 1.01 – 3.50	0.00 0.00 – 5.26	1.15 0.70 – 1.89
Illicit opiates	0.03 0.00 – 1.27	0.00 0.00 – 0.88	0.77 0.30 – 2.01	0.00 0.00 – 5.26	0.30 0.12 – 0.78
Benzodiazepines	3.12 1.69 – 5.69	0.35 0.08 – 1.49	0,30 0.07 – 1.30	0.00 0.00 – 5.26	0.97 0.57 – 1.67
Z-drugs	-	-	-	-	-
Medicinal opiates and opioids	0.00 0.00 – 1.21	0.00 0.00 – 0.88	1.39 0.67 – 2.85	0.00 0.00 – 5.26	0.53 0.25 – 1.09
Alcohol	9.18 6.46 – 12.89	7.91 5.72 – 10.84	8.13 6.03 – 10.87	13.40 7.28 – 23.37	8.59 7.19 – 10.23
Alcohol+drugs	0.09 0.01 – 1.38	1.27 0.57 – 2.84	1.49 0.73 – 2.98	0.13 0.00 – 5.51	1.01 0.59 – 1.71
Drugs-drugs combi	1.21 0.46 – 3.15	1.34 0.61 – 2.93	1.28 0.60 – 2.71	0.00 0.00 – 5.26	1.22 0.75 – 1.97

When observing distribution by age, the general prevalence is to some extent higher in the group 35 – 49, but the highest number of positives for alcohol only was found in the group 50 +. The group 35 - 49 conversely exhibits the highest prevalence for drugs (cannabis, cocaine, opiates and their combination with alcohol). When observing distribution by gender, the highest prevalence of alcohol in women 25-34 reflects a selection bias reasonably due to some pre-selection activity of the police. In the women group, the prevalence of cocaine and illicit opiates is zero, whereas the use of benzodiazepines is higher than in the male group, and, quite unexpectedly, more frequent in the youngest.

Table 8.7. Adjusted distribution of *core substance categories* by day of the week and time of the day (N=1310)

4 categories: weekdays, weekday nights, week-end days, week-end nights

Period of the week	**Weekdays 04:00 – 21:59**	**Weeknights 22:00 – 03:59**	**Weekenddays 04:00 – 21:59**	**Weekendnights 22:00 – 03:59**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	85.23 82.82 – 87.35	85.41 68.88 – 93.93	84.18 79.72 – 87.92	85,49 67.02 – 94.47	84.99 82.95 – 86.82
Amphetamines	-	-	-	-	-
Cocaine	1.63 1.00 – 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
THC	0.00 0.00 – 0.41	0.30 0.01 – 11.84	4.72 2.86 – 7.67	1.16 0.08 – 15.31	1.15 0.70 – 1.89
Illicit opiates	0.40 0.15 – 1.05	0.00 0.00 – 11.31	0.00 0.00 – 1.22	0.58 0.02 – 14.36	0.30 0.12 – 0.78
Benzodiazepines	1.03 0.56 – 1.91	0.00 0.00 – 11.31	0.96 0.33 – 2.79	0.00 0.00 – 13.37	0.97 0.57 – 1.67
Z-drugs	**-**	**-**	**-**	**-**	**-**
Medicinal opiates and opioids	0.73 0.35 – 1.51	0.00 0.00 – 11.31	0.00 0.00 – 1.22	0.00 0.00 – 13.37	0.53 0.25 – 1.09
Alcohol	8.51 6.89 – 10.46	10.64 3.81 – 26.37	8.60 5.97 – 12.24	8.90 2.62 – 26.17	8.59 7.19 – 10.23
Alcohol+drugs	1.03 0.56 – 1.91	1.82 0.21 – 14.34	0.77 0.23 – 2.50	2.13 0.23 – 16.82	1.01 0.59 – 1.71
Drugs-drugs combi	1.44 0.85 – 2.42	0.91 0.06 – 12.87	0.62 0.17 – 2.28	0.58 0.02 – 14.36	1.22 0.75 – 1.97

When observing adjusted distribution of core substance categories by day of the week and time of the day, as shown in Table 8.7, it is interesting to note that driving under the influence of alcohol occurs in both day and night periods, but peaks at night. The prevalence of THC is the lowest during weekday, and the highest during weekend days and weekend nights; *vice versa* the use of cocaine appears evenly distributed along the week. However, it must be remembered that some time periods (e.g. DRUID time period 6, corresponding to weekend day, period 7 and period 3) were underrepresented ($n < 100$).

In Tables 8.8-8.10 are reported the results pertaining the use of alcohol according to concentration class, gender and age, time day of the week and time of the day.

Table 8.8. Adjusted general distribution of alcohol by concentration class (N=1310)

Alcohol alone	**Prevalence (%)**	**Confidence interval (%)**
Alcohol 0.1 – 0.49 g/L	3.35	2.51 - 4.47
Alcohol 0.5 – 0.79 g/L	2.02	1.39 - 2.94
Alcohol 0.8 – 1.19 g/L	1.81	1.22 - 2.69
Alcohol ≥ 1.2 g/L	1.40	0.89 - 2.19
In total	8.59	7.19 - 10.23

Table 8.9 Adjusted distribution of *alcohol alone* by gender and age (N= 1310)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	3.18 1.62 - 6.15	2.48 1.30 - 4.71	3,87 2,31 - 6,42	0,21 0,00 – 8,47	3,05 2.15 – 4.31
0.5 – 0.79 g/L	1.82 0.75 - 4.34	0.75 0.24 - 2.34	2.40 1.25 – 4.57	8.69 3.35 – 20.71	1.96 1.26 – 3.02
0.8 – 1.19 g/L	2.82 1.38 - 5.68	0.65 0.19 - 2.19	2.67 1.43 – 4.91	3.42 0.79 – 13.58	2.03 1.32 – 3.11
≥ 1.2 g/L	1.66 0.66 - 4.13	1.49 0.65 - 3.39	1.15 0.45 – 2.89	-	1.35 0.79 – 2.27
In total	9.48 6.44 - 13.74	5.38 3.46 - 8.27	10.08 7.37 – 13.66	12.32 5.54 – 25.20	8.39 6.82 – 10.27
Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	2.56 0.62 – 10.03	9.48 4.89 – 17.61	-	15.24 6.02 – 33.55	4.31 2.56 – 7.17
0.5 – 0.79 g/L	0.08 0.00 – 5.97	8.19 4.01 – 16.01	0.03 0.00 – 2.72	-	2.24 1.09 – 4.55
0.8 – 1.19 g/L	0.16 0.00 – 6.11	0.44 0.04 – 5.16	2.12 0.72 – 6.05	-	1.11 0.40 – 2.99
≥ 1.2 g/L	5.19 1.84 – 13.75	0.22 0.01 – 4.76	1.06 0.24 – 4.47	-	1.57 0.67 – 3.64
In total	7.98 3.44 – 17.41	18.35 11.54 – 27.91	3.21 1.33 – 7.58	15.24 6.02 – 33.55	9.22 6.49 – 12.94
In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	3.05 1.64 – 5.60	3.85 2.41 – 6.11	2.77 1.65 – 4.62	5.76 2.26 – 13.91	3.35 2.51 – 4.47
0.5 – 0.79 g/L	1.47 0.61 – 3.52	2.21 1.19 – 4.07	1.73 0.90 – 3.30	5.48 2.10 – 13.54	2.02 1.39 – 2.94
0.8 – 1.19 g/L	2.29 1.12 – 4.61	0.61 0.19 – 1.90	2.51 1.46 – 4.29	2.16 0.50 – 8.85	1.81 1.22 – 2.69
≥ 1.2 g/L	2.36 1.17 – 4.71	1.24 0.55 – 2.79	1.12 0.50 – 2.50	-	1.40 0.89 – 2.19
In total	9.18 6.46 – 12.89	7.91 5.72 – 10.84	8.13 6.03 – 10.87	13.40 7.28 – 23.37	8.59 7.19 – 10.23

Table 8.10 Adjusted distribution of *alcohol alone* by day of the week and time of the day (N=1310)

4 categories: weekdays. weekday nights. week-end days. week-end nights

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekenddays 04:00 – 21:59	Weekendnights 22:00 – 03:59	In total
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	2.98 2.07 – 4.27	2.43 0.34 – 15.28	4.72 2.86 – 7.67	1.55 0.13 – 15.92	3.35 2.51 – 4.47
0.5 – 0.79 g/L	2.16 1.40 – 3.29	1.52 0.15 – 13.85	1.68 0.73 – 3.80	1.93 0.20 – 16.53	2.02 1.39 – 2.94
0.8 – 1.19 g/L	1.85 1.16 – 2.92	2.74 0.42 – 15.74	1.58 0.67 – 3.67	2.13 0.23 – 16.82	1.81 1.22 – 2.69
≥ 1.2 g/L	1.52 0.91 – 2.52	3.95 0.79 – 17.53	0.62 0.17 – 2.28	3.29 0.50 – 18.56	1.40 0.89 – 2.19
In total	8.51 6.89 – 10.46	10.64 3.81 – 26.37	8.60 5.97 – 12.24	8.90 2.62 – 26.17	8.59 7.19 – 10.23

In total, alcohol prevalence is 8.59 % with confidence interval 7.19 – 10.,23; however it must be highlighted that the zero tolerance approach was not in force in Italy during DRUID roadside survey sampling period, and the legal limit for DUI was 0.5 g/L. Considering only the class ≥ 0.5 g/L, the total prevalence for DUI of alcohol according to Italian law is reduced to 5.24 %. The highest prevalence occur in the time period 22:00 – 03:59, either during week or weekend. In the same time period are the highest concentrations (≥ 1.2 g/L) observed more frequently (3.95 and 3.29%). When observing distribution by age, the highest frequency is observed for the group ≥ 50; however, in this group no concentration ≥ 1.2 g/L was observed in both the male and female groups. Conversely, the highest concentration category is mostly represented in the groups 18 – 24.

8.5 Discussion

8.5.1 Representativeness

The Veneto region was chosen due to the vast number of rural, urban, provincial and state roads within the region. In total there are 7397 Km of state regional and provincial roads. It is important to note that, as previously stated, the police preferred to choose times of day and days that would be most dangerous. DUI of alcohol or drugs is according to Italian legislation, is a criminal offence and police, willing to enforce their prevention/repression activity, preferred to sample in time periods were a positive correlation between accident occurrence and use of alcohol/substances is known (Ferrara et al. 2000). As a matter of fact, in week night and weekend nights accidents are caused mainly by human factors, whereas in week day and weekend day heavy traffic conditions have the main impact on the frequency of accidents. This of course may have reduced the representativeness for the entire population, but, as stated in the Statistical section, correcting factors were applied for the traffic. As to the existence of bias, we must emphasize that 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 in Italy (see 8.5.3), evidencing that the sampled population can be considered a representative sample of Italy.

8.5.2 Effects of non response

There was no effect of non response, as detailed in section 3 above.

8.5.3 Highlights

A comparison between the results of DRUID roadside survey, Italian epidemiology data on use/abuse of substances, and available road side surveys was though of interest. Alcohol turned out to be the most prevalent substance in the sampled driving population: 8,59 %, with confidence interval 7.19 – 10,23; this result is in good agreement with the most recent epidemiology studies on alcohol use in Italy (2 - 5). In 2008, 28.3% of the Italian population drank alcohol daily, 41.7 % drank occasionally (irregularly), 26.2 % drank between meals. 9.4% of Italians are considered heavy drinkers, consuming excessive daily amounts of alcohol (more than 20 g/day for women, 40 g/day for men). A survey based on interviews in different Italian regions (either in the North, in the Middle or in the South of Italy) evidenced that about 14% of interviewed people admitted having driven a car or a motorcycle

after consuming 2 or more glasses of wine (10 – 12 g or more) in the previous 60 min. 14 % was the total prevalence for Italy, with regional distribution from 6 % in Campania (in the South) to 16 % in Val d'Aosta (in the North). In the same survey, people aged 65-69 admitted driving when under the influence of alcohol in 12 % of cases.
Considering the Italian law enforced during DRUID operations, the alcohol concentrations below 0,5 g/L (3.35 % of the total sample, 38 % of positive for alcohol only) cannot be considered DUI offences. Only recently, in August 2010, a zero tolerance approach has been introduced for people aged below 21 or during the first three years of driving license holding.
Wishing to compare our results to data gathered in other roadside surveys, we could use the DRUID 5.24 % prevalence of alcohol ≥ 0.5 g/L and compare it to 5.9 % of BAC ≥ 0.5 g/L (measured either by breathalyzers or "precursor tests") obtained by Police and Carabinieri in their activity in 2007 (on 790319 drivers stopped), or to 3.41 % obtained in 2008 on 1393467 drivers (6). The confidence intervals are not known. For the same year 2008, the Police obtained 9.33 %, of alcohol ≥ 0.5 g/L during weekend nights, whereas the DRUID weighted prevalence for the same time period is 7.35 %.
As far as drugs, a clear distinction must be made between illicit and licit ones (benzodiazepines, medicinal opiates). For licit drugs, i.e. those that can be used when a medical prescription is presented, no road side survey is available for comparison.
For illicit drugs, recent surveys are only available for selected time periods, namely weekend nights, and for selected locations (e.g. streets near discos or pubs). In those cases, up to 47 % of positive for illicit drugs and/or alcohol was obtained (7, 8) with 27.8 % of positive for alcohol, 10.2 for illicit drugs only, and 8.7 % alcohol combination with drugs. Older data, given by Police and regarding 2004, reported 11481 positive drivers for drugs but no data on the whole number of stopped drivers was available and the prevalence was mathematically estimated to be 12.4 % (9). To get a more general view, we were able to compare our data to epidemiology studies.
In DRUID roadside survey, the most prevalent illicit drug is cocaine (1.25 % total population), followed by THC (1.15 %) and illicit opiates (0.30 %). The same trend has been observed in the 2009 National report to the European Monitoring Center for Drugs and Drug Addiction (EMCDDA) (10) presenting studies conducted in 2008 on the general population and providing information on trends in illegal drug use. Cocaine use in Italy, both occasional and frequent, seems to be considerably higher than the European average, and particularly prevalent in the male population between 15 and 34 years of age. For both genders, the youngest subjects, between 15-24 years of age, and those between 25-34, report having used cocaine over the course of the last year, in the highest percentages (15-24 years of age: m=3.27%; f=2,0%; 25-34 years of age: m=4.97%; f=2.14%). Prevalence of use decreases steadily in the older age groups, reaching 1.79% and 0.86% for men in the groups aged between 35-44 and 45-55 respectively, and 0.43% and 0.17% for women. For men aged between 55-64, the prevalence of use is 0.38% while for women it is near 0%. The trend that emerged confirm that there has been a steady increase in cocaine frequent use in the Italian population (1.6 % total prevalence) starting from 2001 to 2008, with men having a greater propensity for it than women. These data are in agreement with our results (1.15 %), when we consider that people under 18 was excluded in our study and that the 1.15 % value does not include cocaine in combination with alcohol or other drugs.
According to the information gathered in population surveys conducted between 2001 and 2007/08, the use of cannabinoids has also risen steadily giving Italy one of the highest incidences of use among the European countries: 1.34% of the Italian population uses cannabis frequently. The highest prevalence is in subjects ranging between 15-24 years of age with similar incidence among women and men. The total prevalence in the DRUID roadside survey is comparable (1.15 % for cannabis alone, excluding combinations).
Lastly, 0.15% of the Italian population sample reported frequent use of heroin, whereas 1.57% reported having tried heroin at least once in their lives, and 0.39% reported having used it in the course of the twelve months prior to completing the questionnaire. In the roadside data base a 0.30% prevalence was observed.
The frequent use of stimulant drugs (amphetamines, ecstasy) was reported by 0.04% only of the Italian population sample, a much lower incidence in comparison to the European average; in the roadside survey the weighted incidence is, accordingly, 0 %.
In the National Report to the EMCDDA, a strong tendency toward polydrug use was observed and a high incidence of combined use of alcohol and tobacco with all other drugs was reported; in DRUID roadside survey, alcohol plus drug and drug/drug combinations account for 1.01 and 1.22 % of the total population respectively, their incidence being comparable to those of cocaine or THC alone.

8.6 Acknowledgments

The roadside survey described in this report was carried out in close cooperation with five police departments: Padova, Rovigo, Treviso, Venice, and Vicenza. The authors are grateful to the police staff and executive personnel for their dedication to make the survey possible.

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Annex 8.1. Methods of analysis

Sample collection

For the preparation of blanks, calibrators and quality control samples, a pool of drug-free OF was prepared from samples from 8 healthy volunteers.

Method 1. Liquid chromatography/tandem mass spectrometry for the analysis of illicit drugs and medicines (excludingTHC and THC-COOH)

Chemicals.

The 30 *target analytes* and the *internal standards* are listed in Table 1. Stock solutions in methanol or acetonitrile at 1 g/L or 100 mg/L were supplied by Cerilliant (Round Rock, TX, USA) and Lipomed (Arlesheim, Switzerland).

Standard solutions.

From individual stock solutions mixed working solutions in methanol at 12.5 mg/L, 2.5 mg/L, 0.5 mg/L and 0.05 mg/L were prepared with the exception of zopiclone. The IS stock solutions were diluted in methanol to give a mixed working solution of 4 mg/L. Zopiclone working solution in acetonitrile at 10 mg/L, 1 mg/L, 0.1 mg/L and 0.01mg/L were prepared weekly and not mixed with the other substances.

Sample preparation.

The samples were extracted by solid phase extraction (SPE) using Bond Elut Certify SPE (130 mg - 10 mL; Varian Inc, Palo Alto, CA, USA) columns. 1 ml blood samples were diluted with 6 ml of phosphate buffer, spiked with 20 □L of IS working solution, centrifuged and introduced into the SPE columns conditioned with methanol and phosphate buffer (0.1 M, pH 6). 500 □L OF sample centrifuged, diluted with 2 mL of phosphate buffer, spiked with 20 □L of IS solution, and into conditioned SPE columns. The calibrators and quality control samples were prepared from 1 mL blank blood samples or 250 □L blank oral with working solutions. The columns were washed with purified water, HCl 0.1 N, and methanol. The elution was carried out by of dichloromethane/isopropanol 90:10 (v/v) containing 2% of NH_4OH aqueous solution. Eluates were evaporated at room temperature under a stream of nitrogen and re-dissolved in 50 □L of 5 mM ammonium acetate buffer pH 5.0/acetonitrile (vol/vol, 10:90).

HPLC Chromatographic conditions.

An Agilent 1200 HPLC system (Agilent, Santa Clara, CA, USA) was used. The chromatographic separation was performed by a Waters Atlantis T3 (100 x 2.1 mm, 3 □m particle size) column at 40 °C using gradient elution with 5 mM ammonium acetate buffer pH 5.0 (phase A) and acetonitrile (phase B) at a flow rate of 0.3 mL/min. A gradient was programmed by increasing % B as follows: from 10% B to 25 % B in 4 min, hold for 3 min, to 40 % B in 5 min, to 60% in 4 min, to 90 % B in 2 min, hold for 2 min. An injection volume of 5 □L was used.

Mass spectrometry**.**

The HPLC system was combined with an Agilent MSD ion trap mass spectrometer (Agilent, Santa Clara, CA, USA) fitted with an Electrospray (ESI) ionization source. The mass spectrometer was operated in positive ion mode and in the multiple reaction monitoring (MRM) mode. For collisionally induced dissociations helium was used as a target gas and appropriate tickle voltage, tickle time and q_z values were determined for each substance. The MRM transitions with the corresponding collision voltage and retention time of the analytes and internal standards are presented in Table 1.

Validation results**.**

The method was validated in terms of specificity/selectivity, linearity, limits of quantitation (LOQ), intra-assay precision, inter-assay precision and accuracy (bias). No interferences were detected by analyzing 20 drug-free OF and blood samples. The calibration curves, prepared with six points ranging from 1 to 200 □g/L, showed r^2 ≥ 0.9889. The LOQ, expressed as the lowest analyte concentration which could be determined with an acceptable level of precision and bias (≤ 20 %), were in the range 1-50 □g/L for blood and OF, respectively. The intra- and inter-assay precision and accuracy were determined by measuring four replicates at two concentration levels (low and high) on four different days (n=16). Precision was expressed as the CV% of the measured values and was always < 15% in both blood and OF, with the exception of zopiclone. Details are given for OF in Table 1. The accuracy, expressed as bias, was always in the range ± 15 % at the two levels.

Method 2. Gas chromatography - mass spectrometry for the determination of THC and THC-COOH.

Chemicals.

Delta-9-tetrahydrocannabinol (THC),11-nor-9-carbooxy-tetrahydrocannabinol (THC-COOH) and the internal standards THC-d3 and THC-COOH-d3 in methanol at 100 mg/L were obtained from Cerilliant (Round Rock, TX, USA).

Standard solutions**.**

From individual stock solutions at 100 mg/L, mixed working solutions in methanol at 5 mg/L, 1 mg/L, 0.500 mg/L, 0.250 mg/L and 0.025 mg/L were prepared. The internal standard (THC-d3 and THC-COOH-d3) stock solutions at 100 mg/L were diluted in methanol to give a mixed working solution of 0.5 mg/L.

Sample preparation**.**

The samples were prepared by liquid-liquid extraction. To 2 ml blood. 5 mL of hexane/ethyl acetate (vol/vol, 90:10) containing 0.4% of glacial acetic acid and 40 □L of IS workin
500 □L of IS working solution were added. The calibrators and quality control samples were prepared by spiking 2 mL blank blood or 250 □L blank OF c
solutions. The samples were mixed by inversion for 15 min. After centrifugation, the organic phase was transferred to conical tubes and evaporated to dryness at 40 °C under a stream of nitrogen. To the dried extracts were added 50 (blood) or 30 (OF) □L of trimethylsilyl containing
1% of trimethylchlorosylane as derivitizing agent. Derivatization was achieved by heating at 75 °C for 20 min.

Gas chromatography conditions**.**

An Agilent 6890N gas chromatography (GC) system (Agilent, Santa Clara, CA, USA). The chromatographic separation was performed with an HP Ultra 1 Methyl Siloxane column (12 m x 200 µm o.d., 0.33 µm film thickness). Helium at a constant flow of 0.8 mL/min was used as a carrier gas. 1 (blood) or 2 (OF) □L of derivatized extracts were injected by splitless injection at 250°C . The initial oven temperature of 80 °C was held for 1 min, followed by an increase to 300°C at 25°C/min with 2 min hold.

Mass Spectrometry.

All mass spectrometric measurements were performed on an Agilent 5973 MS single quadrupole mass spectrometer (Agilent, Santa Clara, CA, USA). The single quadrupole was operated in Electron Ionization (EI) conditions (70 eV, 200 □A) and in sing
monitored: for THC ions at *m/z* 303, 371 and 386; for THC-COOH ions at *m/z* 371, 473 and 488; for the IS THC-d3 ions at *m/z* 306, 374 and 389; for the IS THC-COOH-d3 ions at *m/z* 374, 476 and 491.

Validation results.

No interferences were detected by analyzing 20 drug-free oral fluid or blood samples. The calibration curves, prepared with six points ranging from 0.2 to 20.0 □g/L THC and THC-COOH in spiked blood and OF, yielded r^2 ≥0.999. The LOQs resulted to be 0.2 □g/L for THC and THC-COOH in both fluids. The intra- and inter-assay precision and accuracy were determined by measuring four replicates at two concentration levels (1 □g/L and 5 □g/L) on four differe
was found to be 3.2 and 1.9 % and the inter-assay precision 3.5 and 2.3 % for the lower and higher concentration levels, respectively. The accuracy (bias) was found to be +1.2 and +0.8% for the lower and higher concentration levels, respectively.

Method 3. Saliva alcohol concentration by Headspace Gas Chromatography

Chemicals.

Absolute 200 proof ethanol, LC grade *iso*-propanol, sodium chloride, and sodium fluoride were obtained from Sigma Aldrich (Milan, Italy). Acetaldehyde, LC grade methanol, acetone, n-propanol, methyl,ethyl ketone and toluene were purchased from Merck Chemicals (Milan, Italy). Purified water was obtained with a Milli-Q system (Millipore).

Standard solutions**.** Ethanol working solutions in purified water at 1, 2 and 5 g/L were prepared and used for the validation and preparation of calibration curves. *Iso*-propanol (IS) working solution was prepared in purified water at 0.5 g/L. Ethanol Standards (0.05%, 0.08%, 0.10%, 0.20% and 0.30% w/v) NIST traceable were purchased from Cerilliant (Round Rock, TX, USA) and used as quality controls.

Sample preparation.

To 0.1 mL oral fluid in a 20 mL glass headspace vial were added 750 mg sodium chloride, 40 mg sodium fluoride, 0.5 mL of IS working solution and water to a final volume of 1.5 mL. The calibrators and quality control samples were prepared by adding to 0.5 mL blank blood samples or to water the appropriate working solution volumes. To 0.1 mL of OF in a 20 mL glass headspace vial were added 750 mg sodium chloride, 40 mg sodium fluoride, 0.1 mL of IS working solution and water to a final volume of 1.5 mL. The calibrators and quality control samples were prepared by adding to 0.1 mL water the appropriate working solution volumes.

Headspace-Gas Chromatography (HS-GC) conditions.

An Agilent 7694 gas chromatograph (GC) with flame ionization detector and a headspace autosampler was used. The chromatographic separation was performed on J&W DB-ALC1 (30 m x 0.534 µm x 3.00 µm) column. The GC operational parameters were: oven 50º C isothermal, injector 250 ºC,

detector (FID) 250 ºC, hydrogen flow 35 mL/min, Air flow 450 mL/min, Make-up gas (nitrogen) flow 22.6 ml/min. The injection was in split mode with a split ratio 1:50. The HS sampler parameters were: sample oven 75 ºC, sample equilibration 10 min, sample inject 1.00 min.

Validation results**.**

Volatiles were identified based on relative retention times compared to calibrators. Linearity was evaluated by the preparation of calibration curves with 5 points ranging from 0.01 to 0.05 %. w/v. The r^2 value for the linear regression curve was always 0.997 or greater. A study was run to evaluate the interferences of other volatile substances (acetaldehyde, methanol, acetone, isopropanol, toluene and methyl ethyl ketone). The peaks were resolved with a resolution better than 1 and a peak-to-valley ratio better than 90%. The precision, accuracy, and limit of quantitation (LOQ) were determined by ten replicate measurements of ethanol at different concentrations; precision was defined as the coefficient of variation (CV%); accuracy was defined as the deviations from the actual concentration. The LOQ was determined to be 0.010%. .At concentrations of 0.010, 0.050, 0.100, 0.200 and 0.300 % precisions were 1.8%, 0.4%, 0.2%, 0.5%,0.2% respectively and accuracies were +13.0% +8.5% -1.8% +0.6% -1.6%.

Validation parameters for core drugs and additional substances in OF. Low = LOQ, High = 5 x LOQ.

Compound	Rt (min)	Fragmentation amplitude (V)	Transitions *(m/z)*	IS	LOQ □g/L	R^2	Intra-assay % CV		Inter-assay %CV	
							Low	High	Low	High
6-Acetylmorphine (6-MAM)	6.4	1.10	328 → 268	cocaine D3	5	0.9961	6.2	4.5	10,0	9,8
7-aminoclonazepam	9.9	1.00	286 → 250	nordiazepam D5	1	0.9940	7.2	5.4	9.5	5.0
7-aminoflunitrazepam	11.7	1.00	284 → 135	nordiazepam D5	1	0.9920	4.3	4.2	13.8	9.1
alprazolam	17.2	1.20	309 → 281	nordiazepam D5	1	0.9889	8.5	9.8	14.8	13.0
amitriptyline	17.0	1.10	278 → 233	cocaine D3	5	0.9940	5.4	2.2	9.3	8.5
amphetamine	5.9	1.10	136 → 119	MDPA	25	0.9928	4.3	3.6	11.9	7.0
benzoylecgonine	7.7	1.20	290 → 168	benzoylecgonine D3	10	0.9942	4.1	4.3	13.5	12.8
bromazepam	14.7	1.00	316 → 182	nordiazepam D5	2	0.9918	3.7	3.2	14.1	10.5
buprenorphine	15.4	1.00	468 → 414	buprenorphine D4	5	0.9958	2.9	1.8	7.9	6.5
clonazepam	17.5	0.90	316 → 270	nordiazepam D5	1	0.9989	3.8	2.6	14.1	12.5
cocaine	9.9	1.00	304 → 182	cocaine D3	10	0.9928	4.6	5.4	10.7	5.9
codeine	4.9	1.00	300 → 215	cocaine D3	10	0.9972	3.8	2.5	11.1	14.3
diazepam	19.9	0.90	285 → 193	nordiazepam D5	5	0.9958	5.5	4.2	16.3	9.7
flunitrazepam	18.3	1.10	314 → 268	nordiazepam D5	1	0.9930	6.1	5.3	11.5	9.8
fluoxetine	17.3	1.20	310 → 148	cocaine D3	5	0.9990	3.5	2.9	12.4	8.7
ketamine	8.1	0.90	238 → 220	MDPA	20	0.9978	4.5	4.0	14.3	10.3
lorazepam	17.3	1.10	322 → 305	nordiazepam D5	1	0.9880	9.8	8.0	14.7	10.5
metamphetamine	6.6	1.10	150 → 119	MDPA	25	0.9928	6.0	4.5	12.3	8.8
methadone	17.2	1.20	310 → 265	cocaine D3	20	0.9989	3.1	2.8	8.5	6.5
methylendioxyamphetamine (MDA)	6.4	1.00	180 → 163	MDPA	25	0.9937	5.5	6.5	10.9	10.5
methylendioxyethylamphetamine (MDEA)	7.7	1.00	208 → 163	MDPA	25	0.9962	4.8	4.1	9.9	8.5
methylendioxymetamphetamine (MDMA)	6.9	0.90	194 → 163	MDPA	25	0.9948	5.9	4.2	8.0	6.6
morphine	2.2	1.10	286 → 201	cocaine D3	10	0.9989	5.0	3.2	7.7	6.6
norbuprenorphine	11.4	1.30	414 → 396	buprenorphine D4	5	0.9995	3.9	2.4	7.0	5.4
nordiazepam	18.5	0.90	271 → 208	nordiazepam D5	20	0.9943	5.5	4.9	9.1	8.7
olanzapine	8.2	1.20	313 → 256	MDPA	5	0.9961	4.0	3.5	5.8	6.0
oxazepam	16.9	0.80	288 → 241	nordiazepam D5	50	0.9921	3.7	2.9	8.1	7.2
venlafaxine	11.5	1.10	278 → 260	cocaine D3	5	0.9989	3.5	1.9	6.0	5.3
zolpidem	11.1	1.10	308 → 263	cocaine D3	20	0.9925	3.0	2.0	5.5	5.3
zopiclone	8.8	0.80	389 → 345	MDPA	10	0.9918	10.5	9.3	16.2	14.8
benzoylecgonine D3(IS)	7.6	1.00	293 → 171	-						
buprenorphine D4 (IS)	15.4	1.00	472 → 415	-						
cocaine D3 (IS)	9.9	1.00	307 → 185	-						
methylendioxypropylamfetamine (MDPA) (IS)	9.0	0.90	222 → 163	-						
nordiazepam D5	18.4	0.90	276 → 213	-						

9 Country report Lithuania

Authors: Marija Caplinskiene, Alvydas Pauliukevicius, Zita Minkuviene, Vaida Stankute

State Forensic Medical Service under the Ministry of Justice, Didlaukio 86E, Vilnius, Lithuania

9.1 Description of the roadside driver sample

In the Lithuania roadside surveys (RSS) have been carried out from 10th of April 2008 until 12th of May 2009 to assess the situation in Lithuania regarding the prevalence of alcohol and other psychoactive substances in drivers in the general traffic. The second objective of the roadside surveys was to collect control data for a case-control study to determine the risk of driving under the influence of psychoactive substances. In this case-control study cases are formed by seriously injured car drivers and controls are a representative sample of drivers from the driving population in the hospital's catchments area. For both the prevalence and the case-control calculations, the dataset has been weighed for the distribution of traffic by DRUID time period.

All studies were approved by Lithuanian Bioethics Commission according to the code of ethics on human experimentation established by the declaration of Helsinki (1964) and amended in Edinburgh (2000).

The uniform protocol on road side surveys and all procedures were prepared and adapted by the working paper "Uniform design and protocols for carrying out case-control studies" (revision date: 29/06/2007) of the DRUID project and were set up in progress. Information and the design on uniform road side surveys were sent to the Lithuanian Police and other respective state institutions. The uniform questionnaire forms in Lithuanian language for road side surveys were prepared. TMI DRUID researchers team for road side surveys appointed. Toxicological analyses protocol completed. The uniform protocol for road side surveys was sending for Lithuanian Bioethics Commission for approval.

The meetings were organized with Lithuanian Police representatives on the uniform protocol for road side surveys, all details were discussed, the responsible persons were appointed. Dissemination activities carried out by information leaflet about the project and distributed during the road side survey. The continuing the DRUID advertising campaign via mass media (during project period) the information articles about the DRUID project were published in the public journals (“VEIDAS”, “MOKSLAS IR TECHNIKA”), information about the project were spread by LT-radio.

9.2 Roadside data collection and analysis

9.2.1 Characteristics of the roadside sample

Both foreign and domestic drivers were included if they drove a passenger car or a van (domestic car drivers B category). The following information was collected for participants: date, time, gender, age, road type, clinical signs of impairment, self-reported drug use and for refuses the reason of refusal. The type of body fluid that was collected was whole blood.

12 different research sites were selected, distributed over the different areas in the research regions. The main selection criteria were: traffic flow, possibilities for drivers to avoid the research site, safe working conditions. Almost all sites were selected along main municipal and provincial roads. During the period 2005-2009, these road types accounted for approximately 90% of serious injury crashes in the Lithuania.
Table 9.1 presents the distribution of the survey sample by road type. The roadside samples are almost evenly spread over the urban and rural roads.

Table 9.1. Distribution of the survey sample by road type

Road type	Road side sample
Urban	(52%)
Rural	(48%)
Total	**(100%)**

As stated before, the roadside survey sessions have been distributed over all seasons of the year. This distribution is present in table 9.2. Almost three quarters of all samples have been collected in the second half of the year.

Table 9.2. Distribution of the roadside sample by season

Season of the year	Roadside sample
January- March	(16%)
April- June	(10%)
July- September	(33%)
October- December	(41%)
Total	**(100%)**

The distribution of the survey sample over the eight different time periods is presented in table 9.3. 55 roadside survey sessions were conducted during the period from 10th of April 2008 until 12th of May 2009. In each time of the DRUID time periods at least one roadside survey session took place, the period 5 was problematic as no samples were collected regarding a very low traffic during this time period.

Table 9.3 Distribution of the roadside sample by DRUID time period

DRUID time period	Road side sample
1	(3%)
2	(14%)
3	(30%)
4	(2%)
5	(0%)
6	(32%)
7	(18%)
8	(1%)
In total	**(100%)**

Most samples were collected in the afternoon (10-16) and evening (16-22) during both weekdays and the weekend. Only a small fraction of the total number of samples (6%) was collected in the other time periods with even no samples from time period five. The skiff sampling was due to a traffic volume.

Table 9.4 Distribution of the roadside sample by age and gender

Age	Male	Female	Total
18-24	191 (16%)	23 (15%)	214 (16%)
25-34	299 (25%)	43 (29%)	342 (25%)
35-49	424 (35%)	34 (23%)	458 (34%)
50+	286 (24%)	50 (33%)	336 (25%)
Unknown	12 (1%)	0 (0%)	12 (1%)
Total	1200 (100%)	150 (100%)	1350 (100%)

Most samples (89%) were collected from male drives. The distribution by age was quite comparable for males and females.

9.2.2 Driver selection and data collection procedures

Randomly selected drivers were stopped by the police at the request of the acting researcher. The interviewer and nurse were interviewing the driver and taking the blood sample. Participation was on a voluntary basis. Drivers, who agreed to cooperate, were interviewed on their drug and medicine use. The results for each driver were entered on a uniquely numbered research form. The same form was used for responders and non-responders. Subsequently, subjects were requested to produce a blood specimen. A trained research nurse performed the venapuncture. All specimens were numbered; the numbers corresponding with those of the subjects' research forms. The interviewing and sampling of blood took place in a specially equipped mobile research unit with enough space to accommodate the research team and two subjects or in stationary Lithuanian Police check point station. Breath testing was not performed during the RSS. Apart from self-reported drug use and time of administration, data collection also comprised date and time of selection, gender and age of the subject, and signs of impairment. For non-responders the unified protocol form was full filled, indicating the reason on rejecting.

9.2.3 Description of method for toxicological analyses

The blood samples were collected in 6 ml vacuum blood tubes, made by „Vacuette“ firm with Na+ fluoride and K+ oxalate. The sample shipping and storage were done by DRUID guidelines. All analyses on DRUID core substances were done in TMI Toxicology Lab in Vilnius. The toxicology Lab undergoes all proficiency tests (Round Robin test) for detection substances in blood. The samples storage was in TMI Toxicology Lab in -20°C.

The methods used in TMI Toxicology Lab were following: for ethanol detection in blood was done using GC/HS method (the amount of blood used were 0,2 ml); for amphetamines, cocaine and opiates, cannabinoids detection in blood were done using GC-MS method (from 1 ml blood each); for benzodiazepines detection were used HPLC and GC-MS (from 1 ml of blood). All detailed information on toxicological methods is described in **Annex 9.1.** The methods used for toxicological analyze in TMI Toxicology Laboratory and **Annex 9.2.** The Validation data (reproducibility).

9.2.3.1 Bioethical issues

TMI submitted all the necessary documents required for receiving the permission for implementation of the DRUID project in Lithuania to the Lithuanian Bioethical Committee in November, 2007. The documents were prepared following the Committee's previous recommendations and remarks.

The preliminary written consent (including some remarks) from the Committee was received at TMI on November 21, 2007 (Lithuania's Bioethical Committee's official letter No.6B-07-386 (Code 07-11-01).

9.2.3.2 Data and sample collection issues
Data and sample collection in Task 2.2a, 2.2b, 2.3 has been started following the relative protocols, procedures and other requirements.

9.2.3.3 Toxicological issues
Toxicological methods regarding the sample analyses in the above tasks have been set up in the TMI Toxicology lab in Vilnius. During the joint workshop at LMU (Muenchen, February 18-22, 2008) TMI experts-toxicologists have undergone inter-lab quality control. The TMI Toxicology lab undergo Round Robin test - the proficiency testing to be performed by DRUID partners.

9.2.3.4 Research area and selection of research sites

The control drivers were taken at random from moving traffic in the following research regions of Lithuania – in Vilnius, Kaunas, Klaipeda and Alytus regions, in main urban and rural roads. These research regions of Lithuania were based on the geographical distribution of population over the country, accounting for 3,350 mln. Inhabitants (see picture No.1 Map LT – 4 RSS research regions in Lithuania).

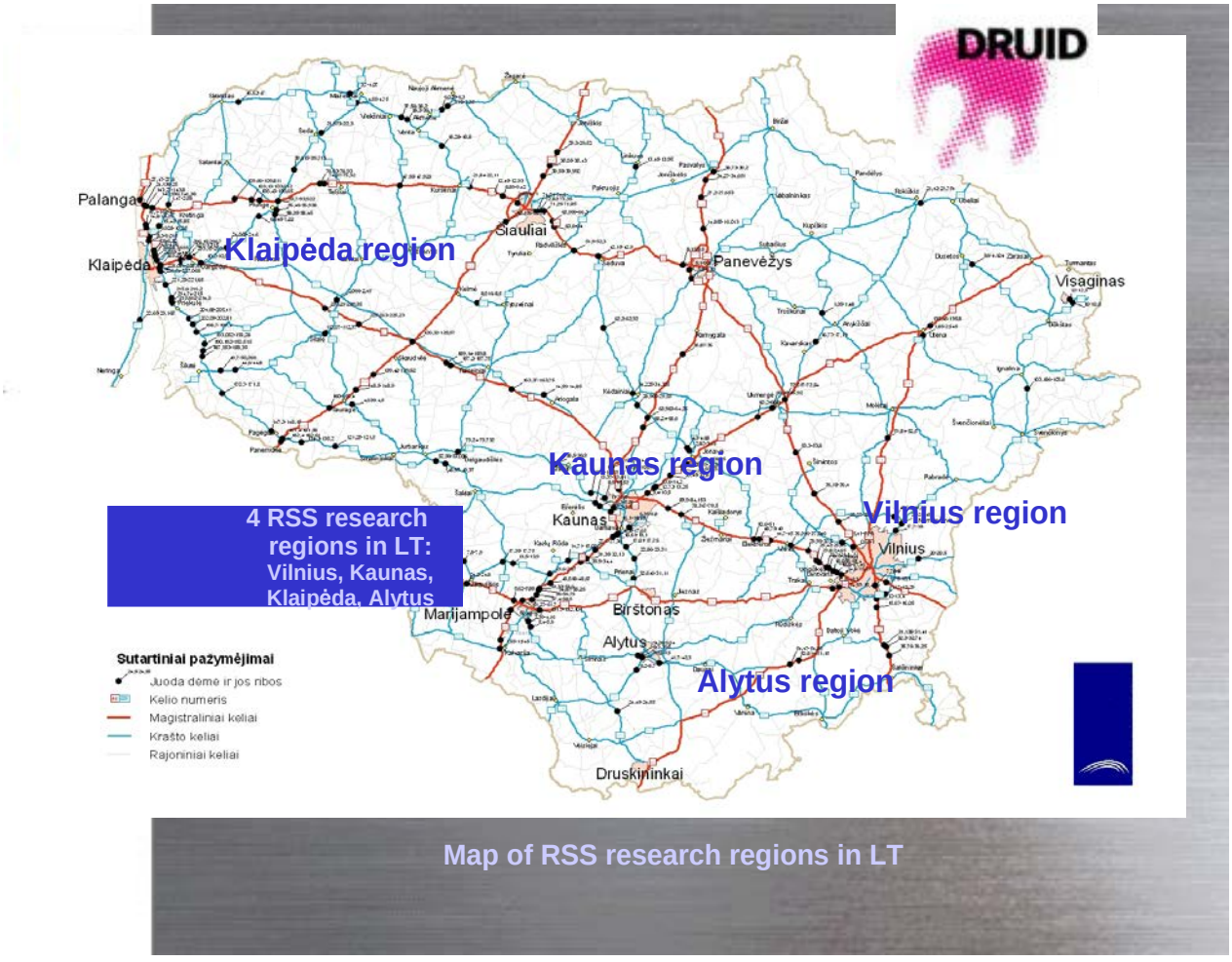

Figure 9.1 Map LT – 4 RSS research regions in Lithuania

The survey was carried out during the four quarters of the year (winter – month 1-3, spring – 4-6, summer – month 7-9, autumn – month 10-12), during the daytime and night time on weekdays and weekends using time intervals of the week according to DRUID project time periods. The expected

number of samples (whole blood) was approximately 1500. The personnel in charge of stopping the vehicles at the check points were police staff, the personnel in charge of filling in the driver information/case study report were members of the researcher team and the personnel in charge of taking the blood samples were licensed nurses.

9.2.3.5 Data collection procedure
Car drivers were randomly selected and stopped by police officers at the check points. The researcher filled in the driver information/case study report and the nurses took the blood samples using vacuum tubes.

The transportation and storage: the 5-10 mL whole blood was collected in vacuum tubes containing sodium fluoride and potassium oxalate, transportation at 4°C (max. 48 hours) to the Toxicology Lab of TMI, storage in laboratory at -20°C.

9.3 Non-response

The total number of randomly selected drivers (incl. refuses) - 1731. The total number of interviewed drivers performed – 1726. The total number of blood-sampled drivers was 1323. The response rate was 76%. The total number size of Data Base (DB) of Lithuanian RSS was 1318.

Table 9.5 Distribution of drivers by gender non-response

		Refusals (non-response)	Respondents (Volunteers)	Total
Gender	Male	127 (33,3%)	1200 (88,9%)	1327
	Female	254 (66,7%)	150 (11,1%)	404
	Unknown	0 (0%)	0 (0%)	0
Total		381 (100%)	1350 (100%)	1731

The non-responses group were in age from 18-31, two third of this group were female. The main reason of rejection was the lack of time. No signs of impairment in this group were observed.

9.4 Results

The analytical results for mutually exclusive substance groups weighted for time period for core substances are presented in Table 9.6. The results by age and gender are presented in Table 9.7 and by time period in Table 9.8. A dummy variable has been included to create a better presentation of the results in SAS. 45 records have been deleted since they did not contain any substance values for blood. In total 1264 records were included. A factor 1.04 was added to the traffic distribution per time period to correct for missing time period 5 that accounted for 4%.

Table 9.6 Adjusted general distribution of core substance categories (N=1264)

Substance	percent	lower	upper
00 negative	94,49	93,09	95,61
01 amphetamines	0,22	0,07	0,66
02 cocaine	-	-	-
03 THC	-	-	-
04 illicit opiates	-	-	-
05 benzodiazepines	1,41	0,90	2,23
06 Z-drugs	-	-	-
07 medicinal opiates and opioids	-	-	-
08 alcohol	3,86	2,93	5,06
09 alcohol-drugs combinations	0,03	0,00	0,36
10 drug-drug combinations	-	-	-
	100,00		

Table 9.7. Adjusted distribution of core substance categories by gender and age (N=1264)

Male	18-24	25-34	35-49	50+	Total
Negative	95,21 *90,68 - 97,60*	96,07 *93,05 - 97,81*	95,39 *92,96 - 97,02*	93,43 *89,89 - 95,79*	94,88 *93,45 - 96,01*
Amphetamines	0,00 *0,00 - 2,38*	0,32 *0,05 - 1,98*	0,00 *0,00 - 0,90*	0,00 *0,00 - 1,36*	0,08 *0,01 - 0,47*
Benzodiazepines	0,24 *0,02 - 2,83*	0,00 *0,00 - 1,40*	0,21 *0,03 - 1,28*	2,91 *1,48 - 5,61*	0,82 *0,43 - 1,52*
Alcohol	4,54 *2,24 - 9,01*	3,60 *1,96 - 6,55*	4,40 *2,82 - 6,80*	3,52 *1,91 - 6,40*	4,20 *3,18 - 5,52*
Alcohol-drugs combinations	0,00 *0,00 - 2,38*	0,00 *0,00 - 1,40*	0,00 *0,00 - 0,90*	0,14 *0,01 - 1,62*	0,03 *0,00 - 0,40*

Female	18-24	25-34	35-49	50+	Total
Negative	88,70 *65,71 - 96,98*	99,24 *91,59 - 99,94*	97,66 *86,77 - 99,62*	52,73 *30,84 - 73,62*	90,77 *84,30 - 94,74*
Amphetamines	11,30 *3,02 - 34,29*	0,00 *0,00 - 7,06*	0,00 *0,00 - 9,35*	0,00 *0,00 - 18,35*	1,53 *0,40 - 5,63*
Benzodiazepines	0,00 *0,00 - 19,00*	0,00 *0,00 - 7,06*	2,34 *0,38 - 13,23*	45,02 *24,60 - 67,26*	7,07 *3,70 - 13,06*
Alcohol	0,00 *0,00 - 19,00*	0,76 *0,06 - 8,41*	0,00 *0,00 - 9,35*	2,25 *0,19 - 21,84*	0,64 *0,09 - 4,21*
Alcohol-drugs combinations	0,00 *0,00 - 19,00*	0,00 *0,00 - 7,06*	0,00 *0,00 - 9,35*	0,00 *0,00 - 18,35*	0,00 *0,00 - 3,07*

Total	18-24	25-34	35-49	50+	Total
Negative	94,60 *90,18 - 97,10*	96,57 *93,97 - 98,07*	95,58 *93,29 - 97,11*	91,08 *87,27 - 93,82*	94,49 *93,09 - 95,61*
Amphetamines	1,06 *0,28 - 3,96*	0,27 *0,04 - 1,67*	0,00 *0,00 - 0,83*	0,00 *0,00 - 1,28*	0,22 *0,07 - 0,66*
Benzodiazepines	0,22 *0,02 - 2,57*	0,00 *0,00 - 1,18*	0,38 *0,10 - 1,48*	5,35 *3,31 - 8,53*	1,41 *0,90 - 2,23*
Alcohol	4,12 *2,02 - 8,19*	3,16 *1,73 - 5,69*	4,04 *2,59 - 6,26*	3,45 *1,89 - 6,20*	3,86 *2,93 - 5,06*
Alcohol-drugs combinations	0,00 *0,00 - 2,16*	0,00 *0,00 - 1,18*	0,00 *0,00 - 0,83*	0,13 *0,01 - 1,53*	0,03 *0,00 - 0,36*

Table 9.8 Adjusted distribution of core substance categories by day of the week and time of the day (N=1264)

Timeperiod	weekday 04:00-21:59	weekday 22:00-03:59	weekend 04:00-21:59	weekend 22:00-03:59	Total
Negative	94,26 *92,59 - 95,57*	96,15 *82,65 - 99,24*	94,58 *91,16 - 96,72*	100,00 *86,63 - 100,00*	94,49 *93,09 - 95,61*
Amphetamines	0,29 *0,09 - 0,88*	0,00 *0,00 - 11,28*	0,00 *0,00 - 1,43*	0,00 *0,00 - 13,37*	0,22 *0,07 - 0,66*
Benzodiazepines	1,81 *1,14 - 2,88*	0,00 *0,00 - 11,28*	0,29 *0,04 - 1,96*	0,00 *0,00 - 13,37*	1,41 *0,90 - 2,23*
Alcohol	3,64 *2,62 - 5,03*	3,85 *0,76 - 17,35*	4,99 *2,95 - 8,31*	0,00 *0,00 - 13,37*	3,86 *2,93 - 5,06*
Alcohol-drugs combinations	0,00 *0,00 - 0,40*	0,00 *0,00 - 11,28*	0,15 *0,01 - 1,70*	0,00 *0,00 - 13,37*	0,03 *0,00 - 0,36*

The analytical results for alcohol by concentration class are presented in Table 9.9. The results by age and gender are presented in Table 9.10. and by time period in Table 9.11.

Table 9.9 Adjusted general distribution of alcohol by concentration class (N=1264)

BAC	percent	lower	upper
1 alcohol 0.1-0.49	1,55	1,00	2,39
2 alcohol 0.5-0.79	0,43	0,19	0,97
3 alcohol 0.8-1.19	0,41	0,18	0,94
4 alcohol 1.2+	1,47	0,94	2,29
SUM	3,86	2,93	5,06

Table 9.10 Adjusted distribution of alcohol alone by gender and age (N=1264)

Male	18-24	25-34	35-49	50+	Total
1 alcohol 0.1-0.49	2,89 *1,19 - 6,82*	1,39 *0,53 - 3,61*	1,63 *0,79 - 3,34*	0,80 *0,23 - 2,71*	1,68 *1,08 - 2,61*
2 alcohol 0.5-0.79	0,31 *0,03 - 2,94*	0,46 *0,10 - 2,22*	0,76 *0,27 - 2,14*	0,17 *0,02 - 1,69*	0,47 *0,21 - 1,07*
3 alcohol 0.8-1.19	0,24 *0,02 - 2,83*	0,32 *0,05 - 1,98*	0,50 *0,14 - 1,75*	0,31 *0,05 - 1,93*	0,45 *0,19 - 1,03*
4 alcohol 1.2+	1,11 *0,28 - 4,26*	1,43 *0,55 - 3,66*	1,51 *0,71 - 3,18*	2,23 *1,04 - 4,73*	1,59 *1,01 - 2,49*
SUM	4,54 *2,24 - 9,01*	3,60 *1,96 - 6,55*	4,40 *2,82 - 6,80*	3,52 *1,91 - 6,40*	4,20 *3,18 - 5,52*

Female	18-24	25-34	35-49	50+	Total
1 alcohol 0.1-0.49	- *- - -*	- *- - -*	- *- - -*	2,25 *0,19 - 21,84*	0,32 *0,03 - 3,66*
2 alcohol 0.5-0.79	- *- - -*	- *- - -*	- *- - -*	- *- - -*	0,00 *0,00 - 3,07*
3 alcohol 0.8-1.19	- *- - -*	- *- - -*	- *- - -*	- *- - -*	0,00 *0,00 - 3,07*
4 alcohol 1.2+	- *- - -*	0,76 *0,06 - 8,41*	- *- - -*	- *- - -*	0,32 *0,03 - 3,66*
SUM	0,00 *0,00 - 19,00*	0,76 *0,06 - 8,41*	0,00 *0,00 - 9,35*	2,25 *0,19 - 21,84*	0,64 *0,09 - 4,21*

Total	18-24	25-34	35-49	50+	Total
1 alcohol 0.1-0.49	2,61 *1,08 - 6,19*	1,17 *0,44 - 3,05*	1,49 *0,72 - 3,07*	0,88 *0,28 - 2,75*	1,55 *1,00 - 2,39*
2 alcohol 0.5-0.79	0,28 *0,03 - 2,67*	0,39 *0,08 - 1,87*	0,70 *0,25 - 1,96*	0,16 *0,02 - 1,59*	0,43 *0,19 - 0,97*
3 alcohol 0.8-1.19	0,22 *0,02 - 2,57*	0,27 *0,04 - 1,67*	0,46 *0,13 - 1,61*	0,30 *0,05 - 1,82*	0,41 *0,18 - 0,94*
4 alcohol 1.2+	1,00 *0,25 - 3,87*	1,32 *0,53 - 3,27*	1,39 *0,65 - 2,93*	2,11 *0,98 - 4,46*	1,47 *0,94 - 2,29*
SUM	4,12 *2,02 - 8,19*	3,16 *1,73 - 5,69*	4,04 *2,59 - 6,26*	3,45 *1,89 - 6,20*	3,86 *2,93 - 5,06*

Table 9.11 Adjusted distribution of alcohol alone by day of the week and time of the day (N=1264)

Time period	weekday 04:00-21:59	weekday 22:00-03:59	weekend 04:00-21:59	weekend 22:00-03:59	Total
1 alcohol 0.1-0.49	1,13 *0,63 - 2,03*	3,85 *0,76 - 17,35*	2,95 *1,49 - 5,75*	- *- - -*	1,55 *1,00 - 2,39*
2 alcohol 0.5-0.79	0,38 *0,14 - 1,02*	- *- - -*	0,69 *0,18 - 2,61*	- *- - -*	0,43 *0,19 - 0,97*
3 alcohol 0.8-1.19	0,46 *0,19 - 1,14*	- *- - -*	0,29 *0,04 - 1,96*	- *- - -*	0,41 *0,18 - 0,94*
4 alcohol 1.2+	1,67 *1,03 - 2,70*	- *- - -*	1,05 *0,35 - 3,16*	- *- - -*	1,47 *0,94 - 2,29*
SUM	3,64 *2,62 - 5,03*	3,85 *0,76 - 17,35*	4,99 *2,95 - 8,31*	0,00 *0,00 - 13,37*	3,86 *2,93 - 5,06*

Results on the roadside survey in Lithuania show that the prevalence of alcohol was 3.86%. The higher prevalence was found among male 4.2 percent than female 0.64 percent; no difference was found for male age groups. For females alcohol prevalence was higher in the age group of 50+. The higher prevalence of alcohol was found at weekend nights than during other periods of the week. 1.55% of the drivers were found to have alcohol concentrations 0.1-0.45 and 1.45% of the drivers BAC concentration of 1.2+. The alcohol and drugs combination was only found among 0.03 percent of the drivers.

The Benzodiazepines were detected in 1.41% of the samples and were thus the most prevalent medicinal drug group detected. The prevalence was higher among female drivers (7.07%) than among male drivers (0.82%). The prevalence was higher in age group 50+ for both genders. Benzodiazepines were commonly found during weekdays at daytime. During this time period the prevalence was 5.56 %.

Amphetamines were detected in 0.22% of the drivers. Among male drivers the prevalence was 0.08% but among female drivers the prevalence was much higher with 1.53%. Most users were in age group 18-24.

No cocaine, THC, illicit opiates, Z-drugs, medicinal opiates and opioids were found in collected blood samples.

9.5 Discussion

Lithuanian roadside survey and national data was collected from 10th of April 2008 until 12th of May 2009 assess the situation in country regarding the prevalence of alcohol and other psychoactive substances in drivers as control population. The research areas of Lithuania were based on the geographical distribution of population over the country, accounting for 3,350 mln. inhabitants in total. All collected blood samples were investigated in TMI Toxicology laboratory and the data was filled in a database.

Such studies on roadside survey in Lithuania done first time so there are no data available to compare with situation of previous years on driving population. Till now the main problem in driving population in Lithuania is the use of alcohol and relatively in high concentrations. It's critical important to use the DRUID project experience and data to do the future studies on driving population.

9.6 Acknowledgements

The roadside survey in Lithuania was carried out in close cooperation with Lithuanian Police in the following research regions of Lithuania – in Vilnius, Kaunas, Klaipeda, Alytus regions. The authors are grateful to the police staff and executive personnel for their dedication to make the survey a success. The TMI Toxicology Laboratory staff were investigated the collected blood samples.

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Annex 9.1

THE METHODS USED FOR TOXICOLOGICAL ANALYSE IN TMI TOXICOLOGY LABORATORY FOR:

AMPHETAMINES

LLE
1ml whole blood + 1ml H2O + 50µl IS + 200µl 8N NaOH + 5ml 1-chlorobutane. Vortex 1 min. Organic layer + 1ml 0,2N H SO Vortex 2 min.

2 4.
Aqueous layer + 100µl 8N NaOH + 1,2ml 1-chlorbutane**.** Vortex 2 min.
Organic layer +100µl tartaric acid in ethylacetate. Evaporate at 40°C, N Equipment: Caliper Turbo

2
Vap LV
Derivatisation
+ 50µl ethylacetate + 50µg HFBA. 20min. at 70°C. Equipment: Pierce Reacti-Therm III
+100µl tartaric acid in ethylacetateat. Evaporate at 40°C, N Equipment: Caliper Turbo Vap LV

2
Reconstitution:50µl ethylacetate.
IS:

Amfetaminas-D5	Cerilliant, 1mg/ml	1000 ng/ml
Metamfetaminas-D5	Cerilliant, 1mg/ml	1000 ng/ml
MDA-D5	Cerilliant, 1mg/ml	1000 ng/ml
MDMA-D5	Cerilliant, 1mg/ml	1000 ng/ml
MDEA-D5	Cerilliant, 1mg/ml	1000 ng/ml

Chromatographic conditions:
Chromatographic system: Agilent technologies 7890A
Column: DB-5ms (Agilent technologies, ID -0,25 mm, length – 30 m, 5% Phenyl Arylene polymer, non-polar)
Carrier gas: Helium
Temperature gradient: 100°C(1,0)→20°C/min→200°C→30°C/min→300°C(7)
Injection: 2µl
Mass Spec conditions:
MS system: Agilent technologies 5975C inert XL MSD with Triple Axis Detector; EI 70 V

Compound	**Rt**	**TIon (m/z)**	**QIon (m/z)**
Amphetamine-D5 (IS)	5.11	244	123
Amphetamine	5.13	240	91; 118
Methamphetamine-D5(IS)	6.03	258	213
Methamphetamine	6.06	254	118; 210
MDA-D5(IS)	7.67	167	268
MDA	7.69	162	240; 375
MDMA-D5(IS)	8.25	258	213
MDMA	8.27	254	162; 210
MDEA-D5(IS)	8.43	273	408
MDEA	8.45	268	240; 403

COCAINE and OPIATES

SPE
Columns: mixed mode, Grace 3 ml/200mg Drug-Clean, Alltech Associates
Sample:
1 ml whole blood + 4 ml H_2O + 50 µl IS
+ 2 ml phosphate buffer pH-6,2 (K_2HPO_4 x $3H_2O$)

Column conditioning	3 ml Methanol 3 ml H_2O 1 ml phosphate buffer pH-6,2
Washing:	2 ml H_2O 2 ml 0,1 N HCl 3 ml Methanol
Elution:	1 x 3 ml CH_2Cl_2/IPA/NH_4OH (78:20:2) 40 ml 2-propanol + 4 ml NH_4OH. Mix + 156 ml dichlormethane

Evaporate at 40°C, N_2 Equipment: Pierce Reacti-Therm III

Derivatisation
+ 50 µl Ethylacetate + 40 µl BSTFA. 20min. at 100°C. Equipment: Pierce Reacti-Therm III
IS:

ME-D3	Cerilliant, 0,1mg/ml	1000 ng/ml
Cocaine-D3	Cerilliant, 1mg/ml	1000 ng/ml
BE-D	Cerilliant, 1mg/ml	10 000 ng/ml
Codeine-D3	Cerilliant, 1mg/ml	2000 ng/ml
Morphine-D3	Cerilliant, 1mg/ml	2000 ng/ml
6MAM-D3	Cerilliant, 1mg/ml	2000 ng/ml

Chromatographic conditions:
Chromatographic system: Agilent technologies 7890A
Column: DB-5ms (Agilent technologies, ID -0,25 mm, length – 30 m, 5% Phenyl Arylene polymer, non-polar)
Carrier gas: Helium
Temperature gradient (opiates): 150C (3,0) → 10C/min. → 280C (0,0) → 40C/min. → 300C (8,0)
Temperature gradient (cocaine): 80C (4,0) → 40C/min. → 240C (6,0) → 30C/min. → 290C (0,0)
Injection: 2µl
Mass Spec conditions:
MS system: Agilent technologies 5975C inert XL MSD with Triple Axis Detector; EI 70 V

Compound	**Rt**	**TIon (m/z)**	**QIon (m/z)**
ME-D3(IS)	6,98	85	185; 274
ME	6,99	82	182; 271
Cocaine-D3(IS)	8,87	185	201; 306
Cocaine	8,88	182	198; 303
BE-D3(IS)	9,07	243	364
BE	9,08	240	256; 361
Codeine-D3(IS)	15,09	374	346
Diphenhydramine	9,62	58	152; 165
Tramadol	10,52	58	245; 335

Methadone	12,37	72	165; 178
Codeine	15,12	371	234; 343
Morphine-D3(IS)	15,47	432	417
Morphine	15,49	429	401; 414
6-MAM-D3(IS)	16,02	402	343
6-MAM	16,04	399	287; 340
Zolpidem	17,9	235	219; 307
Buprenorphine	23,44	450	482

CANNABINOIDS

SPE
Columns: non-polar, Chromabond C8 1 ml/100 mg, Macherey-Nagel Gmbh & Co.
Sample:
1 ml whole blood + 1 ml IS + 2 ml H_2O

Column conditioning 2x1ml Methanol
2x1ml H_2O

Washing: 1ml H_2O
1ml 0,25M acetic acid
1ml H_2O

Elution: 2x1ml Acetone

Evaporate at 40°C, N_2 Equipment: Caliper Turbo Vap LV

Derivatisation
+ 150 µl DMSO/TBAH (1ml: 980 µl DMSO/ 20 µl TBAH)
+ 50 µl Jodmethane, 25-30 min room temperature
+ 350 µl 0,1 M HCl + 1 ml Isooctane
Organic layer evaporate at 40°C, N_2 Equipment: Caliper Turbo Vap LV
Reconstitute in 40 µl Ethylacetate
IS:

THC-D3	Cerilliant, 0,1mg/ml	30 ng/ml
THC-OH-D3	Cerilliant, 0,1mg/ml	20 ng/ml
THC-COOH-D3	Cerilliant, 0,1mg/ml	30 ng/ml

Chromatographic conditions:
Chromatographic system: Agilent technologies 7890A
Column: DB-5ms (Agilent technologies, ID -0,25 mm, length – 30 m, 5% Phenyl Arylene polymer, non-polar)
Carrier gas: Helium
Temperature gradient: 150C (0,0) → 25C/min. → 280C (9,8)
Injection: 2µl
Mass Spec conditions:
MS system: Agilent technologies 5975C inert XL MSD with Triple Axis Detector; EI 70 V

Compound	**Rt**	**TIon (m/z)**	**QIon (m/z)**
THC-D3(IS)	6,03	316	248; 331
THC	6,04	328	245; 285

THC-OH-D3(IS)	6,69	316	260; 361
THC-OH	6,7	313	257; 358
THC-COOH-D3(IS)	7,35	316	360; 375
THC-COOH	7,36	313	357; 372

BENZODIAZEPINES

LLE

200µl whole blood + 100µl K_2HPO_4 (PBS pH-9,2) + 300µl organic mix from (n-Butylacetate and IS Flurazepam 200 ng/ml),
Vortex 1 min.

Derivatisation

50µl Upper organic layer transfer to chromatography vials + 10µl (MTBSTFA)Vortex 0,1 min., 20min. at 90°C. Equipment: Pierce Reacti-Therm III

IS:

Flurazepam Lipomed 200 ng/ml

Chromatographic conditions:

GC/NICI-MS system, Agilent 5975C inert XL el/cl MSD GC System
Column: Agilent 123-5731 DB-5HT, max. 400 ºC, 30 m, 0,320 mm, 0,1 µm particle size.
Carrier gas: Helium
Chemical ionization gas – methan (purity 5,5)
Temperature gradient: 180C (0) → 50ºC/min. → 325ºC → (2,0) Run Time- 4,9 min
Injection: 2µl

Mass Spec conditions:

Compound	**Retention time** (min)	**TIon (m/z)**	**QIon (m/z)**
Flurazepam (IS)	2,57	387	389
137Diazepam	2,05	284	286
Flunitrazepam	2,32	313	314
Oxazepam	2,49	268	270
Lorazepam	2,70	302	304
Alprazolam	2,84	308	310
Zopiclone	3,03	143	246
Nordazepam	2,11	234	384
7-amino-clonazepam	2,62	249	363
Clonazepam	2,73	429	431

ETHANOL

IS: 0,1 % 1-propanol

Chromatographic conditions:

Chromatographic system: Perkin Elmer Clarus 500 TurboMatrix110
Column 1: Elite BAC1 (PE: 0,18x10x1,0)
Column 1: Elite BAC2 (PE: 0,18x10x0,63)
Carrier gas: Helium
Temperature: 35C
Injection: 2µl

Controls for:

Benzodiazepines – Medidrug Benzodiazepine S, level 1 (serum cotrol). Remark: used serum control as not produsing the controls in blood.

Other – Medidrug BTMF 2/---B, drugs of abuse, whole blood control with reference values. Remark: produced year 06; 07 ir 08: 2/06-B; 2/07-B ir 2/08-B.

Alkohol – Medidrug Ethanol VB-plus, Blood alcohol- Whole blood control (human). Concentrations: 0,5 g/L; 0,8 g/L ir 1,1 g/L. Folowing concentrations produced: 0,2 g/L ir 4,0 g/L

Terms:

Benzodiazepines – Nr.1- Nr.400 – from 2008.10.01 till 2009.03.06.; Nr.401- Nr.1323 – from 2009.11.02. till 2009.12.02.

Other – Nr.1- Nr.970 – from 2008.10.01 till 2009.05.31.; Nr.971- Nr.1323 – from 2009.09.15. till 2009.11.01.

Annex 9.2

VALIDATION DATA (REPRODUCIBILITY)

Compound	Calibration points, ng/ml	Avg. ng/ml	RSD, %	Bias, %	LOD, ng/ml	LOQ, ng/ml
Diazepam	0;10;20;30;50;70;100;120	10,34 /49,7/ 101,11	10,83 /4,67/ 4,48	3,4 /-0,6/ 1,11	1,4	4,2
Flunitrazepam	0;10;20;30;50;70;100;120	11,8 /49,26/ 103,4	9,92 /10,90/ 4,46	18 /-1,5/ 3,4	1,2	3,6
Oxazepam	0;10;20;30;50;70;100;120	10,93 /51,3/ 102,22	14,36 /5,54/ 7,15	9,3 /2,6/ 2,22	3,2	9,8
Lorazepam	0;10;20;30;50;70;100;120	11,73 /50,4/ 102,91	14,66 /7,90/ 9,37	17,3 /0,8/ 2,91	2,3	7,0
Alprazolam	0;10;20;30;50;70;100;120	12,38 /51,64/ 102,67	5,25 /4,45/ 5,07	23,8 /3,3/ 2,67	2,6	7,9
Zopiclone	0;10;20;30;50;70;100;120	- /49,16/ 104,19	- /16,97/ 18,47	- /-1,7/ 4,19	6,1	18,4
Nordazepam	0;10;20;30;50;70;100;120	9,32 /49,65/ 103,31	13,63 /9,73/ 10,75	-6,8 /-0,7/ 3,31	1,8	5,5
7-amino-clonazepam	0;10;20;30;50;70;100;120	12,85 /51,8/ 95,43	22,18 /8,55/ 8,79	28,5 /3,6/ -4,57	3,8	11,4
Clonazepam	0;10;20;30;50;70;100;120	11,87 /52,89/ 101,52	15,25 /7,83/ 11,14	18,7 /5,8/ 1,52	1,7	5,0
Amphetamine	0;20;50;100;150;200;250;300	23,60/143,07/288,13	14,58/2,40/1,92	18/-5/-4	4,2	12,7
Methamphetamine	0;20;50;100;150;200;250;300	21,93/139,26/289,14	7,48/4,72/4,05	10/-7/-4	5,24	15,9
MDA	0;20;50;100;150;200;250;300	20,44/141,32/285,23	10,71/2,05/6,25	2/-6/-5	2,65	8,02
MDMA	0;20;50;100;150;200;250;300	21,63/133,58/277,62	3,24/1,91/1,61	8/-11/-7	2,33	7,1
MDEA	0;20;50;100;150;200;250;300	22,68/136,7/280,33	1,59/2,44/1,5	13/-9/-7	1,78	5,39
THC	0;2;4;6;8;10;12;14	-/9,58/14.58	-/3,44/2,47	19,75/4,1	0,84	2,54
THC-OH	0;2;4;6;8;10;12;14	2,08/8,61/13,70	4,33/3,14/14,45	4/7,63/-2,14	0,52	1,56
THC-COOH	0;10;20;30;40;50;60;70	11,04/46,06/63,55	5,34/3,34/10,95	10,4/15,5/-9,21	2,39	7,15
ME	0;10;20;30;40;50;60;70	-/35,93/59,18	-/6,74/14,26	-/-10,17/-15,46	4,56	13,82
Cocaine	0;10;20;30;40;50;60;70	10,42/39,2/69,92	9,69/4,69/3,7	4,2/-2/-0,11	3,71	11,25
BE	0;50;100;150;200;250;300;350	50,24/184,46/326.3	4,48/6,3/3,85	0,48/-7,77/-6,77	7,95	24,08
Diphenhydramine	0;10;25;50;100;150;200;250	112,87/221,77	11,32/21,31	12,87/-11,29	7,11	21,55
Tramadol	0;10;25;50;100;150;200;250	94,92/193,81	9,17/6,28	-5,08/-22,48	3,95	11,98
Methadone	0;10;25;50;100;150;200;250	8,94/96,86/198,04	14,32/2,97/8,12	-10,6/-3,14/-20,78	3,21	9,72
Codeine	0;10;25;50;100;150;200;250	10,79/99.36/251/83	1,76/2,21/3,37	7,9/-0,64/0,73	1,8	5,44
Morphine	0;10;25;50;100;150;200;250	-/104,9/217,17	-/12,4/3,58	-/4,9/-13,13	5,01	15,18
6MAM	0;10;25;50;100;150;200;250	10,94/95,14/248,02	4,94/1,32/3,12	9,4/-4,86/0,79	2,78	8,42
Buprenorphine	0;10;25;50;100;150;200;250	87/7/266.05	13,61/5,59	-12,3/6,42	5,22	15,82

10 Country report The Netherlands

Authors: Sjoerd Houwing[1], Rene Mathijssen[1], Marjan Hagenzieker[1], Beitske Smink[2]

[1] SWOV institute for Road Safety Research
[2] NFI Netherlands Forensic Institute

10.1 Description of the roadside driver sample

10.1.1 Introduction

In the Netherlands roadside surveys have been carried out from January 2007 until August 2009 to gain more insight in the prevalence of psychoactive substances among the driving population. A second objective of the roadside surveys is to collect control data for a case-control study to determine the risk of driving under the influence of psychoactive substances. In this case-control study cases are formed by seriously injured car drivers and controls are a representative sample of drivers from the driving population in the hospital's catchment area.
For both the prevalence and the case-control calculations, the dataset has been weighed for the distribution of traffic by DRUID time period.
72 roadside survey sessions were conducted, twelve in each of the six regions. In each time of the eight DRUID time periods at least one roadside survey session took place. The other four survey sessions were distributed according to the distribution of traffic or to the distribution of accidents and risk, depending whether the region was included in the DRUID hospital study or not.
Drivers were stopped by the police at the request of the acting research coordinator. As soon as one of the two interviewers/nurses was ready for interviewing and blood 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. Drivers who agreed to cooperate, were interviewed on their drug and medicine use. The results for each driver were entered on a uniquely numbered research form; see *Appendix A*. Subsequently, subjects were requested to produce a blood specimen. If they were not able or willing to do so, they were requested to deliver a saliva specimen. A trained research nurse performed the venapuncture. Subjects who delivered a blood specimen, received a € 10 reward. For oral fluid, they received € 5. All specimens were numbered; the numbers corresponding with those of the subjects' research forms.
Interviewing and sampling of body fluids took place in a specially equipped mobile research unit with enough space to accommodate the research team and two subjects. After the interview and the blood or saliva sampling, all subjects were breath-tested for alcohol by a police officer, using a *Dräger Alcotest 7410 Plus com* screening device. The breath test was compulsory for all stopped drivers. Breath test results were entered on the (anonymous) research form. Apart from self-reported drug use and time of administration, data collection also comprised date and time of selection, gender and age of the subject, and signs of impairment.

10.1.2 Geographical distribution of drivers over the country

Control drivers were selected at random from moving traffic in six different police regions. The choice of these districts was based on the geographical distribution of population over the country.

Figure 10.1 Geographical distribution of the roadside survey regions

The following police regions (and one district) were included: Amsterdam Amstelland, Hollands-Midden, Gelderland-Zuid, Twente, Groningen, and Tilburg, accounting for 3,7 million inhabitants in total. This is almost a quarter of the Dutch population.
Per police region around 20 different research sites were selected, distributed over the different areas in the police region. The main selection criteria were: traffic flow, (lack of) possibilities for drivers to avoid the research site, enough room for the research and police teams and their vehicles, safe working conditions. Almost all sites were selected along main municipal and provincial roads. During the period 2006-2008, these road types accounted for approximately 80% of serious injury crashes in the Netherlands.
In total 5064 drivers were asked to participate. 242 refused cooperation, and 4822 drivers were included.
Table 10.1 presents the distribution of the samples by survey region. Most of the drivers were included in Twente and Gelderland-Zuid. The lowest number of drivers was included in the Tilburg Region. The different numbers of included drivers between regions were a result of differences in traffic. These differences were caused by several reasons, e.g. weather conditions, distribution of the sampling periods over time and day, locations, and the size of the participating policeteam.

Table 10.1. Distribution of drivers by region (n=4822)

Region	Distribution of samples
Hollands-Midden	16.1%
Tilburg	15.2%
Amsterdam Amstelland	16.6%
Groningen	16.5%
Twente	18.4%
Gelderland-Zuid	17.3%

Traffic distribution numbers were not available for all six regions. For the region that traffic distribution was available the representativeness of these figures for traffic distribution is not optimal since the

available data did not represent the vehicle kilometers that are driven in the region, but the number of trips that started in the region.

10.1.3 Distribution by time period

Table 10.2 presents the distribution of drivers by time period. Over 70% of all included drivers were sampled during daytime hours (4 AM-10PM), while during these hours around 95% of vehicle kilometers are driven.

Table 10.2. Distribution of drivers by time period (n=4822)

Timeperiod	Distribution of samples	Distribution of traffic
Weekday 04:00-09:59	14.5%	22.0%
Weekday 10:00-15:59	13.4%	23.6%
Weekday 16:00-21:59	13.1%	26.9%
Weekday 22:00-03:39	14.0%	3.0%
Weekendday 04:00-09:59	8.2%	2.7%
Weekendday 10:00-15:59	8.5%	11.1%
Weekendday 16:00-21:59	15.2%	8.0%
Weekendday 22:00-03:39	13.1%	2.7%

Therefore, night time hours are overrepresented in the sample. The reason behind this is two-fold. The first reason is that police had a preference for roadside survey sessions during times and days where their normal alcohol enforcement would take place. The second reason for an overrepresentation of night time hours was to make sure that enough samples were gathered during times and days where the prevalence of psychoactive substances was expected to be high.

10.1.4 Distribution by quarter of the year

Table 10.3. Distribution of drivers by quarter of the year (n=4822)

Substance category	Distribution of samples
1st quarter (Jan-Mar)	21.3%
2nd quarter (Apr-Jun)	29.2%
3rd quarter (Jul-Sep)	25.9%
4th quarter (Okt-Dec)	23.6%

The distribution of drivers by quarter of the year is presented in table 10.3. The sampling of drivers is quite evenly distributed over the four quarters of the year. The share of sampled drivers in the first quarter of the year is the lowest (21.3%) and in the second quarter the share of sampled drivers is the highest (29.2%). Both quarters are close to the mean though.

10.1.5 Distribution by gender and age

Table 10.4 presents the distribution of the samples by age (divided over 4 age groups) and gender. Around 70% of the included drivers were males. This share was more or less the same for every age group. The number of drivers between 18 and 24 is lower than drivers from other age groups. However, this age group contains 7 years, whereas the other groups contain at least 10 years. For 5 drivers no age was recorded.

Table 10.4. Distribution samples by gender and age (n=4817)

Age group	Distribution of male drivers	Distribution of female drivers	Total distribution of samples
18-24 years old	68.5%	31.5%	13.0%
25-34 years old	70.4%	29.6%	23.0%
35-49 years old	69.0%	31.0%	34.3%
50 years and older	73.1%	26.9%	29.7%
Total ages	70.5%	29.5%	100%

10.2 Roadside data collection and analysis

10.2.1 Ethical approval

No ethical approval was needed in the Netherlands. After having been informed about the project, the Ethical Committee answered that “the project is not encompassed by the law on Ethical Committees and consideration regarding bio-medical research projects. Therefore, the project should not be announced to the ethical Committee”. Hence, no informed consent was requested.

10.2.2 Samples

Venous blood samples were collected from car drivers on a voluntary basis during a road side survey, and collected in glass tubes containing 20 mg sodium fluoride and 143 IU heparin sodium (BD Plymouth, UK). Oral fluid samples were taken by spitting into a polypropylene container (Deltalab, Spain).
During the road side survey, blood samples and oral fluid samples were stored in solid carbon dioxide at about -80˚C (dry ice). After transportation to the Netherlands Forensic Institute (NFI) in The Hague, blood samples and oral fluid samples were stored at -20˚C until analysis.

10.2.3 Analytical conditions

LCMS analysis was performed on a Water Acquity UPLC®-system with a Waters Quatro premier XE triple quadrupole mass spectrometer. Chromatography employed a reversed-phase UPLC ® column (BEH C-18, 100 x 2.1-mm i.d., 1.7 µm particle diameter) and a 17-min gradient elution (methanol / 10 mM ammonium bicarbonate pH 10.0, 5/95 to 95/5). The UPLC® injector was modified for on-line dilution of the injected sample to allow large injection volumes of acetone. The eluent was introduced to the electrospray source of the triple quadrupole MS instrument at a flow-rate of 500 µL/min. Molecular ions were fragmented using optimized collision-induced dissociation voltages for each compound (9 to 50 eV, positive ion mode). For each target-compound two MRM were monitored and for each deuterated internal standard one MRM was monitored.

10.2.4 Method of BAC quantification

BAC was measured in breath by means of hand hold alcolmetres of the police teams using a *Dräger Alcotest 7410 Plus com* screening device. The alcolmetres are calibrated to show a reading of 0.5 g/L ethanol when calibrated by means of breath containing 0.22 mg/L.
1 permille BAC in the Netherlands is equivalent to a breath alcohol result of 440 microgram per liter. This conversion factor was not the same as the conversion factor used in the DRUID project (2100). Therefore, all BAC results were multiplied by a factor 2300/2100.

10.2.5 Weighting factors for the control sample

The unweighted control sample could not be considered to be representative of all drivers who participated in road traffic in the six police districts at all days of the week and all times of the day, since the sample distribution over different times and days was not equal to the distribution of traffic volumes. The reason for this was the more or less constant sampling capacity of the research team, regardless of the traffic volumes that are strongly varying by day of the week (weekdays versus weekend) and by time of the day. Furthermore, the police had a quite understandable preference for enforcement activities during high-risk hours, i.e. the nighttime hours with low traffic volumes. So, in order to make the control sample representative for the whole week, it had to be weighted, based on traffic flow distribution over the various days of the week and times of the day.
In order to make the control sample representative of the general driving population in the Tilburg police district, it had to be weighted. The weighting procedure was based on 2007-2008 trip data collected by the Dutch Central Bureau of Statistics (CBS), following the weighting procedure that was applied in a previous case-control study by Mathijssen and Houwing *(2005).*
Table 10.5 provides an overview of the sample distribution, the traffic distribution and the resulting weightfactor.
Weekend nights and, to a lesser degree, weekday nights were strongly over-represented in the control sample. Drink driving is strongly concentrated in nighttime hours. As a consequence, drink driving was over represented in the unweighted control sample. Weighting the control sample solved this problem.

Table 10.5. Applied weighting factors

Timeperiod	Distribution of samples	Distribution of traffic	Weight factor
Weekday 04:00-09:59	14.5%	22.0%	1.52
Weekday 10:00-15:59	13.4%	23.6%	1.76
Weekday 16:00-21:59	13.1%	26.9%	2.05
Weekday 22:00-03:39	14.0%	3.0%	0.22
Weekendday 04:00-09:59	8.2%	2.7%	0.33
Weekendday 10:00-15:59	8.5%	11.1%	1.31
Weekendday 16:00-21:59	15.2%	8.0%	0.53
Weekendday 22:00-03:39	13.1%	2.7%	0.21

10.2.6 Statistical analysis

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

10.3 Non-response

In the Dutch roadside survey information on non respondents is available for the following characteristics: age, gender, passengers, BAC, and self reported use of psychoactive substances.
Based on this information a comparison between respondents and non-respondents can be made in order to assess the possible size and nature of the non-response bias. The age and gender distribution for both the response and the non-response group is presented in table 10.6.

Table 10.6. Distribution by age and gender for respondents and non-respondents

	Respondents (n=4822)			Non-respondents (n=242)		
	Male	Female	Total	Male	Female	Total
18-24	8.9%	4.1%	13.0%	12.0%	1.7%	13.6%
25-34	16.2%	6.8%	22.9%	26.0%	5.0%	31.0%
35-49	23.6%	10.6%	34.3%	26.9%	5.8%	32.6%
50+	21.7%	8.0%	29.7%	12.8%	4.6%	17.4%
Unknown	0.1%	--	0.1%	5.4%	--	5.4%
Total	70.5%	29.5%	100%	83.1%	16.9%	100%

Males aged 25-34 years were overrepresented among the non-response group and females aged 35 years and older, as well as males aged 50 years and older were underrepresented. The number of non-respondents in each of these groups were very low. Therefore, the possible effect of these biases is expected to be very limited.
The share of drivers who were driving with passengers was almost identical. When adjusting for unknown passengers, 61.5% of the respondents were driving alone versus 62.2% of the non respondents.
The distribution by BAC level is presented in table 10.7. All drivers, whether they participated in the study or not, were tested for alcohol.

Table 10.7. Distribution by BAC level for respondents and non-respondents

BAC	Respondents (n=4822)	Non-respondents (n=242)	Total (n=5064)
0-0.1	95.8%	92.6%	95.6%
0.1-0.5	3.1%	5.4%	3.2%
0.5-0.8	0.5%	0.8%	0.5%
0.8-1.3	0.4%	0.8%	0.4%
>1.3	0.3%	0.4%	0.3%
Total	100%	100%	100%

The prevalence of alcohol is slightly higher for the non-response group than it is for the response group. However, the distribution over the BAC level is almost identical for the combination of both the respondent group and the non-respondent group as it is for the respondent group alone.
The selfreported use of psychoactive substances was higher for the non-response group. After correction for the unknown answers, 6.5% of the non respondents reported the use of psychoactive substances in the past 12 hours versus 3.6% of the respondents. When correcting for this bias, the self reported use of the total study population would shift from 3.6% to 3.7%.
Based on the comparison between the response and non-response group it can be assumed that there is a strong likelihood of difference in prevalence between both groups. However, the possible bias is tends to be very small due to the small size of the non-response group.

10.4 Results

In total 4822 drivers were included in the analysis. Table 10.8 provides a general overview of the use of psychoactive substances in Dutch Traffic. Alcohol and THC are by far the most commonly detected substances, followed by benzodiazepines, drug-drug combinations and cocaine.

Table 10.8. Adjusted general distribution of *core substance categories* (N=4822)

Substance category	**Prevalence (%)**	**Confidence interval (%)**
Negative	94.49	93.81 - 95.10
Amphetamine	0.19	0.10 - 0.36
Cocaine	0.30	0.18 - 0.50
THC	1.67	1.34 - 2.07
Illicit opiates	0.01	0.00 - 0.09
Benzodiazepines	0.40	0.25 - 0.62
Z-drugs	0.04	0.01 - 0.15
Medicinal opioids	0.16	0.08 - 0.32
Alcohol	2.15	1.78 – 2.60
Alcohol – drugs	0.24	0.13 - 0.42
Multiple drugs	0.35	0.22 - 0.56

Illicit drugs are commonly detected in drug-drug and drug-alcohol combinations as well. Cocaine was detected among 0.30% of the drivers as a single drug, but also present in combination with alcohol or other drugs in 0.36% of the drivers. The prevalence of amphetamines is doubled from 0.19% to 37% if combined use is taken into account. Medicinal drugs are less frequently used in combinations.

Table 10.9. Combined use of psychoactive substances

Substance	Prevalence (%)	Total prevalence (%)
amphetamines alone	0.19	
amphetamines in combination	0.18	0.37
cocaine alone	0.30	
cocaine in combi	0.36	0.66
THC alone	1.67	
THC in combi	0.43	2.10
illicit opiates alone	0.01	
illicit opiates in combi	0	0.01
benzodiazepines alone	0.40	
benzodiazepines in combi	0.04	0.44
z-drugs alone	0.04	
z-drugs in combi	0.01	0.05
opiates and opioids alone	0.16	
opiates and opioids in combi	0.05	0.21
alcohol alone	2.10	
alcohol in combi	0.28	2.38

Alcohol is the most commonly detected psychoactive substance in traffic in the Netherlands. In traffic, 2.15% of the drivers had a bac of 0.1g/L and 0.61% had a BAC above the 0.5 g/L.

Table 10.10. Adjusted general distribution of alcohol by concentration class (N=4822)

Alcohol alone	**Prevalence (%)**	**Confidence interval (%)**
Alcohol 0.1 – 0.49 g/L	1.54	1.23 – 1.93
Alcohol 0.5 – 0.79 g/L	0.26	0.15 – 0.44
Alcohol 0.8 – 1.19 g/L	0.14	0.07 – 0.29
Alcohol 1.2+	0.21	0.12 – 0.39
In total	2.15	1.78 – 2.60

Table 10.11. Adjusted distribution of *core substance categories* by gender and age (N=4822)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	91.05 87.61 – 93.61	92.12 89.93 – 93.83	93.40 91.82 – 94.70	95.32 93.93 – 96.40	93.54 92.66 – 94.32
Amphetamine	0.18 0.02 - 1.41	0.13 0.02 - 0.76	0.55 0.26 – 1.17	0.00 0.00 – 0.34	0.23 0.12 – 0.46
Cocaine	0.86 0.29 - 2.49	0.91 0.43 - 1.91	0.23 0.07 – 0.71	0.00 0.00 – 0.34	0.36 0.21 – 0.63
THC	5.75 3.76 - 8.69	2.51 1.60 - 3.91	2.12 1.43 – 3.13	0.63 0.31 – 1.28	2.08 1.65 – 2.62
Illicit opiates	0.00 0.00 - 1.08	0.05 0.00 - 0.61	0.00 0.00 – 0.33	0.00 0.00 – 0.34	0.01 0.00 – 0.13
Benzodiazepines	0.00 0.00 - 1.08	0.00 0.00 - 0.52	0.45 0.19 – 1.03	0.34 0.13 – 0.88	0.27 0.14 – 0.50
Z-drugs	0.00 0.00 - 1.08	0.00 0.00 - 0.52	0.03 0.00 – 0.34	0.15 0.04 – 0.61	0.06 0.02 – 0.22
Medicinal opioids	0.06 0.00 - 1.20	0.00 0.00 - 0.52	0.00 0.00 – 0.33	0.32 0.12 – 0.85	0.11 0.04 – 0.30
Alcohol	0.82 0.27 - 2.42	2.17 1.34 - 3.51	2.79 1.98 – 3.91	3.01 2.17 – 4.18	2.52 2.04 – 3.11
Alcohol – drugs	0.67 0.20 - 2.20	0.81 0.37 - 1.77	0.20 0.06 – 0.67	0.03 0.00 – 0.39	0.32 0.18 – 0.58
Multiple drugs	0.61 0.17 - 2.11	1.30 0.70 - 2.42	0.24 0.08 – 0.74	0.20 0.06 – 0.68	0.50 0.31 – 0.80

Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	97.23 93.29 – 98.88	95.76 92.75 – 97.55	96.46 94.63 – 97.69	97.47 95.52 – 98.58	96.71 95.66 – 97.51
Amphetamine	0.00 0.00 - 2.42	0.46 0.10 – 2.13	0.00 0.00 – 0.66	0.00 0.00 – 0.88	0.09 0.02 – 0.42
Cocaine	0.34 0.04 - 3.04	0.53 0.12 – 2.25	0.04 0.00 – 0.73	0.00 0.00 – 0.88	0.15 0.05 – 0.53
THC	1.61 0.50 – 5.07	1.51 0.61 – 3.69	0.62 0.23 – 1.66	0.00 0.00 – 0.88	0.71 0.39 – 1.30
Illicit opiates	0.00 0.00 - 2.42	0.00 0.00 – 1.33	0.00 0.00 – 0.66	0.00 0.00 – 0.88	0.00 0.00 – 0.26
Benzodiazepines	0.00 0.00 - 2.42	0.53 0.12 – 2.25	1.09 0.51 – 2.31	0.55 0.17 – 1.80	0.70 0.38 – 1.28
Z-drugs	0.00 0.00 - 2.42	0.00 0.00 – 1.33	0.00 0.00 – 0.66	0.00 0.00 – 0.88	0.00 0.00 – 0.26
Medicinal opioids	0.00 0.00 - 2.42	0.00 0.00 – 1.33	0.35 0.10 – 1.26	0.47 0.13 – 1.68	0.28 0.11 – 0.71
Alcohol	0.61 0.10 – 3.50	1.07 0.37 – 3.07	1.44 0.74 – 2.78	1.51 0.72 – 3.15	1.30 0.83 – 2.02
Alcohol – drugs	0.21 0.02 – 2.82	0.08 0.00 – 1.47	0.00 0.00 – 0.66	0.00 0.00 – 0.88	0.04 0.00 – 0.33
Multiple drugs	0.00 0.00 - 2.42	0.07 0.00 – 1.46	0.00 0.00 – 0.66	0.00 0.00 – 0.88	0.01 0.00 – 0.29

In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	92.94 90.37 – 94.86	93.14 91.42 – 94.54	94.43 93.25 – 95.42	95.91 94.82 – 96.79	94.49 93.81 - 95.10
Amphetamine	0.12 0.02 – 0.98	0.22 0.07 – 0.76	0.36 0.17 – 0.78	0.00 0.00 – 0.24	0.19 0.10 - 0.36
Cocaine	0.70 0.26 – 1.88	0.81 0.41 – 1.57	0.16 0.05 – 0.49	0.00 0.00 – 0.24	0.30 0.18 - 0.50
THC	4.49 3.00 – 6.66	2.22 1.48 – 3.33	1.62 1.12 – 2.33	0.45 0.22 – 0.93	1.67 1.34 - 2.07
Illicit opiates	0.00 0.00-0.75	0.03 0.00 – 0.44	0.00 0.00 – 0.22	0.00 0.00 – 0.24	0.01 0.00 - 0.09
Benzodiazepines	0.00 0.00-0.75	0.15 0.03 – 0.64	0.66 0.37 – 1.17	0.39 0.18 – 0.85	0.40 0.25 - 0.62
Z-drugs	0.00 0.00-0.75	0.00 0.00 – 0.38	0.02 0.00 – 0.26	0.11 0.03 – 0.44	0.04 0.01 - 0.15
Medicinal opioids	0.04 0.00-0.83	0.00 0.00 – 0.38	0.12 0.03 – 0.43	0.36 0.16 – 0.80	0.16 0.08 - 0.32
Alcohol	0.75 0.29 – 1.96	1.86 1.19 – 2.89	2.33 1.72 – 3.16	2.60 1.92 – 3.51	2.15 1.78 – 2.60
Alcohol – drugs	0.53 0.17 – 1.63	0.60 0.28 – 1.30	0.13 0.04-0.45	0.02 0.00 – 0.28	0.24 0.13 - 0.42
Multiple drugs	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

Table 10.11 presents the distribution of psychoactive substances by gender and age.

Illegal drug use is mainly a problem among young male drivers.
Young male drivers aged 18-24 have the highest prevalence of THC in traffic. Furthermore, the prevalence of cocaine, alcohol-drugs and drug-drug combinations is higher for males aged 18-34, than for males 35 years and older. The prevalence of medicinal drugs is very low among young male drivers.
The prevalence of psychoactive substances among the youngest agegroup (18-24) of female drivers is lower than it is for the agegroup 25-35 years. Multi drug use is almost absent amongst female drivers, but alcohol, THC and cocaine are relatively frequently found among female drivers younger than 35 years old, when compared to older female drivers,
The use of medicinal drugs in traffic is most often detected by female drivers 35 years and older.
Young drivers (18-24) have lower BAC's than older drivers and male drivers have approximately a twice as high prevalence of alcohol, although the prevalence of high BAC levels (1.2g/L) is similar for female drivers as for male drivers.

Table 10.11. Adjusted distribution of *alcohol alone* by gender and age (N=4822)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.60 0.17 – 2.10	1.34 0.72 – 2.47	1.98 1.32 – 2.96	2.40 1.66 – 3.46	1.83 1.43 – 2.35
0.5 – 0.79 g/L	0.15 0.02 – 1.37	0.19 0.04 – 0.86	0.30 0.11 – 0.82	0.35 0.14 – 0.90	0.28 0.15 – 0.52
0.8 – 1.19 g/L	0.06 0.00 – 1.20	0.34 0.10 – 1.10	0.12 0.03 – 0.55	0.18 0.05 – 0.65	0.18 0.08 – 0.39
1.2+	-	0.30 0.09 – 1.03	0.39 0.16 – 0.95	0.08 0.01 – 0.49	0.22 0.11 – 0.45
In total	0.82 0.27 – 2.42	2.17 1.34 – 3.51	2.79 1.98 – 3.91	3.01 2.17 – 4.18	2.52 2.04 – 3.11
Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.14 0.01 – 2.68	1.07 0.37 - 3.07	0.85 0.36 – 1.98	1.00 0.41 – 2.46	0.86 0.50 – 1.48
0.5 – 0.79 g/L	0.34 0.04 – 3.04	-	0.11 0.01 – 0.87	0.41 0.10 – 1.58	0.20 0.07 – 0.60
0.8 – 1.19 g/L	-	-	0.04 0.00 – 0.73	0.10 0.01 – 1.06	0.04 0.01 – 0.35
1.2+	0.13 0.01 – 2.67	-	0.41 0.20 – 0.84	-	0.19 0.06 – 0.58
In total	0.61 0.10 – 3.50	1.07 0.37 - 3.07	1.44 0.74 – 2.78	1.51 0.72 – 3.15	1.30 0.83 – 2.02
In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.46 0.14 – 1.53	1.26 0.74 – 2.16	1.60 1.11 – 2.31	2.01 1.43 – 2.83	1.54 1.23 – 1.93
0.5 – 0.79 g/L	0.21 0.04 – 1.13	0.14 0.03 – 0.62	0.24 0.09 – 0.60	0.37 0.17 – 0.81	0.26 0.15 – 0.44
0.8 – 1.19 g/L	0.04 0.00 – 0.83	0.24 0.08 – 0.79	0.09 0.02 – 0.39	0.16 0.05 – 0.51	0.14 0.07 - 0.29
1.2+	0.04 0.00 – 0.83	0.21 0.06 – 0.74	0.41 0.20 – 0.84	0.06 0.01 – 0.35	0.21 0.12 – 0.39
In total	0.75 0.29 – 1.96	1.86 1.19 – 2.89	2.33 1.72 – 3.16	2.60 1.92 – 3.51	2.15 1.78 – 2.60

Table 10.12. Adjusted distribution of *core substance categories* by day of the week and time of the day (N=4822)

4 categories: weekdays, weekday nights, weekend days, weekend nights

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekenddays 04:00 – 21:59	Weekendnights 22:00 – 03:59	In total
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	95.33 94.58 – 95.98	85.91 79.30 – 90.65	93.89 92.28 – 95.19	86.39 79.45 – 91.25	94.49 93.81 - 95.10
Amphetamine	0.15 0.07 – 0.35	0.45 0.06 – 3.40	0.22 0.07 – 0.74	0.63 0.10 – 4.00	0.19 0.10 - 0.36
Cocaine	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 - 0.50
THC	1.44 1.10 – 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
Illicit opiates	0.00 0.00 – 0.11	0.00 0.00 – 2.59	0.03 0.00 - 0.42	0.00 0.00 – 2.87	0.01 0.00 - 0.09
Benzodiazepines	0.48 0.30 – 0.77	0.00 0.00 – 2.59	0.21 0.06 – 0.72	0.16 0.01 – 3.17	0.40 0.25 - 0.62
Z-drugs	0.05 0.01 – 0.20	0.00 0.00 – 2.59	0.03 0.00-0.42	0.00 0.00 – 2.87	0.04 0.01 - 0.15
Medicinal opioids	0.20 0.09 – 0.41	0.15 0.01 – 2.87	0.08 0.01 – 0.51	0.00 0.00 – 2.87	0.16 0.08 - 0.32
Alcohol	1.59 1.22 – 2.06	9.20 5.49 – 15.02	2.51 1.72 – 3.64	6.65 3.49 – 12.28	2.15 1.78 – 2.60
Alcohol – drugs	0.19 0.09 – 0.40	0.74 0.14 – 3.89	0.24 0.07 – 0.76	0.95 0.19 – 4.52	0.24 0.13 - 0.42
Multiple drugs	0.32 0.18 – 0.58	0.15 0.01 – 2.87	0.33 0.12 – 0.90	1.42 0.37 – 5.26	0.35 0.22 - 0.56

The use of illicit drugs and alcohol in traffic is the highest in week and weekend nights. The use of medicinal drugs is the highest during daytime hours. Multi drug use was most prevalent in weekend nights and the lowest in week nights.

Table 10.13. Adjusted distribution of *alcohol alone* by day of the week and time of the day (N=4822)

4 categories: weekdays, weekday nights, week-end days, week-end nights

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekenddays 04:00 – 21:59	Weekendnights 22:00 – 03:59	In total
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	1.06 0.77 – 1.46	6.68 3.63 – 11.97	1.96 1.28 – 2.98	5.38 2.63 – 10.69	1.54 1.23 – 1.93
0.5 – 0.79 g/L	0.22 0.11 – 0.44	1.04 0.24 – 4.37	0.24 0.08 – 0.77	0.47 0.06 – 3.73	0.26 0.15 – 0.44
0.8 – 1.19 g/L	0.10 0.04 – 0.28	0.89 0.19 – 4.13	0.14 0.03 – 0.62	0.32 0.03 – 3.45	0.14 0.07 - 0.29
1.2+	0.20 0.10 – 0.42	0.59 0.09 – 3.65	0.16 0.04 – 0.65	0.47 0.06 – 3.73	0.21 0.12 – 0.39
In total	1.59 1.22 – 2.06	9.20 5.49 – 15.02	2.51 1.72 – 3.64	6.65 3.49 – 12.28	2.15 1.78 – 2.60

Alcohol use was the highest during weeknights and not during weekend nights. The prevalence of drivers with a BAC above the legal limit of 0.5 g/L was around 0.5% during daytime in both week and weekend days, around 1.2% in weekend nights and approximately 2.55% in weeknights.

10.5 Discussion

The analysis of the roadside survey data show that alcohol and THC are by far the prevailing psychoactive substances among drivers of passenger cars in the Netherlands. 2.38% of the drivers were positive for alcohol (BAC ≥ 0.1 g/l); 2.10% was positive for alcohol alone and 0.28% was positive for alcohol in combination with other psychoactive substances. 2.10% of the drivers were positive for THC; 1.67 for THC alone and 0.43% for THC in combination with alcohol and/or other psychoactive substances.

Cocaine, benzodiazepines and amphetamines were the next most prevalent substances with prevalences of 0.66%, 0.44% and 0.37%, respectively.
Illicit drugs, both alone and in combination with alcohol or other psychoactive substances are most prevalent among young male drivers aged 18-34. Medicinal drugs was mostly detected among female drivers aged 35 and older.
Drug and alcohol use is most prevalent among night time hours, both during week and weekend nights. Medicinal drugs were most commonly detected among daytime drivers.
Between 2000 and 2004 a roadside survey has been conducted in the Tilburg police district as part of the European IMMORTAL study (Impaired Motorists, Methods of Roadside Testing and Assessment for Licensing), which is also one of the participating police districts in the present study. Drivers in the IMMORTAL study where tested on blood or urine though and the applied cut-off levels were in general higher than they were in the DRUID study for blood.
The prevalence of drugs was higher in the IMMORTAL study than it is in the DRUID study. This difference could partly be explained by the use of urine as body fluid in the IMMORTAL study, since drugs are longer detectable in urine than in oral fluid. Furthermore, for oral fluid equivalent cut-offs have been used in the DRUID roadside survey which are higher than the limits of quantitation that were used for the cut-offs for blood.
On the other hand, the IMMORTAL cut-offs in serum were (after correction for the conversion) higher than the DRUID cut-offs in blood, which would likely have lead to relatively higher prevalence results in the DRUID study.
Due to the design differences in the two studies it is better to focus on the ranking of substances and the relative differences in prevalence between groups, rather than comparing the actual figures.
The DRUID and IMMORTAL study both have found a relatively high prevalence for alcohol and THC. Furthermore, the prevalence of alcohol and drugs was strongly concentrated in night time hours and medicinal drug use was more prevalent during daytime hours in both studies.
There are also some differences: Benzodiazepine use was one of the prevailing substances in the IMMORTAL study, whereas in the DRUID study the prevalence is not that high anymore. Furthermore, not only the youngest group of male drivers is overrepresented among drug drivers, also young male drivers aged 25-34 are overrepresented. In the DRUID project, medicinal drugs is not only prevailing among female drivers aged 50+, but also among female drivers aged 35-49.
More research is needed to get a better idea whether these differences are artificial or real.

10.6 Acknowledgements

The roadside survey described in this report was carried out in close cooperation with one police district and five regional traffic enforcement teams of the police, accounting for six different areas in the Netherlands: Amsterdam Amstelland, Hollands-Midden, Tilburg, Twente, Groningen, and Gelderland-Zuid. The authors are grateful to the police staff and executive personnel, many of whom cooperated on a voluntary basis, for their dedication to make the survey a success. The Department of Toxicology of the Netherlands Forensic Institute are thanked for undertaking the analysis of blood and saliva samples.

10.7 References

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11 Country report Norway

Authors: *Hallvard Gjerde[a], Asbjørg S. Christophersen[a], Per T. Normann[a], Terje Assum[b], Bjørg Pettersen[a], Ada Josefine Rognerud[a], Azemira Sabaredzovic[a], Jørg Mørland[a]*

[a]Norwegian Institute of Public Health, PB 4404 Nydalen, NO-0403 Oslo, Norway
[b]Institute of Transport Economics, Gaustadalléen 21, NO-0349, Norway

11.1 Description of the roadside driver sample

The main objective for the Norwegian DRUID roadside survey was to study the prevalence of drug and alcohol use among drivers in representative areas of the country, covering north, middle, south-west and south-east, including the capital. The drivers included in the roadside survey were also intended to be used as control population in a case-control study of fatal accidents.

The study was performed as described in Annex 1 of the Summary Report, except that the Regional Committee for Medical and Health Research Ethics did not allow the recording of information about refusers.

For practical and economical reasons, we could not perform roadside sampling completely by random in such a sparsely populated country as Norway, which covers an area of 385 252 square kilometres, and has 93 247 km of public roads, but a population of only 4.8 millions. Therefore, six representative areas were selected: two areas in south-eastern Norway (Hedmark & Romerike and Buskerud & Asker-Bærum, both areas included parts of Oslo), two areas in south-western Norway (Hordaland and Haugaland), and two areas in middle and northern Norway (Trøndelag and Troms), see Figure 1. The selected areas constituted parts of five of Norway's 10 Mobile Police Service districts. Oslo Police gave the Mobile Police Service of surrounding districts permission to stop drivers within Oslo.

Drivers were selected from April 2008 to March 2009 using a stratified multi-stage cluster sampling procedure. In the first stage, representative police districts were selected. In the second stage, random road sites and time intervals were selected according to a table of random sampling numbers (1). The third state consisted of randomly stopping drivers. The data collection was carried out in cooperation with the National Mobile Police Service of Norway, which has the right to stop vehicles without any particular suspicion.

Roads were chosen by first randomly selecting map co-ordinates within the study areas, weighted according to the population in the area, and then choosing the roads closest to the selected map coordinates. Sites included both urban and rural roads, but only within about 120 km from the Mobile Police Service headquarters in the following cities: Haugesund, Bergen, Trondheim and Tromsø, and in south-eastern Norway within about 200 km from the laboratories of the Norwegian Institute of Public Health in Oslo.

Time intervals were chosen by first randomly selecting a period of 3-5 consecutive days for each police district for each season of the year. For each day, the starting time for roadside sampling was randomly selected. However, some of the selected time periods had to be changed to comply with working time regulations for police officers.

For each day the police chose two road sites that were suitable as checkpoints located within about 30-45 minutes' drive from each other. After stopping drivers by random for two hours at the first site, the personnel had a one hour break where they moved to the second sampling site, and continued sampling for two hours. If more cars passed the site than the police or the research team could handle, the police were instructed to stop cars at random, rather than stopping old cars, young drivers or other possible suspects of drugged driving.

Oral and written information about the project was given to each driver; leaflets were available in 12 languages. If informed consent was given, a sample of oral fluid was taken and a questionnaire filled in. Participating drivers did not receive any reward for taking part in the survey.

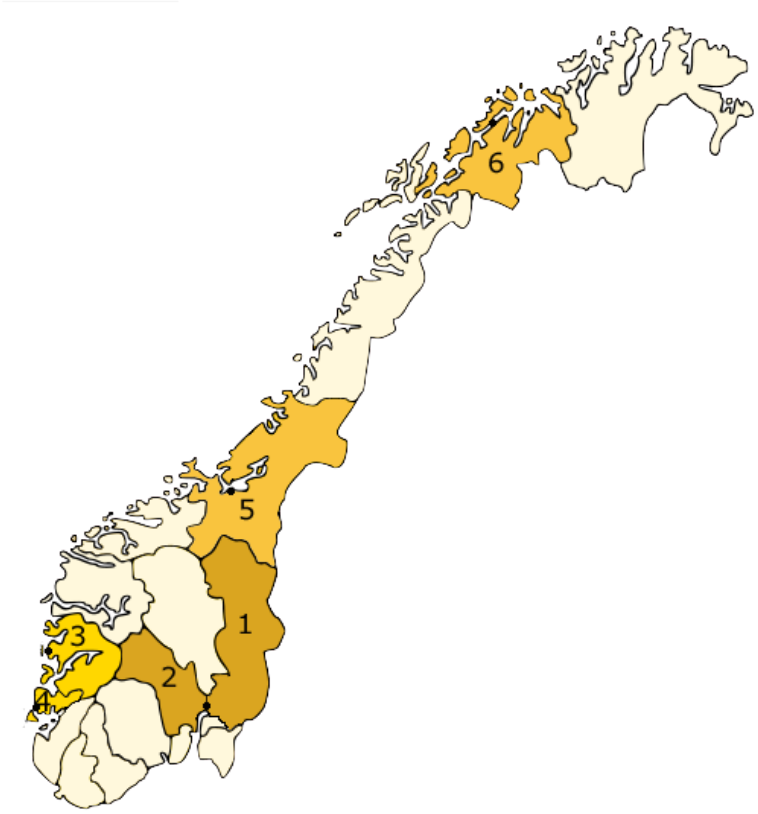

Figure 11.1. Map showing the study areas. 1: Hedmark & Romerike, 2: Buskerud & Asker-Bærum, 3: Hordaland, 4: Haugaland, 5: Trøndelag, and 6: Troms.

Altogether 184 roadside survey sessions were conducted, and 10 004 drivers were asked to provide a voluntary and anonymous sample of oral fluid. A total of 5.8% (583 drivers) refused to participate; thus, a total of 9 421 samples were taken. Samples from 69 motorcyclists and 80 truck drivers were excluded from this study in addition to samples from six car drivers below 18 years of age. Thirty samples contained less than 0.2 ml of oral fluid and could therefore not be analysed for both alcohol and drugs; those 30 drivers were also excluded. Thus, data from a total of 9 236 van and car drivers are included in this report.

About 58% of the included drivers were from south-eastern Norway, 19% from south-west, and 23% from middle/north. As comparison, in December 2008 about 54% of all cars and vans were owned by drivers living in south-east, 23% in south-west, and 23% in middle/north according to Statistics Norway (http://www.ssb.no).

11.1.1 Distribution of drivers by road type

Practical sites for the roadside study were chosen by the Mobile Police Service at the roads that were selected by the random procedure described above. The distribution of drivers included from urban and rural roads are presented in Table 11.1. The number of respondents was quite evenly distributed over rural and urban roads. However, in south-eastern Norway a larger proportion of the drivers were selected from urban roads than in other parts of the country due to higher population density.

Table 11.1: Distribution of drivers included in urban and rural roads from the three regions of Norway

Road type	South-east	South-west	Middle/north	Total
Urban	61.5%	48.1%	44.4%	55.0%
Rural	38.5%	51.9%	55.6%	45.0%
Total	100.0%	100.0%	100.0%	100.0%

11.1.2 Distribution of drivers by season, day of the week and time of the day

The time periods were initially selected by random as described above. However, the Mobile Police Service had to move some time periods because these periods did not comply with their working hour regulations. In addition, some sampling days were cancelled due to illness or extreme weather conditions, and one sampling period of five consecutive days had to be moved from the holiday season to a later month. Therefore, drivers for the period July – September are over-represented, while drivers in October – December are under-represented (Table 11.2). The distribution by time period was also somewhat affected (Table 3); the largest under-representation was for weekday evening and weekend early morning, while the largest over-representation was for weekend daytime.

Table 11.2. Distribution of drivers by season

January - March	April - June	July - September	October - December
28.3%	25.2%	30.0%	16.5%

Table 11.3. Distribution of drivers by the eight time periods

Time period no.	Day and time	Normal traffic	Roadside survey
1	Mon-Fri, 04.00-9.59	15.0	10.0
2	Mon-Fri , 10.00-15.59	26.6	25.2
3	Mon-Thu, 16.00-21.59	23.1	14.3
4	Mon-Thu, 22.00-23.59	5.9	8.1
	+ Tue-Fri, 00.00-03.59		
5	Sat-Sun, 04.00-9.59	1.5	4.1
6	Sat-Sun, 10.00-15.59	8.0	17.7
7	Fri-Sun, 16.00-21.59	15.3	15.1
8	Fri-Sun, 22.00-23.59	4.6	5.5
	+ Sat-Mon, 00.00-03.59		
Total		100.0	100.0

11.1.3 Distribution of drivers by gender and age

The inclusion of drivers was random as far as gender and age was concerned. The distribution by age and gender is presented in Table 4. The percentage of males was higher than females, and only about 28% were below 35 years of age. These percentages correspond to the distribution of km driven by gender and age among drivers in the Norwegian Travel Survey (2).

Table 11.4. Distribution of drivers by age and gender

Gender	18-24 years	25-34 years	35-49 years	50+ years	Unknown	Total
Female	3.3%	5.5%	11.0%	9.1%	0.0%	28.8%
Male	7.1%	12.4%	24.1%	27.5%	0.1%	71.1%
Total	10.4%	17.9%	35.1%	36.6%	0.1%	100.0%

11.2 Roadside data collection and analysis

Oral fluid was collected using the Statsure Saliva Sampler™ (see Annex 2 of the Summary Report). The oral fluid sampling kits were inspected visually, and kits that did not contain any buffer, or contained too small volume of buffer as observed visually, were discarded (about 5%). When sampling oral fluid, the collection pad was placed under the tongue until the indicator turned blue, or until five minutes had passed. The vial was then capped and labelled with a bar code label identical to the bar code of the questionnaire. The sample was kept in a bag at a temperature of approximately 5°C for a

maximum of 6 hours, and then frozen at about -20°C. Frozen samples from south-western, middle and northern Norway were transported to Oslo by airplane in well-insulated containers preventing the frozen samples from thawing during transport.

One day before the analysis of oral fluid started, samples were thawed and weighed to determine the total amount of oral fluid collected, and aliquots were pipetted into separate tubes for analysis of alcohol and drugs. The concentrations of alcohol and drugs in undiluted oral fluid were calculated based on the weight of oral fluid collected, assuming that 1.0 ml buffer was present in the collection device.

Drug concentrations in oral fluid-buffer mixtures were analysed by the Division of Forensic Toxicology and Drug Abuse at the Norwegian Institute of Public Health using liquid chromatography – tandem mass spectrometry (3) and concentrations in un-diluted oral fluid were calculated.
In addition to the common list of drugs analysed, we analysed for nitrazepam, 7-aminonitrazepam, 7-aminoclonazepam, 7-aminoflunitrazepam, carisoprodol and meprobamate.

Three-point calibration was used. Upper and lower calibrator and upper limit of linearity are presented in Table 11.5. Cutoff concentrations are presented in Annex 2 of the Summary Report.

Table 11.5. Lowest and highest calibration standard, and limit of linearity (ng/ml)

Analyte	Lowest standard	Highest standard	Limit of linearity
6-MAM	1.25	12.5	124.9
7-Aminoclonazepam	1.25	12.5	125.2
7-Aminoflunitrazepam	0.25	2.5	25.1
7-Aminonitrazepam	1.25	12.5	124.5
Alprazolam	0.75	7.5	75.2
Amphetamine	88.6	886	8860
Benzoylecgonine	12.5	125	1250
Diazepam	0.65	6.50	65.0
Carisoprodol	50.3	503	503
Clonazepam	0.76	7.56	75.6
Cocaine	3.00	30.0	90.0
Codeine	12.5	125	1250
Flunitrazepam	0.51	5.14	51.4
Lorazepam	1.52	15.2	152
MDA	50.7	507	1520
MDEA	50.2	502	502
MDMA	9.88	98.8	988
Meprobamate	20.0	200	2000
Metamphetamine	50.7	507	5070
Methadone	12.5	125	375
Morphine	12.5	125	1250
Nitrazepam	0.75	7.47	74.7
Nordiazepam	1.25	12.5	125
Oxazepam	8.54	85.4	854
THC	0.99	16.7	167
Zolpidem	0.25	2.5	25.0
Zopiclone	1.25	12.5	125

Samples with higher concentrations than the limit of linearity were diluted with sampling kit buffer and re-analysed. In cases where no sample was left for diluting and re-testing, concentrations were extrapolated.

The alcohol concentration in oral fluid was analysed by an automated enzymatic method using alcohol dehydrogenase (4). The method was initially developed for the analysis of alcohol in blood and urine. Before we used it in this study, the method was validated for the analysis of alcohol in saliva diluted with buffer from the Statsure sampling kit. The validated upper limit of linearity was 3 g/l in the oral fluid – buffer mixture. The BAC was estimated by multiplying the alcohol concentration in oral fluid by 1.22.

We recorded the driver's gender, age group and nationality, in addition to the month, day of the week, time interval (2h intervals), site, and type of vehicle.

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

The study was approved by the Regional Committee for Medical and Health Research Ethics.

11.3 Non-response

A total of 5.8% refused to provide a sample of oral fluid. The refusal rate varied between different regions; in south-east 6.2%, in south-west 6.7%, and in middle/north 3.9%. We were not allowed to collect any data on the refusers.

We requested a voluntary sample of oral fluid after the Mobile Police Services had performed their mandatory control. Six drivers whom the police officers suspected of driving while drunk refused to provide a sample of oral fluid before they were transported to a different site for evidential breath testing or blood sampling for legal purposes. Thus, the prevalence of BACs above the legal limit of 0.2 g/kg might have been about 1% among the refusers, and the total prevalence of drunken driving was about 0.06% higher than the value presented in this report. We assume that the prevalence of drugs might also have been higher among the refusers than among those who decided to participate in the study, because some drivers were not convinced that the study was absolutely anonymous.

11.4 Results

The weight of 50 samples were lower than the weight for non-used sampling kits (containing buffer), in spite of the fact that we were able to pipette at least 0.1 ml oral fluid-buffer mixture from these vials. This fact indicated that the original volume of buffer in these samples was significantly lower than 1.0 ml. Alcohol or drugs were found in 10 of these samples. The exact concentration of drugs in undiluted oral fluid could not be calculated for these samples. Instead we used the average weight for all received samples for calculation purposes.

Analytical results for mutually exclusive substance groups (weighted for time period) for core substances are presented in Table 6. Results by age and gender are presented in Table 7 and by time period in Table 11.8. The total findings for each substance groups are not presented. Results for alcohol alone are presented in Tables 11.9-11.11. Results for additional substances are presented in Table 12.

Table 11.6. Adjusted general distribution of *core substance categories* (N=9236)

Substance category	Prevalence (%)	Confidence interval (%)
Negative	97.03	96.67 – 97.36
Alcohol	0.32	0.23 – 0.46
Amphetamines	0.06	0.02 – 0.13
Cocaine	0.06	0.03 – 0.14
THC	0.48	0.36 – 0.64
Illicit opiates	0.00	0.00 – 0.04
Benzodiazepines	0.84	0.67 – 1.05
Z-drugs	0.69	0.54 – 0.88
Medicinal opioids	0.16	0.10 – 0.27
Alcohol – drugs	0.07	0.03 – 0.15
Multiple drugs	0.28	0.19 – 0.42

Table 11.7. Adjusted distribution of *core substance categories* by gender and age (N=9228)

	Men				
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	96.74	96.99	97.80	96.85	97.17
	95.11 – 97.83	95.83 – 97.83	97.10 – 98.33	96.09 – 97.47	96.74 – 97.55
Alcohol	0.44	0.06	0.29	0.43	0.34
	0.15 – 1.29	0.01 – 0.45	0.14 – 0.62	0.24 – 0.77	0.22 – 0.51
Amphetamines	0.14	0.19	0.05	0.00	0.06
	0.02 – 0.81	0.05 – 0.66	0.01 – 0.27	0.00 – 0.15	0.03 – 0.16
Cocaine	0.00	0.15	0.08	0.04	0.07
	0.00 – 0.56	0.04 – 0.59	0.02 – 0.32	0.01 – 0.22	0.03 – 0.17
THC	1.54	1.34	0.41	0.16	0.59
	0.85 – 2.78	0.81 – 2.18	0.22 – 0.78	0.06 – 0.42	0.43 – 0.81
Illicit opiates	0.00	0.00	0.00	0.00	0.00
	0.00 – 0.56	0.00 – 0.34	0.00 – 0.17	0.00 – 0.15	0.00 – 0.06
Benzodiazepines	0.55	0.39	0.56	1.09	0.73
	0.21 – 1.46	0.16 – 0.95	0.33 – 0.97	0.75 – 1.58	0.55 – 0.97
Z-drugs	0.00	0.22	0.17	0.95	0.46
	0.00 – 0.56	0.07 – 0.70	0.06 – 0.44	0.64 – 1.42	0.32 – 0.66
Medicinal opioids	0.00	0.00	0.26	0.23	0.18
	0.00 – 0.56	0.00 – 0.34	0.12 – 0.58	0.10 – 0.50	0.10 – 0.31
Alcohol – drugs	0.11	0.18	0.04	0.06	0.08
	0.02 – 0.77	0.05 – 0.64	0.01 – 0.25	0.01 – 0.26	0.03 – 0.18
Multiple drugs	0.49	0.49	0.33	0.18	0.32
	0.17 – 1.36	0.22 – 1.10	0.16 – 0.67	0.08 – 0.44	0.21 – 0.49

(Table 7 continues on next page)

Table 11.7. (continued) Adjusted distribution of *core substance categories* by gender and age (N=9228)

Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	99.15	98.29	97.52	93.92	96.72
	97.38 – 99.73	96.76-99.11	96.38-98.31	92.11-95.33	95.98-97.33
Alcohol	0.29	0.27	0.30	0.30	0.29
	0.05 – 1.74	0.06 – 1.22	0.10 – 0.87	0.09 – 0.95	0.15 – 0.58
Amphetamines	0.24	0.00	0.02	0.00	0.04
	0.03 – 1.65	0.00 – 0.75	0.00 – 0.42	0.00 – 0.45	0.01 – 0.21
Cocaine	0.00	0.00	0.16	0.00	0.06
	0.00 – 1.21	0.00 – 0.75	0.04 – 0.64	0.00 – 0.45	0.01 – 0.25
THC	0.32	0.43	0.20	0.00	0.19
	0.06 – 1.78	0.12 – 1.47	0.06 – 0.71	0.00 – 0.45	0.08 – 0.44
Illicit opiates	0.00	0.00	0.00	0.00	0.00
	0.00 – 1.21	0.00 – 0.75	0.00 – 0.37	0.00 – 0.45	0.00 – 0.14
Benzodiazepines	0.00	0.09	0.88	2.37	1.10
	0.00 – 1.21	0.01 – 0.91	0.47 – 1.66	1.54 – 3.62	0.77 – 1.57
Z-drugs	0.00	0.61	0.74	2.62	1.22
	0.00 – 1.21	0.21 – 1.74	0.37 – 1.48	1.74 – 3.92	0.87 – 1.71
Medicinal opioids	0.00	0.00	0.10	0.30	0.13
	0.00 – 1.21	0.00 – 0.75	0.02 – 0.56	0.09 – 0.95	0.05 – 0.36
Alcohol – drugs	0.00	0.00	0.00	0.13	0.04
	0.00 – 1.21	0.00 – 0.75	0.00 – 0.37	0.02 – 0.67	0.01 – 0.21
Multiple drugs	0.00	0.31	0.07	0.36	0.20
	0.00 – 1.21	0.08 – 1.29	0.01 – 0.50	0.13 – 1.04	0.09 – 0.45

In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	97.50	97.39	97.71	96.09	97.03
	96.33 – 98.31	96.51 – 98.06	97.14 – 98.17	95.38 – 96.70	96.67 – 97.36
Alcohol	0.39	0.12	0.30	0.39	0.32
	0.15 – 1.02	0.03 – 0.45	0.16 – 0.55	0.23 – 0.67	0.23 – 0.46
Amphetamines	0.17	0.13	0.04	0.00	0.06
	0.04 – 0.68	0.04 – 0.45	0.01 – 0.20	0.00 – 0.11	0.02 – 0.13
Cocaine	0.00	0.10	0.11	0.03	0.06
	0.00 – 0.39	0.02 – 0.41	0.04 – 0.29	0.00 – 0.16	0.02 – 0.14
THC	1.15	1.06	0.34	0.12	0.48
	0.65 – 2.03	0.66 – 1.67	0.19 – 0.61	0.05 – 0.16	0.36 – 0.64
Illicit opiates	0.00	0.00	0.00	0.00	0.00
	0.00 – 0.39	0.00 – 0.23	0.00 – 0.12	0.00 – 0.11	0.00 – 0.04
Benzodiazepines	0.38	0.29	0.66	1.42	0.84
	0.14 – 1.00	0.12 – 0.69	0.44 – 1.01	1.07 – 1.88	0.67 – 1.05
Z-drugs	0.00	0.34	0.35	1.39	0.69
	0.00 – 0.39	0.15 – 0.76	0.20 – 0.62	1.05 – 1.85	0.54 – 0.88
Medicinal opioids	0.00	0.00	0.21	0.25	0.16
	0.00 – 0.39	0.00 – 0.23	0.10 – 0.44	0.13 – 0.48	0.10 – 0.27
Alcohol – drugs	0.08	0.12	0.03	0.08	0.07
	0.01 – 0.53	0.03 – 0.45	0.00 – 0.17	0.02 – 0.24	0.03 – 0.15
Multiple drugs	0.33	0.44	0.25	0.23	0.28
	0.12 – 0.93	0.22 – 0.89	0.13 – 0.49	0.11 – 0.46	0.19 – 0.42

Table 11.8. Adjusted distribution of *core substance categories* by day of the week and time of the day (N=9236)

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekenddays 04:00 – 21:59	Weekendnights 22:00 – 03:59	In total
Substance category	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)
Negative	96.75	97.59	97.95	95.64	97.03
	96.27 – 97.17	95.94 – 98.57	96.27 – 98.46	93.37 – 97.16	96.67 – 97.36
Alcohol	0.34	0.00	0.27	0.79	0.32
	0.22 – 0.52	0.00 – 0.69	0.12 – 0.58	0.30 – 2.10	0.23 – 0.46
Amphetamine	0.04	0.13	0.02	0.40	0.06
	0.01 – 0.13	0.02 – 0.94	0.00 – 0.21	0.10 – 1.51	0.02 – 0.13
Cocaine	0.04	0.27	0.00	0.40	0.06
	0.01 – 0.14	0.06 – 1.16	0.00 – 0.17	0.10 – 1.51	0.03 – 0.14
THC	0.39	0.80	0.45	1.39	0.48
	0.26 – 0.58	0.33 – 1.96	0.25 – 0.83	0.65 – 2.92	0.36 – 0.64
Illicit opiates	0.00	0.00	0.00	0.00	0.00
	0.00 – 0.06	0.00 – 0.69	0.00 – 0.17	0.00 – 0.83	0.00 – 0.04
Benzodiazepines	1.02	0.13	0.49	0.99	0.84
	0.80 – 1.31	0.02 – 0.94	0.27 – 0.88	0.41 – 2.38	0.67 – 1.05
Z-drugs	0.92	0.13	0.35	0.00	0.69
	0.71 – 1.19	0.02 – 0.94	0.18 – 0.70	0.00 – 0.83	0.54 – 0.88
Medicinal opioids	0.21	0.00	0.11	0.00	0.16
	0.12 – 0.36	0.00 – 0.69	0.03 – 0.35	0.00 – 0.83	0.10 – 0.27
Alcohol – drugs	0.06	0.13	0.04	0.20	0.07
	0.02 – 0.17	0.02 – 0.94	0.01 – 0.25	0.03 – 1.19	0.03 – 0.15
Multiple drugs	0.23	0.80	0.33	0.20	0.28
	0.13 – 0.38	0.33 – 1.96	0.16 – 0.67	0.03 – 1.19	0.19 – 0.42

Table 11.9. Adjusted general distribution of alcohol by concentration class (N=9227)

Alcohol alone	Prevalence (%)	Confidence interval (%)
Alcohol 0.1 – 0.49 g/L	0.26	0.17 – 0.38
Alcohol 0.5 – 0.79 g/L	0.04	0.02 – 0.11
Alcohol 0.8 – 1.19 g/L	0.02	0.00 – 0.07
Alcohol 1.2+	0.01	0.00 – 0.06
In total	0.32	0.23 – 0.46

Table 11.10. Adjusted distribution of *alcohol alone* by gender and age (N=9219)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**
0.1 – 0.49 g/L	0.37 0.12 – 1.19	0.06 0.01 – 0.45	0.18 0.07 – 0.46	0.40 0.22 – 0.73	0.28 0.18 – 0.44
0.5 – 0.79 g/L	0.07 0.01 – 0.69	0.00 0.00 – 0.34	0.12 0.04 – 0.37	0.03 0.00 – 0.21	0.06 0.02 – 0.15
0.8 – 1.19 g/L	0.00 0.00 – 0.56	0.00 0.00 – 0.34	0.00 0.00 – 0.17	0.00 0.00 – 0.15	0.00 0.00 – 0.06
1.2+	0.00 0.00 – 0.56	0.00 0.00 – 0.34	0.00 0.00 – 0.17	0.00 0.00 – 0.15	0.00 0.00 – 0.06
In total	0.44 0.15 – 1.29	0.06 0.01 – 0.45	0.29 0.14 – 0.62	0.43 0.24 – 0.77	0.34 0.22 – 0.51
Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**
0.1 – 0.49 g/L	0.29 0.05 – 1.74	0.09 0.01 – 0.91	0.16 0.04 – 0.64	0.30 0.09 – 0.95	0.20 0.09 – 0.46
0.5 – 0.79 g/L	0.00 0.00 – 1.21	0.00 0.00 – 0.75	0.00 0.00 – 0.37	0.00 0.00 – 0.45	0.00 0.00 – 0.14
0.8 – 1.19 g/L	0.00 0.00 – 1.21	0.00 0.00 – 0.75	0.15 0.03 – 0.63	0.00 0.00 – 0.45	0.06 0.01 – 0.24
1.2+	0.00 0.00 – 1.21	0.18 0.03 – 1.07	0.00 0.00 – 0.37	0.00 0.00 – 0.45	0.03 0.01 – 0.20
In total	0.29 0.05 – 1.74	0.27 0.06 – 1.22	0.30 0.10 – 0.87	0.30 0.09 – 0.95	0.29 0.15 – 0.58
In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**	**Prevalence (%)** **C.I. (%)**
0.1 – 0.49 g/L	0.35 0.13 – 0.95	0.07 0.01 – 0.36	0.17 0.08 – 0.38	0.37 0.22 – 0.65	0.26 0.17 – 0.38
0.5 – 0.79 g/L	0.05 0.00 – 0.47	0.00 0.00 – 0.23	0.08 0.03 – 0.25	0.02 0.00 – 0.15	0.04 0.02 – 0.11
0.8 – 1.19 g/L	0.00 0.00 – 0.39	0.00 0.00 – 0.23	0.05 0.01 – 0.20	0.00 0.00 – 0.11	0.02 0.00 – 0.07
1.2+	0.00 0.00 – 0.39	0.06 0.01 – 0.33	0.00 0.00 – 0.12	0.00 0.00 – 0.11	0.02 0.00 – 0.06
In total	0.39 0.15 – 1.02	0.12 0.03 – 0.45	0.30 0.16 – 0.55	0.39 0.23 – 0.67	0.32 0.23 – 0.46

Table 11.11. Adjusted distribution of *alcohol alone* by day of the week and time of the day (N=9227)

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekendday s 04:00 – 21:59	Weekendnigh ts 22:00 – 03:59	In total
Alcohol alone	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)	Prevalence (%) C.I. (%)
0.1 – 0.49 g/L	0.28	0.00	0.19	0.59	0.26
	0.17 – 0.44	0.00 – 0.69	0.08 – 0.48	0.19 – 1.81	0.17 – 0.38
0.5 – 0.79 g/L	0.04	0.00	0.07	0.00	0.04
	0.01 – 0.13	0.00 – 0.69	0.02 – 0.30	0.00 – 0.83	0.02 – 0.11
0.8 – 1.19 g/L	0.03	0.00	0.00	0.00	0.02
	0.01 – 0.11	0.00 – 0.69	0.00 – 0.17	0.00 – 0.83	0.00 – 0.07
1.2+	0.00	0.00	0.00	0.20	0.01
	0.00 – 0.06	0.00 – 0.69	0.00 – 0.17	0.03 – 1.19	0.00 – 0.06
In total	0.34	0.00	0.27	0.79	0.32
	0.22 – 0.52	0.00 – 0.69	0.12 – 0.58	0.30 – 2.10	0.23 – 0.46

Table 11.12. Adjusted general distribution of *additional substances* (N=9236)

Substance	Prevalence (%)	Confidence interval (%)
Nitrazepam	0.06	0.03 – 0.14
7-aminonitrazepam	0.22	0.14 – 0.34
7-aminoclonazepam	0.08	0.04 – 0.16
7-aminoflunitrazepam	0.05	0.02 – 0.12
Carisoprodol	0.00	0.00 – 0.04
Meprobamate	0.00	0.00 – 0.04

Benzodiazepines were detected in 0.84% of the samples and were thus the most prevalent medicinal drug group detected. The prevalence was higher among women (1.10%) than men (0.73%), but the difference was not statistically significant. The prevalence increased with age for both genders. Benzodiazepines were most commonly found during weekdays at daytime and weekend nights. Z-drugs, which are sleeping agents, were also highly prevalent (0.69%). The prevalence was significantly higher among women (1.22%) than men (0.46%), and increased with age for both genders. Z-drugs were most commonly found during weekdays at daytime.

THC was the most commonly found illegal drug, and was found in 0.48% of the samples. The prevalence was higher among men (0.59%) than women (0.19%), and the prevalence was highest among drivers below 35 years for both genders. The prevalence was highest during weekend nights and lowest during weekdays at daytime. The prevalence of amphetamines and cocaine was similar for men and women with averages of 0.6% for both substance groups, and were most commonly found in samples from weekend nights.

The prevalence of alcohol was low, only 0.32%; slightly higher among men than women, and higher at weekend nights than during other periods of the week. Combinations of alcohol and drugs were found in only 0.07%, while multiple drugs were found in 0.28% of the samples.

The prevalence of additional substances was fairly low. The sleeping agent nitrazepam and its metabolite 7-aminonitrazepam were the most commonly detected substances, and reflect that nitrazepam is fairly frequently used in Norway; less frequently than the z-drugs, but more frequently than flunitrazepam. Carisoprodol and its metabolite meprobamate were not detected in concentrations above the cut-off thresholds in any sample, reflecting a large decline in use after carisoprodol was withdrawn from the Norwegian market in 2008.

11.5 Discussion

The incidence of drunken driving has decreased and drugged driving increased in Norway during the recent decades. In the 1980s, 0.27% of the motor vehicle drivers had blood alcohol concentration above 0.5‰ (5), while in 2005-6, about 0.1% of the drivers had alcohol concentrations in oral fluid above 0.5‰ and 0.3% above 0.2‰ (6). On the other hand, the number of blood samples from suspected drugged drivers submitted for drug analysis by the police increased from about 2 076 in 1989 to 4 525 in 2008 (7). In the late 80-ies about 80% of the drivers were positive for at least one drug, whereas in 2008 more than 90% of the suspected drivers were drug positive.

In the present study, 0.32% of the drivers were found to have alcohol concentrations above 0.1 g/l. This is similar to the results of our roadside survey performed in 2005-6 (6). Alcohol above 0.1 g/l was in that study found in samples from 0.4% of the drivers. A study performed by TISPOL found that 0.3% had blood alcohol concentrations above the legal limit in Norway (8).

The prevalences of illegal drugs and psychoactive medicinal drugs were higher than for alcohol, confirming the results of our roadside survey performed in 2005-6 (6). The prevalences of different substances cannot be directly compared with the previous study, primarily because significantly lower cut-off thresholds were used in that study and because total substance findings were presented and not mutually exclusive substance groups which are presented in this report. In addition, oral fluid was collected using a different collection device which may affect the results for THC, zopiclone, and possibly also other substances. However, our current findings in relation to gender and age are similar to those found in our previous study (6).

We have previously found that the use of illegal drugs was most commonly found in samples taken during weekends, while medicinal drugs were most commonly found during working days (6). The results from this study confirms those findings, but additionally indicate that illegal drugs were more common at weekends during the night than at daytime, and medicinal drugs were more common during weekdays at daytime than during the night.

The prevalence of drugs does not directly reflect the prevalence of impairment because the drug concentration in oral fluid cannot be used to accurately estimate the drug concentration in blood (9), and because individual assessments of impairment were not performed. To determine whether a driver is impaired by one or more drugs, a blood sample must be analysed, and an expert evaluation of the analytical results must be done according to the current legislation in Norway. However, a process of establishing legislative blood drug concentration limits for driving under influence for 20 drugs started in 2010 (10), and the new limits will reduce the need for expert assessments.

11.6 Acknowledgements

The roadside survey described in this report was carried out in close cooperation with the Norwegian Mobile Police Service. The authors are grateful to the police staff and executive personnel for their good collaboration and flexibility.

Thanks to Magnus Knape, Gerd Wenche Brochmann, Ida Nord, Wenche Andresen, Henriette Mikkelsen, Borghild Yttredal, Lene Johnsen and Karoline Knutsen for assistance in collecting roadside samples, and to the staff at the Department of Clinical Pharmacological Analysis and the Department of Analytical Method Development for analysis of alcohol and drugs in samples of oral fluid. Thanks to Bartho van der Linden for database management.

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12 Country report Poland

Authors:

12.1 Description of the roadside driver sample

The objective of the survey was to identify the scale of alcohol, medication and drugs use by drivers in Poland and compare the Polish results with those collected in other countries participating in the DRUID survey.

It was Poland's first study of prevalence of psychoactive substance use by drivers. The method for the research was developed in Poland in September 2007 ("Guidelines for roadside survey in Poland") and subsequently approved by the coordinators. The procedure of research differed slightly from the DRUID guidelines adopted later. Thus, at some points it was necessary to adapt Polish results to the DRUID guidelines.

During the Druid survey in Poland 4327 drivers were stopped. 51 people did not agree to take part in the survey. More than 251 people did not give enough saliva and the sobriety test could not be taken in the case of 19 people. As a result, 4005 people qualified for further analysis.

12.1.1 Geographic distribution of drivers over the country

The survey covered all of Poland. The country was divided into 6 sub-regions: central Poland (Mazowieckie, Lodzkie), the south (Malopolskie, Slaskie), the east (Lubelskie, Podkarpackie, Podlaskie, Swietokrzyskie), the north-west (Lubuskie, Wielkopolskie, Zachodniopomorskie), the south-west (Dolnoslaskie, Opolskie), and the north (Kujawsko-Pomorskie, Pomorskie, Warminsko-Mazurskie). This was in line with the Nomenclature of Territorial Units for Statistics (NUTS 1) developed by the Polish Central Statistical Office, a division also used by Eurostat.

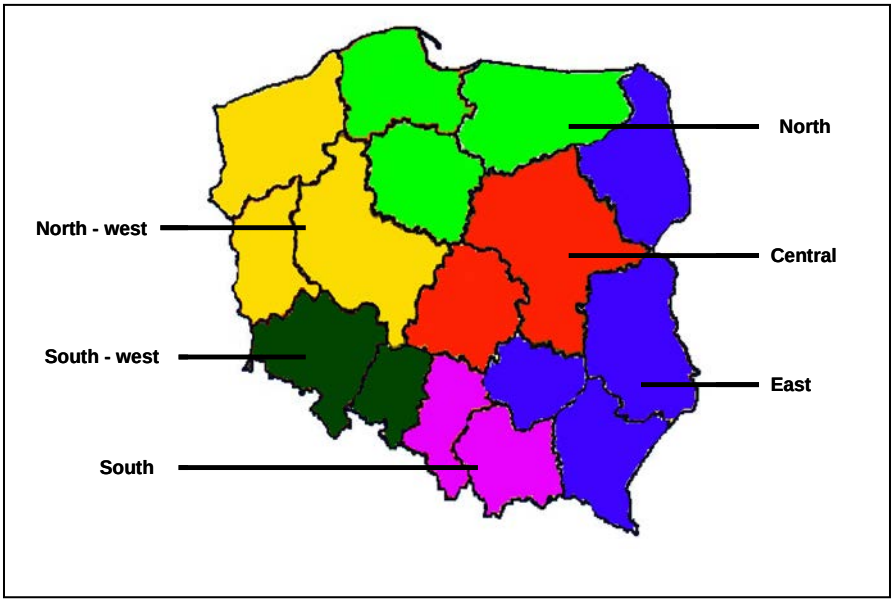

Figure 12.1. The division of Poland into sub-regions

The number of drivers tested in the sub-regions differed depending on the population density. That was the only condition that determined the number of drivers surveyed across Poland. Because we did not have traffic volume studies[13] we could use for the selection, we decided to survey the same number of drivers on urban and regional roads during the day, night, on weekdays and weekends and in all seasons. Table 1 presents the distribution of drivers by sub-region.

[13] Every 5 years the General Directorate for National Roads and Motorways carries out a traffic survey but it only covers national roads that are within the Directorate's remit.

Table 12.1. Distribution of drivers by sub-region

	Sub-region					
	Central (1)	South (2)	East (3)	North-west (4)	South-west (5)	North (5)
% of Poland's population	20.3 %	20.8 %	17.7 %	15.9 %	10.3 %	14.9 %
Number of drivers tested	781 (19.5 %)	799 (19.9 %)	684 (17.1 %)	636 (15.9 %)	479 (12.0 %)	626 (15.6 %)

It is clear that the distribution of the roadside survey sample over the six different survey regions was almost the same as the distribution of the population of Poland.

12.1.2 Distribution of drivers by road type

There were 4 check points in each sub-region: one in the sub-region's biggest town, one in a town with a population of 20,000 – 100,000, one on a national road and one on a regional road. The selection of the specific check points was made in cooperation with regional coordinators. The site for a check point was on a straight stretch of road, with no exits or access roads, at some distance from junctions, etc. Efforts were made to ensure that the checks and tests did not obstruct traffic as drivers pulled over and stopped for ten minutes or so. The check points were equally distributed as much as possible across the sub-region.

In order to improve comparability with the other countries, the Polish survey results were recorded according to the DRUID guidelines. This was possible because the different checkpoints could be aggregated into a binary urban and rural code.

Table 12.2. Distribution of drivers by road type

Type of road	Number
Urban roads (1)	1966 (49 %)
Rural roads (2)	2039 (51 %)
Total	4005 (100 %)

The drivers were distributed more or less equally over the two road types.

12.1.3 Distribution of drivers by season

The survey began in the autumn of 2007 and continued for two years. The survey was carried out during the four seasons: in the summer (22 June – 22 September), autumn (23 September – 21 December), winter (22 December – 20 March) and spring (21 March – 21 June). Table 12.3 presents the distribution of the drivers by season.

Table 12.3. Distribution of drivers by season

1. Winter (22 December – 20 March)	2. Spring (21 March – 21 June)	3. Summer (22 June – 22 September)	4. Autumn (23 September – 21 December)	Total
1034 (25.8 %)	1035 (25.8 %)	986 (24.6 %)	950 (23.7 %)	4005 (100 %)

The samples are well distributed over the seasons.

12.1.4 Distribution of drivers by day of the week and time of the day

The roadside surveys were conducted during daytime (from 7:00 to 21:00) and night-time (from 21:00 to 7:00), on weekdays (Monday from 7:00 to Friday to 21:00) and weekends (Friday from 21:00 to Monday to 7:00).

Table 12.4. Distribution of drivers by day of week and time of day

Time of week	Time of day	Number
Week days (Monday 07-Friday 21)	Day (07-21)	1032 (25.8 %)
	Night (21-07)	1021 (25.5 %)
Weekends (Friday 21- Monday 07)	Day (07-21)	967 (24.1 %)
	Night (21-07)	985 (24.6 %

The Polish survey consisted of four different days of the week and time of the day periods and the distribution of the study population is almost evenly distributed over each of the four periods. The way the Polish survey was organised is different from the guidelines the DRUID adopted later. The difference is that the survey was carried out during the day and night only rather than during the 8 periods the DRUID checked. Since the exact time and day of the sampling were recorded, for each sample the data for time could be converted into the DRUID day and time periods. This distribution is presented in Table 12.5.

Table 12.5. Distribution of drivers by DRUID time periods

DRUID time period	Frequency	Per cent
1 Weekday 04:00-09:59	86	2,2
2 Weekday 10:00-15:59	826	20.6
3 Weekday 16:00-21:59	406	10.1
4 Weekday 22:00-03:39	696	17.4
5 Weekendday 04:00-09:59	294	7.3
6 Weekendday 10:00-15:59	674	16.8
7 Weekendday 16:00-21:59	439	11.0
8 Weekendday 22:00-03:39	584	14.6
Total	4005	100

All DRUID time periods are covered. The distribution over the DRUID time periods in the morning (04-10) is relatively lower than the six other DRUID time periods.

12.1.5 Distribution of drivers by gender and age

The survey covered Polish and foreign drivers of passenger cars, delivery vans (up to 3500 kg) and taxi cabs, aged 18 and more, stopped at random by road police at selected check points. From among 4005 drivers 3612 (90.2%) were passenger car drivers and 364 delivery van drivers (9.1%)[14]. While some of the drivers were lorry drivers, when the police stopped them they were driving a passenger car. The group included 38 foreign nationals from 15 different countries (most were from Ukraine – 12, Lithuania – 7 and Germany - 4). Table 6 presents some more demographic data.

Table 12.6. Distribution of drivers by gender and age

Age	Women	Men	Data not available	Total
18 - 24	133	589	0	722 (18.0 %)
25 - 34	252	1075	3	1330 (33.2 %)
35 - 49	224	970	0	1194 (29.8 %)
50 +	76	680	2	758 (18.9 %)
Data not available	1	0	0	1 (%)
Total	**686 (17.1 %)**	**3314 (82.8 %)**	**5 (0.1 %)**	**4005 (100 %)**

The average age of women surveyed was 34.3 years with 37.1 for men. In 2005 the average age of women drivers was 37. For men it was 42. In 2010 SARTRE 4, an EU funded programme, studied the

[14] No data is available about the type of vehicle for 29 of the drivers.

age and gender structure of Polish passenger car drivers. The percentage of people who have a driving license and drove a car at least once in the recent year was as follows: aged 18 to 24 – 15 %, aged 25 to 34 – 30 %, aged 35 to 49 – 33 %, aged 50+ – 22 %. The distribution of drivers participating in DRUID is similar to the distribution established in the omnibus study.

The relatively low percentage of women drivers is somewhat surprising. The official 2009 statistics of the Ministry of the Interior and Administration shows that in Poland 37 % of all individual driving licenses were held by women. The results of the omnibus study showed that women drivers make up 34 % of all drivers. Consequently, the gender structure of drivers randomly stopped for the check did not fit the actual gender structure of Polish drivers, a fact that cannot be reliably explained at this point in time.

12.2 Roadside data collection and analysis

12.2.1 Ethical approval

The procedure for the Polish survey was approved by the Bioethics Commission at the District Doctors' Chamber in Krakow (no. 39/KBL/OIL/2006 of 17 May 2006).

12.2.2 Body fluid collection

There were two ITS employees and a traffic police patrol for each survey. The following was the survey procedure:

- A police officer randomly motions a vehicle to pull over, walks up to the driver and asks to see the documents: registration documents, driving license, etc. As he talks to the driver he checks for external symptoms of alcohol or substance use and if observed the changes are recorded in a special form developed by the National Police.
- The police officer informs the driver about why the ITS employee is there and asks if they can have a few questions before he carries out the routine sobriety check. If the driver accepts that, the police officer is joined by an employee of the Motor Transport Institute (ITS).
- The ITS employee introduces himself and informs the driver about DRUID objectives. He then asks the driver if he agrees to take part in the anonymous survey. If the driver accepts that, he talks the driver through the test, hands him a short DRUID leaflet and begins the test (collects a saliva sample and conducts a short interview). Next the driver walks over to the police officer for a regular roadside check.
- If the driver refuses to participate in the DRUID, the ITS employee asks about the reason for the decision and does not proceed with the test. This has no influence on police work at the site. The police officer tests the driver for alcohol and substances (psychoactive substances). For the latter he uses the drug tester. If both tests are negative, the police officer completes the check and the driver is free to go.
- After the driver has left the checkpoint, the police officer gives the results of alcohol and psychoactive substance tests to the ITS employee who records them in the questionnaire.
- When all the activities are completed, the police officer stops the next driver for a test.

Saliva samples were collected as part of the DRUID survey (from all drivers who agreed to take part). Samples (1 ml) were collected by ITS employees using the device called Statsure Saliva Sampler. The procedure followed the guidelines of the manufacturer. Samples of saliva were stored in a special portable fridge. The fridges were brought to the checkpoint by ITS employees. Once collected, saliva samples were transported in the fridges by courier to the Institute of Forensic Research in Krakow.

12.2.3 Toxicological analysis of body fluid

Weighting procedure of Statsure was conducted after tubes were delivered to the laboratory. Stick with indicator was removed from device just after saliva collected to approach real saliva volume. Appropriate formula was applied for volume calculation. Before analyses samples were stored for 25.2 days (mean) or 18 days (median) in freezer at –20^{o}C.

For extraction 1 ml mixture of buffer/saliva (1:1,v/v) from transportation tube (0,5 ml) and saliva (0,5 ml) or if less as much as possible (weight recorded). Samples were extracted with SPE cartridge

Oasis HLB 30 mg (hydrophylic/lipophilic bonds) for up to 1 ml volume sample. Elution solvent was a mixture of methanol, isopropanol and acetic acid (7.5:2.5:0.1, v/v) . Evaporation at 40°C (Pierce Thermo block) under nitrogen and reconstitution solution was 70 ☐l (mixture of acetonitrile, water and formic acid (3:7:0.01)).

Internal standards were purchased from LGC Promochem. For quantitation deuterated standards for all analytes except for carbamazepine and zopiclone (used zolpidem-d6) applied. IS concentrations were the same (50 ng/ml) in net saliva. Country drugs were carbamazepine and imipramine. Additional drugs included in screening were 7-aminoclonazepam and 7-aminoflunitrazepam.

The exact description of procedure See Annex 2: Chromatographic and mass spectrometry conditions.

12.2.4Method of BAC quantification

Sobriety was tested by road police. All drivers stopped under the DRUID project had to take the test. The road police used breathalysers to test for alcohol. Polish police used two devices: Alkomat 7410 PLUScom by DRAGER and Alco-sensor IV M by L. Tech. The results from both devices are given as mg/l and converted to %o using a factor of 2100.

12.2.5 Interviews

ITS staff also recorded the details of the check point, date and time of day and driver's reference number in a special questionnaire. During short interviews the following data were collected: gender and age, type of vehicle, occupants in the vehicles, years of driving experience, number of kilometres annually, reasons for refusing to take part in DRUID project, what the driver declared in terms of alcohol, medication and drugs consumption, results of police tests for presence of psychoactive substances in the subject's system and alcohol in the driver's breath. Due to lack of experience the ITS team did not check for clinical signs of disorder.

12.2.6 Statistical analysis

The unweighted control sample could not be considered to be exact representative of all drivers who participated in road traffic in the six police districts during the 8 DRUID time periods, since the sample distribution over different times and days was not equal to the distribution of traffic volumes. So, in order to make the control sample representative for the whole week, it had to be weighted, based on traffic flow distribution over the various days of the week and times of the day. More information on the weighting procedure is available in annex 2 of this report.

The weighted prevalence was calculated by using descriptive statistics by means of the statistical software SAS. 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 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 confidence interval formula is used as it is supplied by SAS as one of the available options.

12.3 Non-response

51 people (1.3 % of all drivers stopped) did not agree to take part in the DRUID survey. The reasons varied but most people would say they were in a hurry, disliked surveys in general, were tired and concerned that the survey would extend the time of the police check. Some drivers said they had concerns about catching an infection, having their personal data put in a DNA database or being accused of committing other crimes. Table 7 presents the basic demographics of these respondents.

Table 12.7. Distribution of drivers by gender and age for non-response

	Age	Refusals (non-response)	Respondents (Volunteers)	Total
Men	18 - 24	5 (9.8 %)	589 (14.7 %)	594
	25 - 34	9 (17.6 %)	1075 (26.8 %)	1084
	35 - 49	14 (27.5 %)	970 (24.2 %)	984
	50 +	14 (27.5 %)	680 (17.0 %	694
	Data not available	1 (2.0 %)	0 (0 %)	1
Women	18 - 24	1 (2.0 %)	133 (3.3 %)	134
	25 - 34	0 (0 %)	252 (6.3 %)	252
	35 - 49	4 (7.8 %)	224 (5.6 %)	228
	50 +	1 (2.0 %)	76 (2.0 %	77
	Data not available	0 (0 %)	1 (0 %)	1
Data not available		2 (2.0 %)	5 (0.1 %)	7
Total		51 (100 %)	4005 (100 %)	4056

The age of those refusing to take part differed (from 20 to 79, average age 40.5), they were mostly men (84.3 % of the entire group) and drivers of passenger cars (78.4 %). Only one of those people tested positive for alcohol later (1.5 %o). In general the average age of those refusing to do the DRUID survey was higher than the average age of those who did the survey (average age of women was 38.5 and 41.1 of men).

Table 12.8. Distribution of drivers by region, road type, and season for non-response

	1	2	3	4	5	6
Region	9	11	6	11	7	7
Road type	24	27				
Season	12	8	6	25		

The data show that neither the number of drivers refusing to take part nor their characteristics should have any effect on the results and how they were interpreted. In fact, the non response percentage is so small that even if the non response group would be selective the effect on the prevalence would be minimal.

12.4 Results

This section of the report presents the basic results of the study of prevalence of psychoactive substance use by Polish drivers of passenger and delivery cars. This, however, will be preceded with a short overview of Poland's road traffic law.

Since 1963 Poland has had a very strict BAC of 0.2 g/L. The limit applies to everyone – adult drivers, young and professional drivers and bicyclists. There have never been any serious attempts to change the limit. All drivers stopped by the police because of alcohol are obligatory sent to court. In 2001 Poland introduced two systems for penalising drink driving. If the BAC is between 0.2 and 0.5 g/L, the case is referred to a court of first instance, and considered an offence. If the BAC is above 0.5 g/L the case is handled by the criminal courts and considered a crime. This means more severe penalties. Almost every single day the results of roadside sobriety checks or information about unusual accidents caused by drunk drivers are reported in the news media. There are numerous public campaigns and political and social statements on the negative effects of drink driving. This shows that Poland has had a consistent drink driving policy for years and that it has strong public support. This cannot be said, however, about other psychoactive substances. The first regulations were introduced in 1997, but it was not until six years later that the government published a list of psychoactive substances that cannot be taken when driving. At present, the following substances are banned: opiates, amphetamine and its derivatives, cocaine, THC and medication based on benzodiazepines such as diazepam, estazolam and clonazepam. The regulations do not make it clear whether any traces of a psychoactive substances make the driver liable ("zero tolerance") or whether it must be proved that the substance

affects the driver's mental and physical ability to drive. This lack of clarity makes enforcement more difficult and inconsistent. In addition the risks caused by psychoactive substances if used by drivers have only been addressed recently with much less intensity compared to alcohol.

Table 112.9 shows the prevalence of psychoactive substances among the general driving population of Polish drivers.

Table 12.9. Adjusted general distribution of *core substance categories* (N = 4005)

Substance category	Prevalence (%)	Confidence interval (%)
Negative	97.63	97.11 – 98.05
Alcohol	1.47	1.14 – 1.90
Amphetamine	0.05	0.01 – 0.18
Cocaine	-	-
THC	0.57	0.38 – 0.85
Illicit opiates	0.09	0.04 – 0.25
Benzodiazepines	0.14	0.08 – 0.31
Z-drugs	-	-
Medicinal opioids	0.03	0.01 – 0.15
Alcohol – drugs	-	-
Multiple drugs	0.02	0.00 – 0.14

As you can see from the data, among all drivers 2.4 % tested positive for one or more of the psychoactive substances included in the study. The most common psychoactive substance in the population of Polish drivers is alcohol (1.47 % of all drivers tested) followed by THC (0.57 %) and benzodiazepines (0.14 %). This is no surprise. A recent representative survey of Poles conducted in 2009 showed that the most prevalent substance was THC with about 2% of the population admitting to having taken it in the last 12 months. The relatively popular benzodiazepines are no surprise either. Poland has one of the highest consumption of over-the-counter sedatives and sleeping pills and Poles are known for their propensity for taking pain killers. The last two ESPAD surveys from 2007 (Ahlström et al. 2009) and a survey conducted by CINN KBPN in 2002 and 2006 (Sierosławski 2006) showed that Poles take more medication than THC. But the problem is that most people using the drugs are unaware of how they affect their mental and physical abilities with ¼ of users not knowing the name of the drug they take.

What came as some surprise is the relatively low prevalence of amphetamine. Poland together with the Netherlands and Belgium is one of Europe's leading producers of amphetamine (EMCDDA 2009). Population surveys show that the number of amphetamine users, including experimental users has been steadily rising since the 1990s. Since then amphetamine has become the second most prevalent drug after cannabis. The results of the previous surveys showed that in the last 12 months 1% of the respondents had taken amphetamine. Roadside surveys in Poland showed that almost equal numbers of drivers used amphetamine and THC, but in the majority of the cases amphetamine levels were below the cut-off point used in DRUID and these people were not included in further analyses. The evidence, however, suggests that amphetamine use in Poland should be further investigated.

Table 12.10 shows the distribution of core substance categories by gender and age.

Table 12.10. Adjusted distribution of *core substance categories* by gender and age (N = 4005)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	96.93 95.01 – 98.13	96.18 94.87 – 97.17	96.71 95.40 – 97.65	99.52 98.72 – 99.82	97.21 96.60 – 97.72
Alcohol	0.54 0.17 – 1.68	2.61 1.82 – 3.73	2.41 1.62 – 3.57	0.45 0.16 – 1.23	1.75 1.35 – 2.25
Amphetamine	0.15 0.02 – 1.04	0.04 0.00 – 0.42	0.00 0.00 – 0.39	0.02 0.00 – 0.53	0.04 0.01 – 0.18
Cocaine	-	-	-	-	-
THC	1.85 0.98 – 3.46	1.05 0.59 – 1.84	0.23 0.07 – 0.78	0.00 0.00 – 0.50	0.68 0.46 – 1.03
Illicit opiates	0.00 0.00 – 0.77	0.11 0.02 – 0.56	0.25 0.08 – 0.82	0.00 0.00 – 0.50	0.11 0.04 – 0.30
Benzodiazepines	0.38 0.10 – 1.43	0.00 0.00 – 0.35	0.36 0.13 – 0.97	0.02 0.00 – 0.53	0.16 0.07 – 0.37
Z-drugs	-	-	-	-	-
Medicinal opioids	0.00 0.00 – 0.77	0.00 0.00 – 0.35	0.05 0.01 – 0.48	0.00 0.00 – 0.50	0.01 0.00 – 0.14
Alcohol – drugs	-	-	-	-	-
Multiple drugs	0.15 0.02 – 1.05	0.01 0.00 – 0.37	0.00 0.00 – 0.39	0.00 0.00 – 0.50	0.03 0.00 – 0.16
Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	99.87 96.26- 100.00	99.52 97.64 – 99.90	99.59 97.69 – 99.93	100.00 95.12 – 100.00	99.65 98.85 – 99.90
Alcohol	0.13 0.00 – 3.74	0.20 0.02 – 1.87	0.11 0.01 -1.78	0.00 0.00 – 4.88	0.13 0.02 – 0.81
Amphetamine	0.00 0.00 – 3.51	0.29 0.04 – 2.03	0.00 0.00 – 1.57	0.00 0.00 – 4.88	0.11 0.01 – 0.77
Cocaine	-	-	-	-	-
THC	0.00 0.00 – 3.51	0.00 0.00 – 1.51	0.00 0.00 – 1.57	0.00 0.00 – 4.88	0.00 0.00 – 0.57
Illicit opiates	0.00 0.00 – 3.51	0.00 0.00 – 1.51	0.00 0.00 – 1.57	0.00 0.00 – 4.88	0.00 0.00 – 0.57
Benzodiazepines	0.00 0.00 – 3.51	0.00 0.00 – 1.51	0.00 0.00 – 1.57	0.00 0.00 – 4.88	0.00 0.00 – 0.57
Z-drugs	-	-	-	-	-
Medicinal opioids	0.00 0.00 – 3.51	0.00 0.00 – 1.51	0.30 0.0.4 – 2.12	0.00 0.00 – 4.88	0.11 0.01 – 0.77
Alcohol – drugs	-	-	-	-	-
Multiple drugs	0.00 0.00 – 3.51	0.00 0.00 – 1.51	0.00 0.00 – 1.57	0.00 0.00 – 4.88	0.00 0.00 – 0.57

Table 12.10 continues on the next page.

Tab. 12.10 continued. Adjusted distribution of *core substance categories* by gender and age (N = 4005)

In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	97.45 95.86 – 98.44	96.81 95.73 – 97.62	97.27 96.20 – 98.05	99.56 98.84 – 99.84	97.63 97.11 – 98.05
Alcohol	0.47 0.15 – 1.42	2.16 1.50 – 3.08	1.95 1.31 – 2.89	0.41 0.15 – 1.12	1.47 1.14 – 1.90
Amphetamine	0.12 0.02 – 0.86	0.08 0.02 – 0.43	0.00 0.00 – 0.31	0.02 0.0 - 049	0.05 0.01 – 0.18
Cocaine	-	-	-	-	-
THC	1.52 0.81 – 2.86	0.85 0.48 – 1.50	0.18 0.05 – 0.62	0.00 0.00 – 0.45	0.57 0.38 – 0.85
Illicit opiates	0.00 0.00 – 0.64	0.09 0.02 – 0.45	0.20 0.06 – 0.66	0.00 0.00 – 0.45	0.09 0.04 – 0.25
Benzodiazepines	0.31 0.08 – 1.18	0.00 0.00 – 0.28	0.29 0.10 – 0.78	0.02 0.00 – 0.49	0.14 0.06 – 0.31
Z-drugs	-	-	-	-	-
Medicinal opioids	0.00 0.00 – 0.64	0.00 0.00 – 0.28	0.10 0.02 – 0.49	0.00 0.00 – 0.45	0.03 0.01 – 0.15
Alcohol – drugs	-	-	-	-	-
Multiple drugs	0.12 0.02 – 0.86	0.01 0.00 – 0.30	0.00 0.00 – 0.31	0.00 0.00 – 0.45	0.02 0.00 – 0.14

Analysis of the data suggests several conclusions:

1. Prevalence of psychoactive substances is the highest among drivers aged 25 to 34 and 35 to 49 and next 18 to 24.
2. Practically in all of the age groups (except 18 to 24) alcohol is the most common psychoactive substance. The degree of prevalence is quite alarming among male drivers aged 25 to 34 and 35 to 49 (2.61 % and 2.41 % respectively tested positive).
3. Drivers aged 18 to 24 use less alcohol compared to other psychoactive substances (primarily THC – 1.52 % were positive).
4. In all age groups consumption of psychoactive substances is distinctly higher among men than women (2.79 % of men were positive versus 0.35 % women). The most common substance among men is alcohol with other psychoactive substances (especially amphetamine and medical opioids) prevailing in women. This needs further verification because women were not well represented in the survey.

Table 12.11 shows the distribution of psychoactive substances by day of the week and time of the day.

Table 12.11. Adjusted distribution of *core substance categories* by day of the week and time of the day (N = 4005)

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekend days 04:00 – 21:59	Weekend nights 22:00 – 03:59	In total
Substance category	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
Negative	97.81 97.21 – 98.29	96.41 90.39 – 98.71	97.20 95.95 – 98.08	97.26 90.75 – 99.23	97.63 97.11 – 98.05
Alcohol	1.41 1.04 – 1.91	1.72 0.41 – 6.90	1.70 1.05 – 2.73	0.86 0.11 – 6.32	1.47 1.14 – 1.90
Amphetamine	0.00 0.00 – 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
Cocaine	-	-	-	-	-
THC	0.52 0.31 – 0.85	0.86 0.13 – 5.53	0.61 0.28 – 1.34	1.54 0.30 – 7.44	0.57 0.38 – 0.85
Illicit opiates	0.13 0.05 – 0.34	0.00 0.0 – 4.00	0.00 0.00 – 0.40	0.00 0.00 – 4.81	0.09 0.04 – 0.25
Benzodiazepines	0.13 0.05 – 0.34	0.57 0.06 – 5.04	0.13 0.03 – 0.63	0.00 0.00 – 4.81	0.14 0.06 – 0.31
Z-drugs	-	-	-	-	-
Medicinal opioids	0.00 0.00 – 0.13	0.00 0.00 – 4.00	0.13 0.03 – 0.63	0.00 0.00 – 4.81	0.03 0.01 – 0.15
Alcohol – drugs	-	-	-	-	-
Multiple drugs	0.00 0.00 – 0.13	0.14 0.00 – 4.27	0.08 0.01 -0.54	0.00 0.00 – 4.81	0.02 0.00 – 0.14

Analysis of the data in Table 12.11 usually helps with a more accurate determination of the times of the week and day when drivers are most likely to have taken psychoactive substances. In many of the previous surveys driving under the influence of psychoactive substances was associated with night time and weekend driving. This cannot be corroborated by the results of the Polish survey. As regards alcohol drunk drivers were caught during the day, night, on weekdays and over the weekend. With no distinct lines drawn between the times of day and week, fewer people in Poland are asked to take the alcohol test during night time. Another explanation could be that there is some diversity among drunk drivers. The experience from the survey shows many drivers tested in the morning hours were surprised that they tested positive for alcohol. While they admitted drinking alcohol the day before, they were certain that having rested at home they were safe to drive. Night time checks offered similar results. Many drivers were certain that by drinking a small amount of alcohol they were not breaking the traffic law. Alcohol concentration data suggest that this is a plausible explanation. Alcohol concentration in nearly half of the drunk drivers did not exceed 0.5 g/L (Table 12.12).

Table 12.12. Adjusted general distribution of alcohol by concentration class (N = 4005)

Alcohol alone	Prevalence (%)	Confidence interval (%)
Alcohol 0.1 – 0.49 g/L	0.89	0.64 – 1.23
Alcohol 0.5 – 0.79 g/L	0.18	0.09 – 0.36
Alcohol 0.8 – 1.19 g/L	0.27	0.15 – 0.48
Alcohol 1.2+	0.14	0.06 – 0.31
In total	1.47	1.14 – 1.90

The distribution of other psychoactive substances by day of the week and time of the day was closer to the expectations (Table 15). People driving under the influence of amphetamine and benzodiazepines tend to do it at night but when it comes to THC (the most common illicit psychoactive substance) the results are not clear cut. This could be because of varying availability of the substances and when they are usually consumed.

The following tables (12.13 – 12.14) show the details of alcohol distribution in road traffic in Poland.

Table 12.13. Adjusted distribution of *alcohol alone* by gender and age (N = 4005)

Men					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.34 0.09 – 1.37	1.26 0.75 – 2.11	1.90 1.22 – 2.97	0.09 0.01 – 0.67	1.05 0.75 – 1.45
0.5 – 0.79 g/L	0.17 0.03 – 1.09	0.30 0.10 – 0.83	0.10 0.02 – 0.57	0.26 0.07 – 0.95	0.21 0.10 – 0.43
0.8 – 1.19 g/L	-	0.91 0.49 – 1.67	0.07 0.01 – 0.53	-	0.32 0.18 – 0.58
1.2+	0.03 0.00 – 0.82	0.15 0.03 – 0.61	0.33 0.12 – 0.93	0.09 0.01 – 0.67	0.17 0.08 – 0.38
In total	0.54 0.17 – 1.68	2.61 1.82 – 3.73	2.41 1.62 – 3.57	0.45 0.16 – 1.23	1.75 1.35 – 2.25
Women					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.13 0.00 – 3.74	0.20 0.02 – 1.87	0.11 0.01 – 1.78	-	0.13 0.02 – 0.81
0.5 – 0.79 g/L	-	-	-	-	0.00 0.00 - 057
0.8 – 1.19 g/L	-	-	-	-	0.00 0.00 - 057
1.2+	-	-	-	-	0.00 0.00 - 057
In total	0.13 0.00 – 3.74	0.20 0.02 – 1.87	0.11 0.01 – 1.78	0.00 0.00 – 4.88	0.13 0.02 – 0.81
In total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.31 0.08 – 1.16	1.06 0.63 – 1.76	1.55 0.99 – 2.41	0.09 0.01 – 0.61	0.89 0.64 – 1.23
0.5 – 0.79 g/L	0.14 0.02 – 0.90	0.24 0.08 – 0.68	0.08 0.01 – 0.46	0.24 0.06 – 0.86	0.18 0.09 – 0.36
0.8 – 1.19 g/L	-	0.74 0.40 – 1.36	0.06 0.01 – 0.42	-	0.27 0.15 – 0.48
1.2+	0.02 0.00 – 0.68	0.12 0.03 – 0.49	0.26 0.09 – 0.75	0.09 0.01 – 0.61	0.14 0.06 – 0.31
In total	0.47 0.15 – 1.42	2.16 1.50 – 3.08	1.95 1.31 – 2.89	0.41 0.15 – 1.12	1.47 1.14 – 1.90

Table 12.14 Adjusted distribution of *alcohol alone* by day of the week and time of the day (N = 4005)

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekend days 04:00 – 21:59	Weekend nights 22:00 – 03:59	In total
Alcohol alone	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**	**Prevalence (%) C.I. (%)**
0.1 – 0.49 g/L	0.85 0.58 – 1.26	1.15 0.21 – 6.00	1.01 0.54 – 1.87	0.51 0.04 – 5.74	0.89 0.64 – 1.23
0.5 – 0.79 g/L	0.13 0.05 – 0.34	0.14 0.00 – 4.27	0.31 0.10 – 0.91	0.34 0.02 – 5.44	0.18 0.09 – 0.36
0.8 – 1.19 g/L	0.34 0.18 – 0.63	0.14 0.00 – 4.27	0.08 0.01 – 0.54	-	0.27 0.15 – 0.48
1.2+	0.09 0.03 – 0.28	0.29 0.02 – 4.54	0.31 0.10 – 0.91	-	0.14 0.06 – 0.31
In total	1.41 1.04 – 1.91	1.72 0.41 – 6.90	1.70 1.05 – 2.73	0.86 0.11 – 6.32	1.47 1.14 – 1.90

It is quite clear from the data that drink driving is a male problem in Poland. Women are not very likely to drink and drive and their blood alcohol levels are low. Drink driving is less common among young and novice drivers (aged 18 to 24) compared to older drivers. What is more their blood alcohol levels are lower than those of older drivers. There is a great deal of concern in the case of drivers aged 25 to 34 and 35 to 49 driving with high alcohol levels. It may be that some of them are alcoholics. This could explain to some extent why the reduction in drink driving has been so slow in Poland because traditional methods do not appeal to these groups. If confirmed in more in-depth studies, this hypothesis means that Poland must urgently diversify its drink driving policy. Finally, the survey has established that older drivers aged 50+ also drink and drive.

12.5 Discussion of results

What we know about the use of psychoactive substances by Polish drivers has so far been based on a few public opinion polls. In a survey in 2002 dr Janusz Sierosławski from the Warsaw based Institute of Psychiatry and Neurology found that 4.4 % of the drivers admitted to drink driving in the last year and 1.2 % said that they had driven after consuming other psychoactive substances. Similar results were obtained in 2006 in the last survey of the prevalence of psychoactive substances in road traffic. The DRUID survey was Poland's special opportunity for filling the gaps.

The survey found that alcohol was detected in 1.47 % of the drivers and other psychoactive substances were detected in 0.9 % of the drivers. In the case of Poland what seems like a low percentage is actually a high number: 174,000 drivers who drink and drive at least once a year, 64,000 use THC, 15,000 take benzodiazepines and 9,000 take amphetamine. To compare – Polish police detect about 80,000 drunk drivers and about 1500 drivers who have taken other psychoactive substances[15].

While the data collected under DRUID suggest some improvement and levelling off of drink and drug driving, it must be treated with a certain degree of caution due to the different methods of estimating the prevalence. It was only recently, i.e. in October 2010 when Poland was running SARTRE 4 (Social Attitudes To Road Traffic Risk In Europe, an EU programme) that public opinion polls data were verified. It was established that 3.3 % of drivers admitted to driving in the last year having consumed even very small amounts of alcohol with 1.5 % in the last month and 1 % in the last week. The results for other psychoactive substances were 0.7 %, 0.6 % and 0.4 % respectively. Among drivers who admitted to driving under the influence of psychoactive substances other than alcohol 54.6 % had taken THC and 9.1 % had taken amphetamine. This shows that there has been some improvement in Poland in recent years and that DRUID results give a relatively true picture of the trends in Poland. The use of alcohol and amphetamine may be underestimated for various reasons.

Over the last twenty years Poland's prevention policy has achieved some success in reducing drink driving but recent results show that progress is now slower. There is an urgent need for a modified policy. Effective drink driving detection should be a priority. Any recommendations regarding other psychoactive substances are a more difficult task. DRUID results from other countries suggest that the

[15] No data are available about the breakdown of psychoactive substances.

situation is not so bad in Poland but experience shows that many of the new traffic risks appear even if a little late. It can be expected that psychoactive substances other than alcohol are going to become a growing problem in Poland. This claim can be corroborated with the results of surveys of psychoactive substances use by youth. On the other hand, recommending a more intensive police enforcement now is not a very good option. The use of psychoactive substances by drivers is a relatively new problem in Poland and cannot be addressed effectively due to inadequate legal regulations, lack of trained police officers or specialist equipment for police patrols. What is more the experience from the survey shows that none of the methods used by Polish police (watching for external symptoms, use of devices) are a guarantee of effective detection of illicit substance driving. Changes may also be required in toxicology testing and within the justice system as well. Because of this, any recommendations to step up police checks are a bit too early. Instead Poland should urgently revise its legal regulations (e.g. allow saliva test results as evidence in court), introduce continuous education training for police officers, toxicology lab staff and the justice system, provide the necessary equipment for toxicology labs and the police and finally raise public awareness. Based on DRUID results it seems a plausible recommendation to target police checks (and the work of the entire system) on detecting drivers who have consumed alcohol, THC and perhaps amphetamine. Another area is the inclusion of the medical community in prevention policies. Finally, because we still have a limited understanding of the problem in Poland, we need a system of regular (e.g. once every 2-3 years) checks to monitor the scale of psychoactive substances use in road traffic. Of the two methods (public opinion polls vs. roadside surveys) the first is clearly the easier and cheaper option. Roadside surveys, however, offer an insight into police work and the entire system for eliminating dangerous drivers. This information can be a point of reference for evaluating the effectiveness and efficiency of the policies. While a repeat survey of DRUID would probably be beyond the capacity of many countries, they can use it to formulate a set of minimum requirements for similar surveys in the future.

12.6 Acknowledgements

The DRUID roadside survey in Poland was carried out by the Motor Transport Institute from Warsaw, Institute of Forensic Research from Krakow and the National Police. In addition, there were DRUID coordinators in each of the participating regions. They were police officers working in Road Traffic Departments of Regional Police responsible for carrying out the survey at check points. In general the Polish DRUID survey was carried out by about 200 people. We want to extend a big thank you to all those who have worked in the project. Without their dedication this major and complex survey could not have been completed. A special thank you goes to Leszek Gontarczyk from the National Police and professor Maria Kale and dr. Wojciech Lechowicz from the Institute of Forensic Research in Krakow for their efforts in preparing and coordinating the survey in Poland.

It was Poland's first survey of the prevalence of psychoactive substances use in road traffic and we want to say thank you to DRUID (WP1) coordinators: Inger Marie Bernhoft and Tove Hels from DTU, René Mathijssen and Sjoerd Houwing from SWOV for their help and support and to all colleagues carrying out the roadside survey in Europe. The opportunity to take advantage of the experience of other countries and participate in the discussions of WP1 members has been a great help.

12.7 References

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Annex 12.1 Chromatographic and mass spectrometry conditions

Chromatographic conditions

Two chromatographic systems were applied: Waters Sep. module and Agilent HP1100. Separations were performed on Merck KGaA columns 125 mm Superspher 60 RP-select B (C-8), 2 mm id. and 55 mm Purospher STAR RP-18e (C-18), 4 mm id., 3 ☐m particle si
consisted of acetonitryle (A) and water (B), formic acid 1% in final mixture:
gradient (I Waters; II Agilent)

- I gradient. 0 min. 35% (A), 1 min 35% (A), 10 min 80% (A), 15 min 80%(A), 15.2 min 35% (A), 20 min. 35% (A); 0,3 ml/min; 40^{o}C
- II gradient 0 min 5% (A), 9 min 65%, 10 min 5%, 13 min 5%; 0,8 ml/min; 25^{o}C
- injection volume: appropriate 30 and 20 ☐l

Mass spectrometry conditions and monitored drugs

Micromass Quattro micro MS System and Agilent HP1100 MSD with ES+ ionisation for both

Table 1. Retention times, monitored m/z of SRM/MRM for all the included drugs

Drug	Parent	Daughter	Drug	Parent	Daughter
Morphine	286	201	Carbamazepine	237	194
Morphine-D3	289	201	Oxazepam-D3	292	292
Codeine	300	165	Oxazepam	287/9	287/9
Codeine-D3	303	165	Zopiclone	277	245
6-acetylmorphine	328	165	Lorazepam-D4	325	325
6-acetylmorphine-D3	331	165	Lorazepam	321/3	321/3
Benzoylecgonine	290	168	Nordiazepam-D5	276	276
Benzoylecgonine-D3	293	171	Clonazepam-D4	320	320
7-Aminoclonazepam-D4	290	290	Clonazepam	316/8	316/8
7-Aminoclonazepam	286/8	286/8	Nordiazepam	271/3	271/3
MDA-D5	185	168	Alprazolam-D5	314	314
MDA	180	163	Alprazolam	309/11	309/11
Amphetamine	136	91	Flunitrazepam-D7	321	321
Amphetamine-D5	141	124	Flunitrazepam	314/5	314/5
7-Aminoflunitrazepam-D7	291	291	Diazepam-D5	290	290
MDMA	194	163	Diazepam	285/7	285/7
MDMA-D5	199	165	Imipramine-D3	284	89
7-Aminoflunitrazepam	284/6	284/6	Imipramine	281	86
Methamphetamine	150	91	Methadone-D3	313	268
Methamphetamine-D5	155	91	Methadone	310	265
MDEA-D5	213	163	THC-D3	318	196
MDEA	208	163	THC	315	193
Tramadol-D3	268	58			
Tramadol	264	58			
Cocaine-D3	307	185			
Cocaine	304	182			
Zolpidem-D6	314	235			
Zolpidem	308	235			

Validation

Freeze and thaw than centrifuged real saliva with addition of 0, 1, 5, 10, 20, 50, 100, 200 ng/ml seven levels calibration and negative each four repetitions. Additional levels 500 and 1000 ng/ml for high concentrations.

Quality control samples

Intensity of signal from mobile phase components before analysis UTAK 100% cut-off synthetic saliva, internal standards signals. Samples are not diluted, results are extrapolated because research is performed only for prevalence not for correlation. Additional levels 500 and 1000 ng/ml gave similar results as extrapolation.

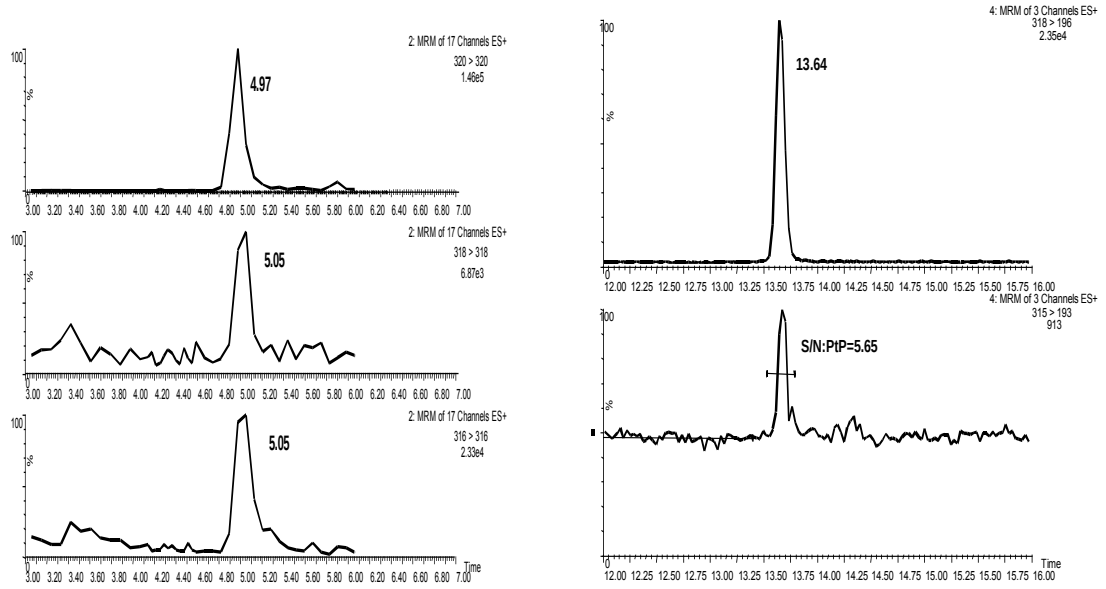

Figure 1. Chromatogram of a positive sample THC and clonazepam both 1 ng/ml

Validation parameters: Calibration model used was linear with zero excluded

Table 2. Accuracy and precision for reference material UTAK

Compund	UTAK 100% cut-off	Measured	Accuracy	Precision (n=12)
Amphetamine	100	87	87%	12%
Metamphetamine	100	103	103%	17%
Benzoylecgonine	40	43	108%	13%
Methadone	10	11.5	115%	13%
Oxazepam	100	86	86%	12%

Table 3. LOQ (CV<30%), for SRM or SIR method of ion recording

Compound	LOD	LOQ	Calibration equation	Determination coefficient R^2 (n=7)
Amphetamine	<1	5	Y = 0.042 * X - 0.033	0.997
Metamphetamina	<1	5	Y = 0.056 * X - 0.035	0.998
MDA	<1	5	Y = 0.020 * X + 0.024	0.998
MDMA	<1	5	Y = 0.020 * X + 0.008	1.000
MDEA	<1	5	Y = 0.020 * X + 0.038	1.000
Tramadol	<1	5	Y = 0.022 * X + 0.003	0.988
Morphine	1	5	Y = 0.034 * X + 0.000	0.997
Benzoylecgonine	<1	5	Y = 0.023 * X – 0.015	0.999
Codeine	1	5	Y = 0.020 * X + 0.064	0.996
6-acetylmorphine	2	5	Y = 0.022 * X + 0.073	0.972
7-aminoclonazepam	5	20	Y = 0.034 * X + 0.000	0.976
7-aminoflunitrazepam	1	5	Y = 0.444* X + 0.000	0.986
Zopiclon	<1	1	Y = 0.026 * X - 0.013	0.984
Carbamazepine	<1	1	Y = 0.075 * X - 0.008	0.996
Nordiazepam	<1	1	Y= 0.020 * X - 0.011	0.999
Oxazepam	<1	2	Y = 0.022 * X - 0.007	0.999
Cocaine	<1	2	Y = 0.021 * X + 0.040	0.987
Zolpidem	<1	1	Y = 0.025 * X + 0.089	0.991
Clonazepam	<1	1	Y = 0.020 * X - 0.007	0.999
Lorazepam	<1	1	Y = 0.014 * X + 0.020	0.999
Imipramine	<1	1	Y = 0.022 * X - 0.027	0.987
Diazepam	<1	1	Y = 0.019 * X - 0.014	0.988
Alprazolam	1	3	Y = 0.026 * X - 0.025	0.999
Methadon	<1	1	Y = 0.020 * X + 0.010	0.992
Flunitrazepam	<1	1	Y = 0.019 * X - 0.019	0.986
THC	1	2	Y = 0.022 * X - 0.029	0.999

Interference from blue indicator – collecting pad is tear off indicator stick and placed in transportation tube. Method was published in proceedings of SOFT/TIAFT Meeting in Seattle 2007 [16]

[16] Wojciech Lechowicz, Maria Kala, Joni Walker (2007): Screening and quantification of the twenty-four drugs in oral fluid relevant for road traffic safety by means of LC-MS-MS/ESI

13 Country Report Portugal

Authors: *Mário Dias, Suzana Fonseca, Susana Simões*

South Branch of National Institute of Legal Medicine, Portugal

13.1 Description of roadside driver sample

It is well established that alcohol impairs driving ability and increases the accident risk. In recent years driving under influence of psychoactive substances other than alcohol has gained considerable attention. Although alcohol is the single compound most frequently detected among accident drivers, the role of drugs and medicines concerning the incidence in driving and their contribution for road traffic accidents has been a subject of increasing interest.

In order to target strategies to better manage driving under influence (DUI), epidemiological data are necessary to document the scope of the problem. Most epidemiological studies on illicit drugs and medicines among drivers have been difficult to compare due to the lack of standardized protocols, e.g. selection of subjects, biological matrix used, different compounds included in the analytical protocol and their cut-off limits. One of the main purposes of DRUID project (Driving Under the Influence of Drugs, Alcohol and Medicines) is to study the prevalence of psychoactive drugs in the driving population.

The Portuguese participation in this study allowed, for the first time, to obtain relevant information about the situation in Portugal regarding the prevalence of driving under the influence of alcohol and psychotropic substances among drivers not involved in accidents. The Portuguese Centre of Post-Graduated Studies in Legal Medicine of the National Institute of Legal Medicine (CPS-NILM) has participated in the DRUID project integrating Task 2.2.a (Road Side Survey) as part of Work Package 2 – Epidemiology. The CPS-NILM was responsible for planning, collecting and analyse about 4000 samples of oral fluid from drivers whose participation was voluntary and anonymous. The selection was made randomly in sessions geographically distributed to ensure the representativeness of the Portuguese drivers. In order to allow comparability of results between different countries, several criteria were established in Deliverable D 2.1.2 (Uniform design and protocols for carrying out case-control studies). Those criteria were related to the geographical distribution of sessions over different time periods (month, days and time of day).

The type of device used for the collection of oral fluid samples was the same for all participant countries and was approved in the initial phase of the project.

The toxicological analysis was performed using an analytical methodology for screening and quantification of 26 substances, 23 of which were common to all participant countries. A minimum analytical limit of detection (Analytical Cut-Off) was established for all substances. All laboratories that participated had to prove ability to achieve these values through participation in a previous program of proficiency.

13.1.1 Geographical distribution

The administrative division of Portugal Continental comprises 308 municipalities spread over 18 districts in 5 regions. Considering the geographical distribution of the population, the number of driving licenses and the number of road accidents with victims in year 2006, 5 municipalities were selected in the district of Porto (Porto, Vila Nova de Gaia, Matosinhos, Gondomar and Valongo), 5 municipalities in the district of Coimbra (Coimbra, Figueira da Foz, Cantanhede, Penacova and Montemor-o-Velho) and 5 municipalities in the district of Lisboa (Lisboa, Sintra, Cascais, Oeiras and Loures).

Figure 13.1 Geographical distribution of roadside survey regions

According to the official statistics of 2006, about 44% of the Portuguese population resided in the geographical area included in the study, and 49% of driving licences as well as 40% of road accidents with victims were there registered. Table 13.1 presents the distribution of population and drivers by Region, District and Municipality and the number of samples collected in the 3 Districts included in the study.

Table 13.1. Distribution of population, driving licenses and number of samples collected by District

Portugal Continental (5 Regions/ 18 Districts/ 308 Municipalities) 10110271 inhabitants (*) 5396647 driver licences (**)								
North Region (8 Districts/ 86 Municipalities) 3744341 inhabitants (*)			Center Region (7 Districts/ 100 Municipalities) 2385891 inhabitants (*)			Lisbon Region (3 Districts/ 51Municipalities) 2794226 inhabitants (*)		
District of Porto (18 Municipalities) 1805015 inhabitants (*)			District of Coimbra (17 Municipalities) 437642 inhabitants (*)			District of Lisboa (16 Municipalities) 2203503 inhabitants (*)		
Municipalities	Inhabitants(*)	**Number of Samples**	Municipalities	Inhabitants(*)	**Number of Samples**	Municipalities	Inhabitants(*)	**Number of Samples**
V.N. Gaia	300868		Coimbra	135314		Lisboa	489562	
Porto	238954		Figueira Foz	63135		Sintra	445872	
Gondomar	169239	**1374**	Cantanhede	38920	**1345**	Loures	195035	**1302**
Matosinhos	168451		Montemor-o-Velho	24766		Cascais	188244	
Valongo	91274		Penacova	16857		Oeiras	172021	

* Year 2006 (Source: Instituto Nacional de Estatística)
** Year 2006 (Source: Autoridade Nacional de Segurança Rodoviária)

13.1.2 Distribution by road type

A total of 117 sessions were carried out on urban and inter-urban roads, in the 15 municipalities included in the study. The locations of the sessions were established according to the traffic flow and safety conditions for the DRUID working teams. In Table 13.2 it is represented the distribution of drivers by road type.

Table 13.2. Distribution of drivers by road type

District	Drivers		
	Urban	Inter-Urban (EN;EM; IP/IC)	Total
Porto	1132	242	1374
Coimbra	796	549	1345
Lisboa	1030	272	1302
Total	2958	1063	4021
EN – national road; EM – municipal road; IP/IC inter-regional road			

13.1.3 Distribution by month, day and time period

Traffic exposure and prevalence of psychoactive substances used by drivers may vary considerably by time (month, day of the week and time of the day). The sessions were distributed evenly for the different seasons. The districts and municipalities included in this study had a monthly identical volume of traffic throughout the year.

To ensure comparability of the results eight time periods were defined (day and time of day) and the planning was made to include more than one session in each of those periods. The sessions were conducted in different time periods according to the availability of police resources. Table 13.3 and 13.4 presents the distribution of drivers with final valid sample by season and time period, respectively. In time period 5 the police forces concentrate their activity in specific operations which partly conditioned the planned sessions during this period. The availability of police resources in time period 2 and the largest volume of traffic during this period, allowed the collection of a higher number of samples.

Table 13.3. Distribution of drivers by season

Season	Drivers
Winter (month 1-3)	1300 (32.78%)
Spring (month 4-6)	959 (24.18%)
Summer (month 7-9)	769 (19.39%)
Autumn (month 10-12)	937 (23.63%)

Table 13.4. Distribution of drivers by time period*

Time period	Drivers
1	483 (12.18%)
2	892 (22.50%)
3	489 (12.33%)
4	485 (12.23%)
5	222 (5.60%)
6	418 (10.54%)
7	518 (13.06%)
8	458 (11.55%)

***Weekday**: **1**- Monday to Friday 04:00 to 10:00 **2** - Monday to Friday 10:00 to 16:00
3 - Monday to Thursday 16:00 to 22:00 **4** - Monday to Thursday 22:00 to 04:00

Weekend: **5** – Saturday and Sunday 04:00 to 10:00 **6** – Saturday and Sunday 10:00 to 16:00
7 – Friday to Sunday 16:00 to 22:00 **8** – Friday to Sunday 22:00 to 04:00

13.1.4 Distribution by gender and age

Table 13.5 presents the distribution of drivers by gender and age group.

Table 13.5. Distribution of drivers by gender and age group

Age group	Gender	
	male	female
18-24	385	218
25-34	802	455
35-49	833	378
≥ 50	690	146
Note: In 53 questionnaires information about age or gender was missing.		

In this study female drivers represent 30.6% of all drivers. This may be partly justified by the fact that the number of women with driving licenses is lower than male. According to 2006 official data only 37.2% of all driving license holders were female[17]. According to the same official data, about 47% of drivers were between 25 and 44 years. In our study the percentage of drivers between 25 and 49 years old is higher. One reason may be attributed to the fact that the municipalities included in this study are part of large metropolitan areas where the majority of the active population lives. In fact, almost 40% of the Portugal inhabitants live in the districts of Lisboa and Porto (see Table 13.1).

13.2 Roadside data collection and analysis

Following the approval by the Ethic Committee of the Faculty of Medicine of the University of Coimbra, the roadside sessions were performed by teams of Police and researchers of the National Institute of Legal Medicine (INML, IP), between January 2008 and June 2009, in selected locations in accordance with the flow of traffic and security conditions for the teams. The first car approaching the research site was ordered to stop by the police as soon as one of the researchers was available to collect the sample and conduct the interview.

Drivers stopped were informed about the aims of the DRUID project and invited to cooperate with the research team on a voluntary and anonymous basis. Drivers who agreed to cooperate, were interviewed about their drug and medicine use, and time of its administration. Apart from this, data collection also comprised date, time, gender and age of the subject, and signs of impairment. The results for each driver were entered on a uniquely anonymous numbered research form.

After the interview and oral fluid sampling, all subjects were breath-tested for blood alcohol concentration (BAC) by a police officer using a Dräger Alcotest 7810 screening device. When the result obtained was ≥ 0.5 g/l, a Dräger Alcotest 7410 was used to obtain a quantitative result. In accordance with the Portuguese law, BAC is obtained through the concentration of alcohol in the breath using a conversion factor of 2.3. The breath test was compulsory for all drivers stopped and the results entered on the research form.

For the oral fluid collection Statsure Saliva Sampler device was used. It consists of a tube containing 1 ml of buffer and a collector equipped with a volume adequacy indicator which changes colour when 1 ml is collected. In order to calculate the precise amount of collected oral fluid all the devices were weighed with and without sample thus allowing to determine the exact volume of each oral fluid sample collected. All samples were preserved at -20 ºC until toxicological analysis.

All the samples were analyzed by the Department of Forensic Toxicology of the South Branch of the INML I.P., between March 2008 and July 2009, using a methodology developed for screening and quantification of the core substances (Deliverable D 2.1.2). Samples were prepared by liquid-liquid extraction followed by liquid chromatography/tandem mass spectrometry (LC/MS/MS) analysis [1]. The method was fully validated, including specificity and capacity of identification, limit of detection (0.2-2.1 μg/l), limit of quantification (0.8-6.4 μg/l), recovery (34-98%), carryover, linearity (1-200 μg/l), intra-assay precision (coefficient of variance (CV) <20% for 20 μg/l and CV <10% for 100 μg/l) and inter-assay accuracy (mean relative error <15%) and precision (CV <20%). For some substances the

[17] Sinistralidade Rodoviária 2006 – Elementos Estatísticos – Observatório de Segurança Rodoviária (2007)

limit of detection and the limit of quantification of the method were below the DRUID cut-off. Detailed information on the toxicological analyses can be found in annex.

13.3 Non -response

The rate of drivers who refused to participate was only 3%. In such cases no sample was collected and in most of them it was not possible to obtain information for the questionnaire.

13.4 Results

The core substances and the analytical cut-offs used in this study were established in Deliverable D.2.1.2. For prevalence calculation the cut-off value (DRUID cut-off) was redefined considering the DRUID cut-off values established for blood analyzes in prevalence study of alcohol and other psychoactive substances in injured and killed drivers (Deliverable D.2.2.5). The core substances categories and the DRUID cut-off in oral fluid and whole blood are presented in Tables 13.6 and 13.7.

Table 13.6. Core substances categories

Type	Group	Analytical findings
Negative	Negative	
Illicit Drugs	Amphetamines	Amphetamine; Methamphetamine; MDMA; MDEA; MDA
	Cocaine	Cocaine; benzoylecgonine
	THC	THC
	Illicit Opiates	6-acetylmorphine; morphine; morphine + codeine (morphine>= codeine)
Medicinal Drugs	Benzodiazepines	diazepam; nordiazepam; oxazepam; lorazepam; alprazolam; flunitrazepam; 7-aminoflunitrazepam; clonazepam; 7-aminoclonazepam
	Z-Drugs	Zolpidem; Zopiclone
	Opiates and opioids	Morfine + codeine (morphine < codeine); methadone; tramadol
Alcohol	Ethanol	
Various combinations	Drug-Alcohol	
	Drug-Drug	

Table 13.7. DRUID cut-off in oral fluid and whole blood for core substances

Substance	Cut-off in oral fluid (ng/ml)	Cut-off in whole blood (ng/ml)
6-AM	16	10
Alprazolam	3.5	10
Amphetamine	360	20
Benzoylecgonine	95	50
Clonazepam	1.7	10
Cocaine	170	10
Codeine	94	10
Diazepam	5.0	140
Flunitrazepam	1.0	5.3
Lorazepam	1.1	10
MDA	220	20
MDEA	270	20
MDMA	270	20
Methadone	22	10
Methamphetamine	410	20
Morphine	95	10
Nordiazepam	1.1	20
Oxazepam	13	50
THC	27	1.0
Zolpidem	10	37
Zopiclone	25	10
Tramadol	480	50
7-amino-clonazepam	3.1	10
7-amino-flunitrazepam	1.0	8.5

The prevalence of drivers by type of substance is presented in table 13.8. The presence of at least one psychoactive substance was detected in almost 10% of drivers. Alcohol alone was detected in 4.93% of the cases. Benzodiazepines and THC with a prevalence of 2.73% and 1.38%, respectively, were the substances most prevalent after alcohol.

Table 13.8. Total drivers: Adjusted general distribution of *core substance categories* (n=3965)

Substance category	Prevalence (%)	95% Confidence interval
Negative	90.01	84.04 – 90.91
Alcohol	4.93	4.29 – 5.64
Amphetamine	---	--
Cocaine	0.03	0.01 – 0.16
THC	1.38	1.07 – 1.80
Illicit opiates	0.15	0.07 – 0.33
Benzodiazepines	2.73	2.27 – 3.29
Z-drugs	---	--
Medicinal opioids	0.11	0.04 – 0.27
Alcohol – drugs	0.42	0.26 – 0.67
Multiple drugs	0.23	0.12 – 0.44

Drivers with amphetamine alone or Z-drugs alone or in combination were not detected.
In 0.65% of drivers there was an association of at least two substances (Table 13.9). The prevalence of cases with alcohol-drugs combination (0.42%) was approximately twice of the multiple drugs (0.23%). THC was present in more than half of the cases with alcohol-drug combination, while cocaine or its metabolite was present in all cases of multiple drugs involving illicit drugs.

Table 13.9. Combinations of alcohol–drugs and multiple drugs (n=3965)

Various combinations	Prevalence (%)	95% Confidence interval
Alcohol + amphetamine	0.42	0.26 – 0.67
Alcohol + cocaine		
Alcohol + THC		
Alcohol + cocaine + THC		
Alcohol + benzodiazepines		
Illicit opiates + Benzoilecgonine	0.23	0.12 – 0.44
Illicit opiates + cocaine		
Illicit opiates + cocaine + THC		
Cocaine + THC + benzodiazepines		
Benzodiazepines + medicinal opiates		

In all illicit opiates positive cases, a direct marker of recent use of heroin, 6-acetylmorphine, was detected. Methadone was detected in 80% of the positive cases for medicinal opioids. No positive cases were detected for zolpidem, flunitrazepam and zopiclone. Benzodiazepines detected with the highest prevalence were nordiazepam (59%) and alprazolam (26%). In most cases where nordiazepam was detected, it was found in association with other benzodiazepines with common metabolism (diazepam and oxazepam). In contrast, only 14% of the alprazolam positive cases were in association with others benzodiazepines.
The prevalence of positive cases in the districts of Porto (9.87%), Coimbra (9.63%) and Lisboa (10.24%) was similar (Tables 13.10, 13.11 and 13.12).
Drivers who tested positive for cocaine alone (0.06%) were only detected in the district of Lisboa, where benzodiazepines prevalence is also greater (3.25%) than in districts of Coimbra (2.16%) and Porto (1.94%). The opposite was observed for alcohol with a prevalence of 6.8% in Porto, 5.32% in Coimbra and 4.46% in Lisbon.

Table 13.10. District of Porto: Adjusted general distribution of core substance categories (n=1324)

Substance category	Prevalence (%)	95% Confidence interval
Negative	90.13	86.86 – 92.66
Alcohol	6.08	4.15 – 8.83
Amphetamine	---	---
Cocaine	---	---
THC	1.10	0.45 – 2.66
Illicit opiates	0.15	0.02 – 1.21
Benzodiazepines	1.94	0.98 – 3.79
Z-drugs	---	---
Medicinal opioids	0.15	0.02 – 1.21
Alcohol – drugs	0.40	0.10 – 1.63
Multiple drugs	0.04	0.00 – 1.00

Table 13.11. District of Coimbra: Adjusted general distribution of core substance categories (n=1348)

Substance category	Prevalence (%)	95% Confidence interval
Negative	90.37	88.69 -91.82
Alcohol	5.32	4.25 – 6.64
Amphetamine	---	---
Cocaine	---	---
THC	1.09	0.66 – 1.79
Illicit opiates	0.10	0.02 – 0.45
Benzodiazepines	2.16	1.51 – 3.07
Z-drugs	---	---
Medicinal opioids	0.26	0.10 – 0.71
Alcohol – drugs	0.62	0.32 – 1.20
Multiple drugs	0.09	0.02 -0.44

Table 13.12. District of Lisboa: Adjusted general distribution of core substance categories (n=1293)

Substance category	Prevalence (%)	95% Confidence interval
Negative	89.76	88.42 – 90.97
Alcohol	4.46	3.67 – 5.41
Amphetamine	---	---
Cocaine	0.06	0.01 – 0.29
THC	1.63	1.17 – 2.25
Illicit opiates	0.19	0.07 – 0.48
Benzodiazepines	3.25	2.58 – 4.08
Z-drugs	---	---
Medicinal opioids	0.00	0.00 – 0.18
Alcohol – drugs	0.29	0.14 – 0.62
Multiple drugs	0.36	0.18 – 0.71

Distribution of core substance categories by gender and age is shown in Table 13.13. The prevalence of alcohol in male (6.21%) was more than two times higher than among female drivers (2.59%). In both groups, the age group 18-24 showed a higher prevalence, 9.76% in male and 8.00% in female drivers (Figure 13.2).

Table 13.13. Adjusted distribution of *core substance categories* by gender and age (n=3912)

Male					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**
Negative	84.21 79.79 – 87.82	86.68 83.96 – 88.99	89.92 87.56 – 91.71	91.67 89.39 – 93.49	88.67 87.39 – 89.84
Alcohol	9.76 6.95 – 13.53	5.99 4.47 – 8.00	6.37 4.89 – 8.26	4.47 3.17 – 6.26	6.21 5.34 – 7.21
Amphetamine	---	---	---	---	---
Cocaine	0 0.00 – 1.20	0.15 0.03 – 0.82	0.03 0.00 – 0.53	0.00 0.00 – 0.54	0.05 0.01- 0.24
THC	2.23 1.09 – 4.52	4.50 3.20 – 6.29	1.03 0.53 – 1.98	0.67 0.28 – 1.59	2.08 1.60 – 2.71
Illicit opiates	0.00 0.00 – 1.20	0.36 0.11 – 1.15	0.39 0.14 – 1.11	0.00 0.00 – 0.54	0.23 0.11 – 0.51
Benzodiazepines	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
Z-drugs	---	---	---	---	---
Medicinal opioids	0.00 0,00 – 1.20	0.00 0.00 – 0.54	0.30 0.09 – 0.97	0.09 0.01 – 0.71	0.12 0.04 – 0.35
Alcohol – drugs	2.05 0.97 – 4.28	1.28 0.68 – 2.42	0.04 0.00 - 0.54	0.03 0.00 – 0.61	0.64 0.39 – 1.03
Multiple drugs	1.08 0.39 – 2.94	0.11 0.02 – 0.74	0.49 0.19 – 1.25	0.01 0.00 – 0.56	0.32 0.16 – 0.62
Female					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**
Negative	90.91 86.26 – 94.09	93.67 91.16 – 95.50	94.01 91.49 – 95.82	85.92 79.89 – 90.36	92.38 90.86 – 93.67
Alcohol	8.00 5.05 – 12.46	2.44 1.40 – 4.22	0.29 0.06 – 1.33	3.14 1.38 – 6.97	2.59 1.88 – 3.58
Amphetamine	---	---	---	---	---
Cocaine	0.00 0.00 – 1.79	0.00 0.00 – 0.77	0.00 0.00 – 0.81	0.00 0.00 – 2.21	0.00 0.00 – 0.28
THC	0.09 0.00 – 1.96	0.24 0.05 – 1.21	0.00 0.00 – 0.81	0.00 0.00 – 2.21	0.10 0.02 – 0.46
Illicit opiates	0.00 0.00 – 1.79	0.00 0.00 – 0.77	0.00 0.00 – 0.81	0.00 0.00 – 2.21	0.00 0.00 – 0.28
Benzodiazepines	1.00 0.28 – 3.47	3.65 2.32 – 5.69	5.44 3.73 – 7.87	10.83 6.99 – 16.40	4.75 3.74 – 6.00
Z-drugs	---	---	---	---	---
Medicinal opioids	0.00 0.00 – 1.79	0.00 0.00 – 0.77	0.25 0.05 – 1.26	0.00 0.00 – 2.21	0.09 0.02 – 0.43
Alcohol – drugs	0.00 0.00 – 1.79	0.00 0.00 – 0.77	0.00 0.00 – 0.81	0.11 0.01 – 2.43	0.01 0.00 – 0.31
Multiple drugs	0.00 0.00 – 1.79	0.00 0.00 – 0.77	0.00 0.00 – 0.81	0.00 0.00 – 2.21	0.08 0.01 – 0.42

Table 13.13 continues on the next page.

Table 13.13. continued. Adjusted distribution of *core substance categories* by gender and age (n=3912)

Total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Substance category	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**
Negative	87.01 83.89 – 89.61	89.63 87.78 – 91.23	91.35 89.69 – 92.76	90.55 88.43 – 92.32	90.01 89.04 – 90.91
Alcohol	8.97 6.83 – 11.70	4.50 3.46 – 5.82	4.16 3.19 – 5.39	4.21 3.07 – 5.75	4.93 4.29 – 5.64
Amphetamine	---	---	---	---	---
Cocaine	0.00 0.00 – 0.72	0.09 0.02 -0.48	0.02 0.00 – 0.34	0.00 0.00 – 0.44	0.03 0.01 – 0.16
THC	1.36 0.67 -2.75	2.72 1.94 -3.80	0.65 0.34 -1.26	0.54 0.22 – 1.28	1.38 1.07 – 1.80
Illicit opiates	0.00 0.00 – 0.72	0.21 0.07 – 0.68	0.25 0.09 – 0.71	0.00 0.00 – 0.44	0.15 0.07 – 0.33
Benzodiazepines	0.08 0.32 -1.98	2.03 1.37 -3.00	2.96 2.16 -4.03	4.58 3.38 – 6.17	2.73 2.27 – 3.29
Z-drugs	---	---	---	---	---
Medicinal opioids	0.00 0.00 – 0.72	0.00 0.00 – 0.32	0.28 0.11 – 0.75	0.07 0.01 – 0.57	0.11 0.04 – 0.27
Alcohol – drugs	1.22 0.58 -2.56	0.75 0.39 – 1.42	0.03 0.00 – 0.35	0.05 0.00 – 0.53	0.42 0.26 – 0.67
Multiple drugs	0.64 0.23 – 1.76	0.06 0.01 – 0.43	0.31 0.12 – 0.79	0.01 0.00 – 0.45	0.23 0.12 – 0.44

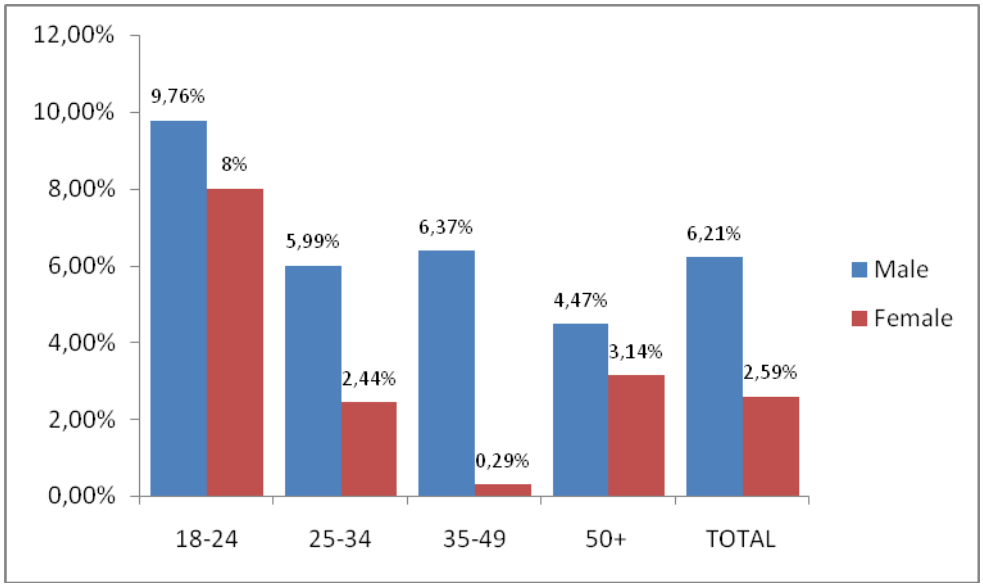

Figure 13.2. Adjusted distribution of alcohol by gender and age

The prevalence of THC in male (2.08%) is higher than that found among female drivers (0.10%). The age groups 18-24 and 25-34 are those with higher prevalence of THC and the only ones where the presence of THC was detected among female drivers (Figures 13.3 and 13.4).

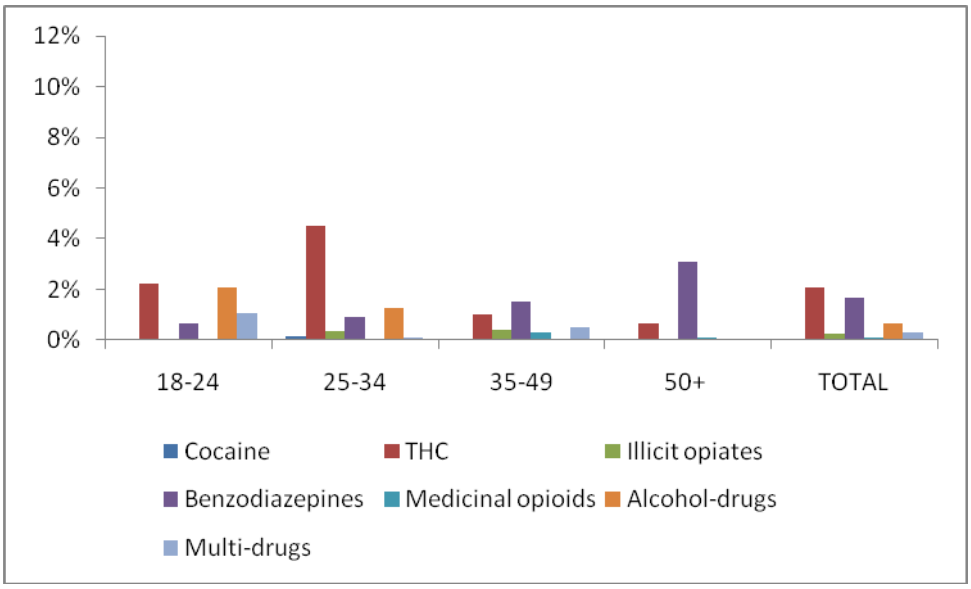

Figure 13.3. Adjusted distribution of drugs by age (male)

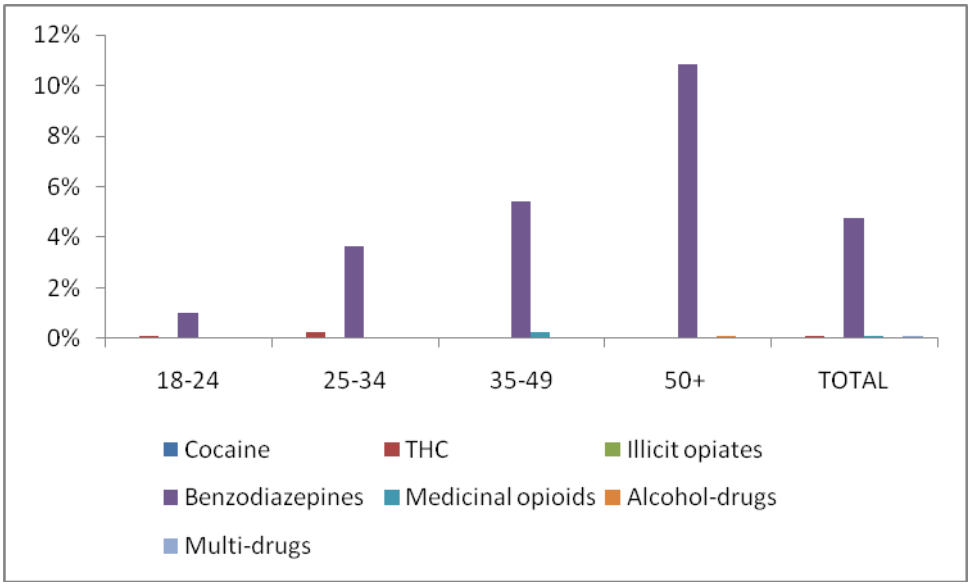

Figure 13.4. Adjusted distribution of drugs by age (female)

Benzodiazepines use was significantly higher among females (4.75%) than among males (1.68%). Drivers in the age group 50+ showed a higher prevalence of benzodiazepines (4.58%). The use of these medicines was concentrated among females age 50 and older, (10.83%) (Table 13.13 and Figures 13.3 and 13.4).

Prevalence of alcohol-drugs and multiple drugs is much higher among male (0.64% and 0.32% respectively), than in female drivers (0.01% and 0.08%) (Figure 13.5).

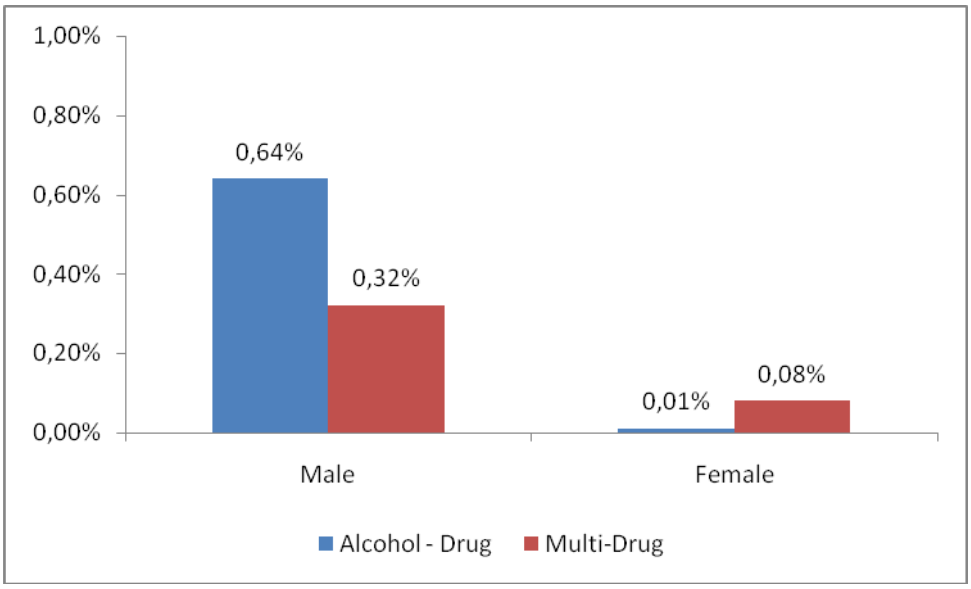

Figure 13.5. Adjusted distribution of alcohol-drug and multiple drugs by gender

Distribution of core substance categories by day of the week and time of the day are presented in Table 13.14 and Figures 13.6 and 13.7. With the exception of medicinal opioids, all substance groups showed a higher prevalence at night-time (22:00 to 3:59), being alcohol (9.00%), cocaine (0.37%), THC (3.25%) and illicit opiates (0.37%) more prevalent on weekend nights and benzodiazepines (4.58%), alcohol-drugs (0.51%) and multiple drugs (0.53%), on week nights. The prevalence of alcohol on weekend nights (9.00%) is about three times higher than on the week nights (3.06%), being the prevalence during the daytime (4:00 to 21:59) similar on week (5.08%) and weekend (4.24%) (Figures 13.6 and 13.7).

The prevalence of THC on weekend (3.25%) and week (2.4%) night-time was higher than during daytime (Figures 13.6 and 13.7).

Benzodiazepines have a similar prevalence at daytime during the week (2.73%) and weekend (2.71%), being the prevalence on week nights (4.58%) 3.4 times greater than on weekend nights (1.56%) (Figures 13.6 and 13.7).

The prevalence of drivers with alcohol-drugs and multiple drugs was greater at night-time than during day time. In cases of multiple drugs, the prevalence at night-time was more than double than during the daytime (Figures 13.6 and 13.7).

Table 13.14. Adjusted distribution of core substance categories by day of the week and time of the day (n=3965)

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekenddays 04:00 – 21:59	Weekendnights 22:00 – 03:59	In total
Substance category	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**
Negative	89.84 88.68 – 90.88	88.90 79.69 – 94.24	91.11 89.09 – 92.80	84.52 74.66 – 91.01	90.01 89.04 – 90.91
Alcohol	5.08 4.34 – 5.94	3.06 0.90 – 9.90	4.24 3.11 – 5.76	9.00 4.37 – 17.64	4.93 4.29 – 5.64
Amphetamine	----	----	----	----	----
Cocaine	0.00 0.00 – 0.13	0.00 0.00 – 4.98	0.12 0.02 – 0.64	0.37 0.02 – 5.56	0.03 0.01 – 0.16
THC	1.44 1.07 – 1.94	2.42 0.62 – 8.96	0.96 0.50 – 1.84	3.25 1.00 – 10.08	1.38 1.07 – 1.80
Illicit opiates	0.15 0.06 – 0.38	0.00 0.00 – 4.98	0.14 0.03 -0.68	0.37 0.02 – 5.56	0.15 0.07 -0.33
Benzodiazepines	2.73 2.19 – 3.38	4.58 1.66 – 12.02	2.71 1.84 – 3.99	1.56 0.31 – 7.54	2.73 2.27 – 3.29
Z-drugs	---	---	---	---	---
Medicinal opioids	0.08 0.03 – 0.27	0.00 0.00 – 4.98	0.20 0.05 – 0.77	0.00 0.00 – 4.89	0.11 0.04 – 0.27
Alcohol – drugs	0.45 0.26 -0.76	0.51 0.04 – 5.90	0.31 0.10 – 0.94	0.50 0.04 – 5.80	0.42 0.26 – 0.67
Multiple drugs	0.23 0.11 – 0.49	0.53 0.05 – 5.95	0.19 0.05 – 0.74	0.43 0.03 – 5.67	0.23 0.12 – 0.44

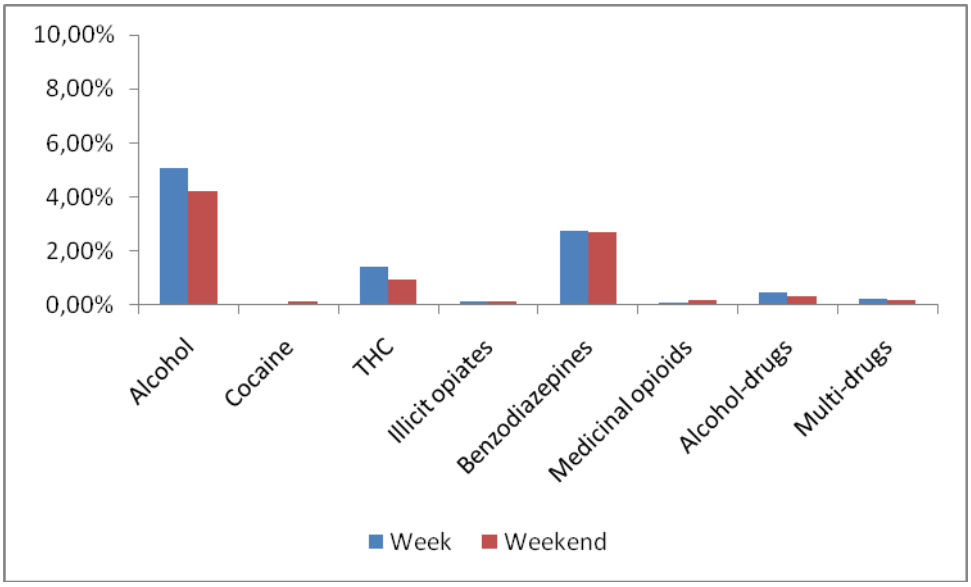

Figure 13.6. Adjusted distribution of core substance categories by daytime (4:00 – 21:59)

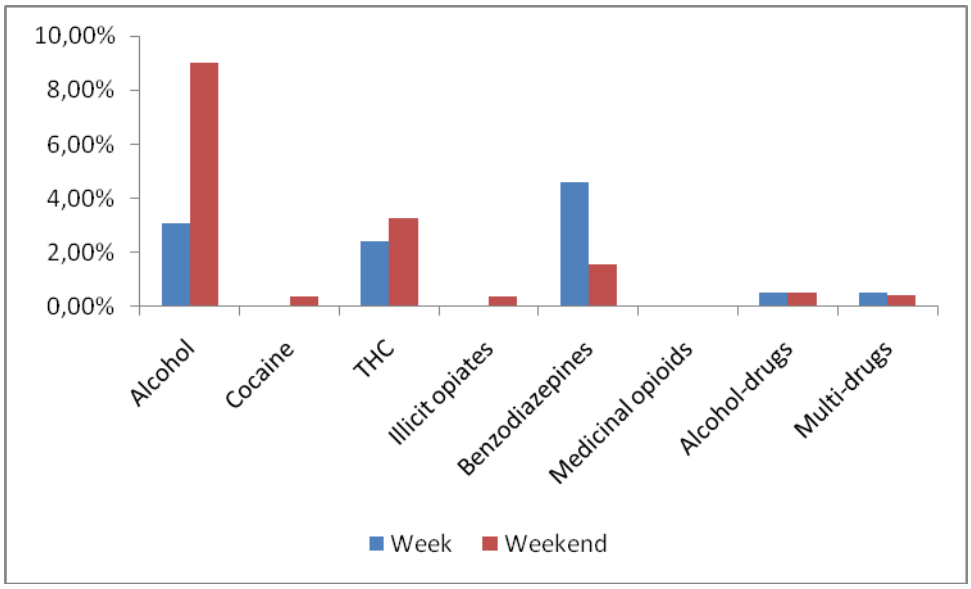

Figure 13.7. Adjusted distribution of core substance categories by night-time (22:00 – 3:59)

Table 13.15 shows the distribution of alcohol positive cases (≥ 0.1 g/l) by level of blood alcohol concentration (BAC). Only 1.22% of positive cases showed a value of BAC at or above the legal limit (0.5 g/l). In male drivers, the prevalence rate of BAC at or above de legal limit (1.53%) was more than double than that in women (0.65%) (Table 13.16 and Figure 13.8).

Table 13.15. Adjusted general distribution of alcohol by concentration class (n=3965)

Alcohol alone	Prevalence (%)	95% Confidence interval
Alcohol 0.1 – 0.49 g/l	3.71	3.17 – 4.35
Alcohol 0.5 – 0.79 g/l	0.44	0.27 – 0.69
Alcohol 0.8 – 1.19 g/l	0.47	0.30 – 0.74
Alcohol 1.2+	0.31	0.18 – 0.53
In total	4.93	4.29 – 5.64

Table 13.16. Adjusted distribution of alcohol alone by gender and age (n=3912)

Male					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**
0.1 – 0.49 g/l	8.39 5.81 – 11.97	4.06 2.83 – 5.79	4.41 3.20 – 6.04	4.01 2.79 – 5.72	4.69 3.93 – 5.57
0.5 – 0.79 g/l	0.66 0.18 – 2.31	0.78 0.35 – 1.75	1.10 0.58 – 2.07	0.01 0.00 – 0.56	0.65 0.40 – 1.04
0.8 – 1.19 g/l	0.33 0.06 – 1.80	0.18 0.04 – 0.87	0.66 0.29 – 1.50	0.46 0.16 – 1.29	0.43 0.24 – 0.76
1.2+	0.38 0.08 – 1.87	0.96 0.46 – 2.00	0.20 0.05 – 0.82	---	0.45 0.25 – 0.79
In total	9.76 6.95 – 13.53	5.99 4.47 – 8.00	6.37 4.89 – 8.26	4.47 3.17 – 6.26	6.21 5.34 – 7.21
Female					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**
0.1 – 0.49 g/l	7.43 4.60 – 11.79	0.91 0.37 – 2.20	0.25 0.05 – 1.26	3.14 1.38 – 6.97	1.94 1.33 – 2.82
0.5 – 0.79 g/l	---	0.14 0.02 -1.03	---	---	0.05 0.01 – 0.37
0.8 – 1.19 g/l	0.57 0.11 – 2.79	1.28 0.60 – 2.72	0.04 0.00 – 0.89	---	0.56 0.28 – 1.12
1.2+	---	0.12 0.01 -0.99	---	---	0.04 0.00 – 0.36
In total	8.00 5.05 – 12.46	2.44 1.40 – 4.22	0.29 0.06 – 1.33	3.14 1.38 – 6.97	2.59 1.88 – 3.58
Total					
Age group	**18-24**	**25-34**	**35-49**	**50+**	**In total**
Alcohol alone	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**
0.1 – 0.49 g/l	7.93 5.93 – 10.54	2.74 1.96 – 3.83	2.89 2.11 – 3.96	3.84 2.75 – 5.33	3.71 3.17 -4.35
0.5 – 0.79 g/l	0.39 0.11 – 1.38	0.51 0.24 – 1.10	0.70 0.37 – 1.32	0.01 0.00 – 0.45	0.44 0.27 – 0.69
0.8 – 1.19 g/l	0.42 0.12 – 1.43	0.63 0.32 – 1.26	0.44 0.20 – 0.97	0.37 0.13 – 1.04	0.47 0.30 – 0.74
1.2+	0.22 0.04 – 1.12	0.61 0.30 – 1.23	0.13 0.03 – 0.52	---	0.31 0.18 – 0.53
In total	8.97 6.83 – 11.70	4.50 3.46 – 5.82	4.16 3.19 – 5.39	4.21 3.07 – 5.75	4.93 4.29 – 5.64

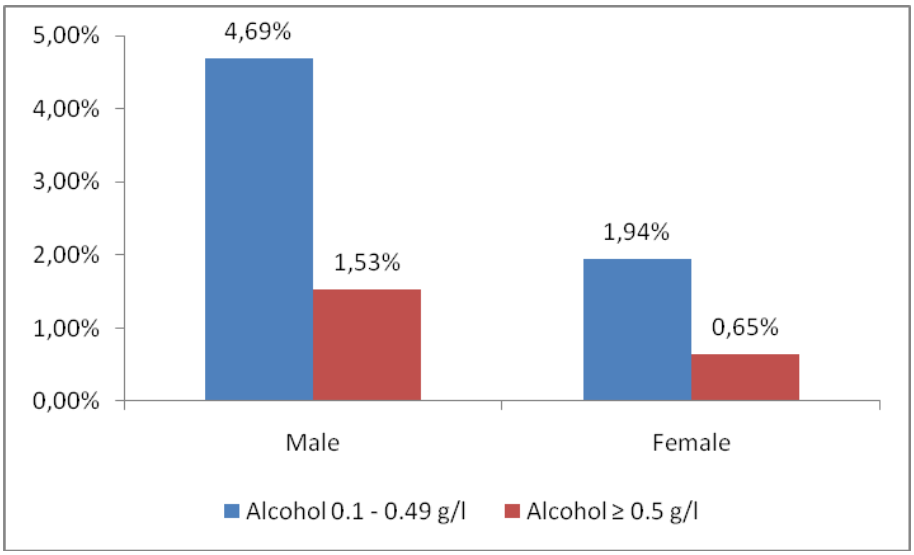

Figure 13.8. Adjusted distribution of alcohol alone by BAC and gender

According to the Portuguese Penal Code, a BAC value ≥ 1.2 g/l is considered a criminal offense. Only 0.31% of drivers showed BAC ≥ 1.2 g/l. Among male drivers the prevalence of cases (0.45%) with BAC at or above criminal offense is about 10 times more than that seen in women (Table 13.16 and Figure 13.9).

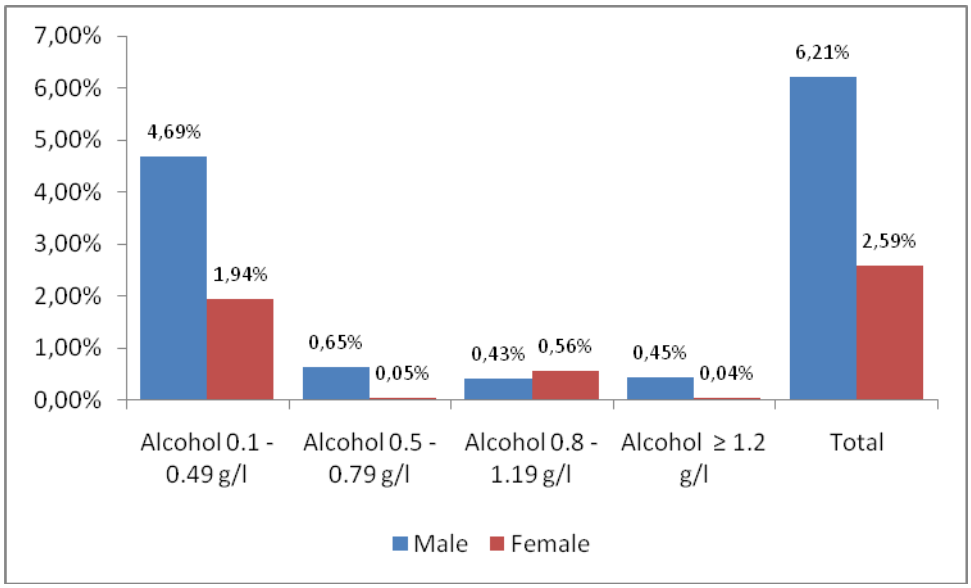

Figure 13.9. Adjusted distribution of alcohol alone by BAC and gender

The highest prevalence of drivers with BAC ≥ 0.5 g/l was observed at weekend nights (1.74%). It was also in this time period that there was a higher prevalence of cases with a BAC value exceeding 1.2 g/l (1.17%) (Table 13.17 and Figure 13.10. Only 0.34% of drivers had values above ≥ 0.5 g/l on week nights. During the daytime the prevalence of cases with a value at or above 0.5 g/l was identical in week (1.27%) and weekend (1.03%) (table 13.17).

Table 13.17. Adjusted distribution of alcohol alone by day of the week and time of the day (n=3965)

Period of the week	Weekdays 04:00 – 21:59	Weeknights 22:00 – 03:59	Weekenddays 04:00 – 21:59	Weekendnights 22:00 – 03:59	In total
Alcohol alone	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**	**Prevalence (%) 95% C.I.**
0.1 – 0.49 g/l	3.80 3.17 – 4.56	2.71 0.74 – 9.39	3.21 2.25 – 4.57	7.26 3.24 – 15.45	3.71 3.17 – 4.35
0.5 – 0.79 g/l	0.48 0.29 – 0.81	0.34 0.02 - 5.62	0.29 0.09 – 0.90	0.50 0.04 – 5.80	0.44 0.27- 0.69
0.8 – 1.19 g/l	0.48 0.29 – 0.81	---	0.50 0.21 – 1.22	0.07 0.00 – 5.01	0.47 0.30 – 0.74
1.2+	0.31 0.16 – 0.59	. ---	0.24 0.07 – 0.83	1.17 0.19 – 6.93	0.31 0.18 – 0.53
In total	5.08 4.34 – 5.94	3.06 0.90 – 9.90	4.24 3.11 – 5.76	9.00 4.37 – 17.64	4.93 4.29 – 5.64

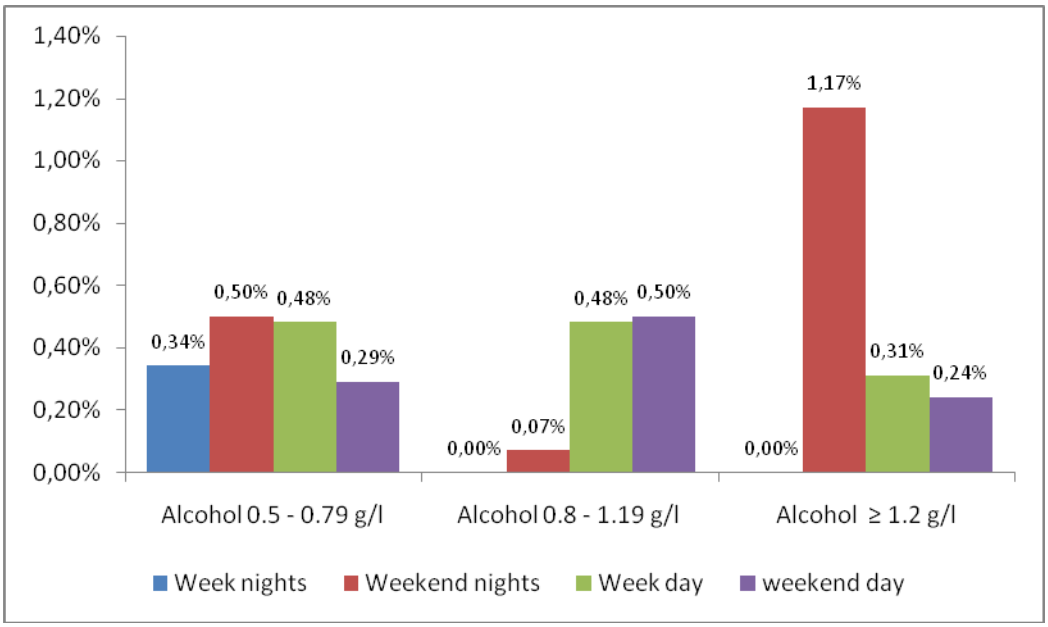

Figure 13.10. Adjusted distribution of alcohol alone by day of the week and time of the day

13.5 Discussion

13.5.1 Representativeness

A comparative analysis of volunteer drivers with the whole Portuguese driving population is difficult as there are no previous studies available with aggregated data in accordance to the criteria used in this study. Nevertheless, a comparison between the distribution of the survey sample according to the eight DRUID time periods and the distribution of the driving population shows a good representativeness. Also the distributions of drivers by gender and by age group are identical to the official data regarding gender and age group of drivers in Portugal in 2006 [2].

13.5.2 Effects of non-response

The size of non response is so small (3%) that the effect of eventual non-response bias would be very small.

13.5.3 Highlights

This study was very important because it allowed, for the first time, to obtain relevant information about the situation in Portugal regarding prevalence of driving under the influence of alcohol and psychotropic substances among drivers not involved in accidents. The strong points of the designed study are the geographical distribution of road sites to ensure representativeness, the random

selection of drivers, the stratification in different time periods (month, days, and time of the day), the quality assurance of the analytical method used, the use of weights based on traffic volume and the comparability of the results between different European countries.

It should be emphasized that this is a study addressed to prevalence and risk estimation, so the final established cut-offs reflect this objectives. Considering that the limit of detection (LOD) of the analytical method used for the core substances in oral fluid is lower than the concentration DRUID cut-off (See Annex - Table 2), the prevalence of consumption among the Portuguese driver population is underestimate. Although the presence of a substance in oral fluid does not necessarily imply that the driver's ability to operate a vehicle was impaired, it is important to our understanding of drugs and driving to know the extent of the use of certain drugs among driving population. To consume substances that have a potential detrimental impact on driving skills, is a risk of adverse consequences to themselves and other road users.

In this study, analyses of the oral fluid were conducted to identify and quantify the twenty three core substances established in Deliverable 2.1.2. For the presentation of the results the substances were aggregated in ten categories: alcohol, amphetamines, cocaine, THC, illicit opiates, benzodiazepines, z-drugs, medicinal opiates and alcohol-drug and drug-drug combinations.

The criteria used in selecting the geographical areas and the low refusal rate (3%) allow this study to be representative of the Portuguese drivers population. The refusal rate is lower than observed in other studies with random selection of voluntary drivers [3-5].

Of the 3965 drivers included in the study, 30.8% were female. In fact the number of female with driving licenses in Portugal is less than male [2]. The most prevalent age groups of the drivers tested were 25-34 and 35-49. This could be explain by the fact that the municipalities included in this study are part of large metropolitan areas where most of the active population lives.

In overall drivers, the presence of at least one psychoactive substance was found in 10% of the drivers. Alcohol alone, benzodiazepines and THC, were the substances more time detected among drivers. With the exception of medicinal opioids, all substances showed a higher prevalence at night-time (22:00 - 3:59), being alcohol, cocaine, THC and illicit opiates more prevalent on weekend, and benzodiazepines, alcohol-drugs and multiple drugs more prevalent during the week.

Alcohol was the most prevalent substance among drivers with an occurrence of 4,93% alone and 0,42% in association with drugs. About a quarter of drivers with alcohol alone had a BAC value at or above the legal limit (0.5 g/l) with special incidence on weekend nights. Alcohol prevalence with BAC over the legal limit in male was more than two times higher than in female. In both groups, male and female drivers, the higher prevalence of alcohol was observed among young drivers (18-24 years). A similar prevalence distribution by gender, age and time period was observed in equivalent studies [3,5-8].

The most prevalent illicit drug was the THC alone (1.38%) with greater occurrence among male (2.08%) than female drivers (0.10%), especially in 18-24 and 25-34 age groups. THC was present in 72% of the cases with alcohol-drug combination (results not shown).
Cocaine or its metabolite (benzoylecgonine) was the illicit drug more detected after THC, mainly among multiple drug cases. The presence of cocaine was detected in 50% of those cases (results not shown).
6-Acetylmorphine was detected in all cases of illicit opiates, 50% of witch in drug-drug combination (results not shown). The results demonstrate the importance of oral fluid for screening these substances among drivers, especially because 6-acetylmorphine is considered a definitive evidence of heroin use [9].
Depending if the study is performed among drivers selected randomly or among drivers suspected of driving under the influence of drugs, the prevalence of illicit drugs could be different. In our study prevalence of illicit drugs alone was lower (1.48%) than observed in equivalent studies [4,6,10-11] and higher than verified among Norwegian drivers [3]. The differences of prevalence observed could be partially explained by different cultural, social and legal issues.
The prevalence of illicit drugs among drivers was higher in night time and weekend. THC in night time was always higher than in day time, whatever the day (week or weekend). Identical observation was registered by other authors [5-6].

Benzodiazepines were the most prevalent substance after alcohol with an occurrence of 2.73%. The prevalence of these medicinal drugs was more common among older drivers (50+), especially among female with an occurrence above 10%, three times higher than in male. Our distribution by age and gender is consistent with other studies which also refer the use of benzodiazepines associated to older age groups and female population [6]. The prevalence of benzodiazepines in weekend nights (1.56%) was 3.4 times lower than during week nights (4.58%) and about half of the prevalence of benzodiazepines registered during day time period on week (2.73%) and weekend (2.71%) (Figures 13.6 and 13.7). Similar distribution of prevalence by gender and time period was observed in other studies [6,12]. Nordiazepam, alprazolam and lorazepam were the substances more commonly detected in our study. Nordiazepam, the main active metabolite of diazepam, is a long action benzodiazepine with a t ½ > 24h while alprazolam and lorazepam are classified as intermediate action drugs with a t ½ 6-24h [13]. The presence of alprazolam and lorazepam is consistent with the Portuguese statistics of medicine use of the National Authority of Medicines and Health Products (INFARMED I.P.). The statistics show the psychodrugs as the second pharmacotherapeutic subgroup with more sales, and alprazolam and lorazepam as the 5th and 8th active substances with more sales in the Portuguese National Health Service in 2008 [14].
Methadone is a synthetic analgesic prescribed for the relief of moderate to severe pain, and used in detoxification treatment of opioid dependence and maintenance in narcotic addiction. This substance may impair mental and/or physical abilities required for the performance of potentially hazardous tasks, and its sedative effects may be enhanced by concurrent use of other CNS depressants, including alcohol. Methadone was present in 80% of the drivers that tested positive for medicinal opiates, and no association with other drugs was detected (results not shown).

The evidence of this survey, based on a random sampling mechanism that allocates equal probabilities for selection to drink drivers and non-drinking, would be different if data had been based on the results of the usual enforcement actions. These actions are usually focused on road sites and time periods, whose probability of selection drinking drivers are higher than non-drinking. For this reason the information provided by this study is of particular relevance for planning drug-driving prevention and enforcement activities in the future.

13.6 Acknowledgements

The roadside survey described in this report was carried out in close cooperation with the traffic enforcement teams of Polícia de Segurança Pública and of Guarda Nacional Republicana. The authors are grateful to the police staff and executive personnel for their good collaboration and flexibility. Thanks to Suzel Costa, Mário Barroso, Francisco Vale, Henrique Rato, Paula Proença, Cláudia Margalho, Helena Teixeira, Carla Monteiro, Fernando Castanheira, Alice Castanheira, Gonçalo Carmim, Jorge Veiga, Joana Vidinha, Francisco Almeida, Edgar Nascimento, André Castro, Pedro Costa, Filomena Coutinho, Lino Assunção and Rui Rangel for assistance in collecting roadside samples, and to all the staff of the Departments of Forensic Toxicology of INML I.P. We acknowledge SWOV and DTU teams for their support.

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Annex 13.1 - Toxicological Analysis of Oral Fluid Samples

1. Sample preparation

The samples were prepared by liquid-liquid extraction using Toxitubes®A. To a 5ml tube 0.6ml of 0.2 mol/l ammonium carbonate buffer pH 9.3, 0.6ml of preserved oral fluid and 30 µl of the internal standard working solution were added. The samples were transferred to the Toxitubes®A and gently mixed for 25 min. After centrifugation at 3500 rpm for 15 min, the organic phase was transferred to glass conical tubes and evaporated to dryness at 30°C under a stream of nitrogen. The dried extract was reconstituted in 50 µl of methanol/water (1:1, v/v), transferred to a vial and analyzed by LC-MS/MS.

2. LC-MS/MS parameters

A Waters Alliance 2795 separation module with a Waters Alliance series column heater (Waters, Milford, MA, USA) high-performance liquid chromatography (HPLC) system was used. The chromatographic separation was performed by a Waters Atlantis T3 (100x2.1mm, 3µm) column at 35°C using gradient elution with acetonitrile/2mM ammonium formate buffer pH3.4 (95:5, v/v) (A) and 2mM ammonium formate buffer pH3.4/acetonitrile (95:5, v/v) (B) at a flow rate of 0.3ml/min. The gradient was programmed as follows: 10% A for 0.1 min, linearly increased to 55% A in 1.9 min and to 95% A in 5min, isocratic for 6min followed by a decrease to the initial conditions in 0.1min and equilibration time for 4.9min, which resulted in a total run time of 18min. An injection volume of 10µl was used.
The HPLC system was combined with a Quattro Micro™ API ESCi triple quadrupole mass spectrometer (Micromass, Waters) fitted with a Z-spray ion interface. The equipment was operated in positive electrospray ionization (ESI+) mode and in the multiple reaction monitoring (MRM) mode. The source parameters were: capillary voltage, 3.0kV; source block temperature, 120°C; desolvation gas (nitrogen) heated to 450°C and delivered at a flow rate of 600L/h; no cone gas was used. The appropriate MRM transitions, cone voltages and collision energies for the individual analytes and internal standards were determined by direct infusion into the mass spectrometer. Collision gas (argon) pressure was maintained at 3.5×10^{-3}mbar, the collision energy optimized and the two most abundant product ions from each substance were subsequently used for the MRM analysis. The MRM transitions with corresponding cone voltage, collision energy and retention time of the analytes and internal standards are presented in Table 1.

Table 1. MRM transitions, cone voltage, collision energy (Coll) and retention time (RT) of the analytes and internal standards (IS)

Compound	Transitions (*m/z*)	Cone (V)	Coll (eV)	RT (min)	IS
Morphine-d3	289.3>201.3	35	25	1.4	
Morphine	286.2>201.2/165.2	35	25/35	1.4	Morphine-d3
Codeine-d3	303.3>215.3	35	25	2.0	
Codeine	300.2>215.2/165.2	35	25/35	2.1	Codeine-d3
Amphetamine-d6	142.1>125.1	15	8	2.6	
Amphetamine	136.0>90.8/119.0	15	12/8	2.7	Amphetamine-d6
6-Acetylmorphine	328.2>165.2/211.3	35	35/25	2.8	Morphine-d3
MDA	180.2>163.2/104.9	15	10/20	2.9	Methamphetamine-d9
Methamphetamine-d9	159.2>125.1	20	11	3.1	
Methamphetamine	150.1>90.8/119.0	15	15/10	3.1	Methamphetamine-d9
MDMA-d5	199.3>165.2	15	13	3.2	
MDMA	194.2>163.2/133.1	15	12/18	3.2	MDMA-d5
MDEA-d5	213.4>163.2	20	13	3.5	
MDEA	208.2>163.2/133.1	15	12/18	3.5	MDEA-d5
Benzoylecgonine-d3	293.3>171.2	25	18	3.6	
Benzoylecgonine	290.2>168.2/104.9	25	19/25	3.6	Benzoylecgonine-d3
Zopiclone	389.1>245.2/345.2	15	14/18	3.7	Nordiazepam-d5
Tramadol	264.3>264.4/57.5	15	5/14	3.8	Nordiazepam-d5
Cocaine	304.2>182.3/81.8	25	19/26	3.9	Nordiazepam-d5
Zolpidem	308.3>235.4/263.3	35	30/25	4.0	Nordiazepam-d5
7-Aminoflunitrazepam	284.2>135.2/227.3	30	26/24	4.1	Nordiazepam-d5
Amitriptyline	278.3>105.0/117.1	25	22/22	4.6	Nordiazepam-d5
Methadone	310.3>265.4/105.0	20	14/26	4.7	Nordiazepam-d5
Oxazepam	287.2>241.3/269.3	20	22/14	5.0	Nordiazepam-d5
Alprazolam	309.2>205.3/281.3	35	40/26	5.0	Nordiazepam-d5
Lorazepam	321.1>275.2/303.2	25	20/15	5.0	Nordiazepam-d5
Clonazepam	316.1>270.3/214.3	35	26/34	5.1	Nordiazepam-d5
Nordiazepam-d5	276.2>213.3	35	26	5.4	
Nordiazepam	271.2>140.1/165.1	35	30/30	5.4	Nordiazepam-d5
Flunitrazepam	314.2>268.3/239.3	35	25/30	5.4	Nordiazepam-d5
Diazepam	285.2>193.2/154.2	35	30/25	6.0	Nordiazepam-d5
THC-d3	318.3>196.3	25	22	10.1	
THC	315.3>193.3/135.2	25	22/22	10.1	THC-d3

3. Validation

The method was fully validated in terms of specificity and capacity of identification, limit of detection and quantification, recovery, carryover, linearity, intra-assay precision and inter-assay accuracy and precision. Method validation data are summarized in Tables 2 and 3.

Table 2. Method validation data (limit of detection, limit of quantification, recovery and linearity)

			LOQ test				Recovery		Linearity		
			1 µg/l		5 µg/l					Intercept Interval	
Compound	LOD (µg/l)	LOQ (µg/l)	CV (%)	E (%)	CV (%)	E (%)	20 µg/l	200 µg/l	R^2	Inf. 95%	Sup. 95%
Morphine	0.4	1.2	1.8	2.6	6.4	1.7	82	90	0.9987	-0.0191	0.0541
Codeine	0.4	1.4	5.1	10.4	4.0	2.4	84	90	0.9996	-0.0144	0.0255
Amphetamine	0.2	0.8	10.2	7.8	5.0	1.6	84	91	0.9986	-0.0111	0.0480
6-Acetylmorphine	0.5	1.4	11.2	2.6	3.9	3.7	79	86	0.9987	-0.2910	0.0271
MDA	0.5	1.6	6.3	3.0	3.6	5.0	82	83	0.9997	-0.0341	0.0004
Methamphetamine	0.5	1.5	5.5	13.4	5.4	3.4	87	90	0.9987	-0.0290	0.0358
MDMA	1.2	3.7	5.2	10.4	4.2	2.3	78	75	0.9986	-0.0077	0.0425
Benzoylecgonine	0.9	2.6	4.2	8.0	7.7	11.7	34	34	0.9944	-0.0851	0.0418
MDEA	0.6	1.9	6.2	5.6	5.2	3.1	84	69	0.9948	-0.0401	0.1076
Zopiclone	1.4	4.1	19.7	5.2	18.0	13.4	65	88	0.9907	-0.0286	0.0300
Tramadol	0.4	1.3	14.8	8.4	5.4	14.7	76	54	0.9988	-0.0281	0.1497
Cocaine	0.5	1.6	8.7	5.4	2.7	10.2	75	95	0.9985	-0.0729	0.0749
Zolpidem	0.4	1.2	5.2	14.4	13.0	16.4	80	87	0.9955	-0.0321	0.1314
7-Aminoflunitrazepam	0.6	1.7	6.7	10.6	4.7	1.4	87	94	0.9995	-0.0689	0.0184
Amitriptyline	0.6	1.8	14.6	13.0	6.1	15.4	56	70	0.9958	-0.0344	0.3050
Methadone	0.4	1.4	14.7	0.2	7.8	13.5	69	77	0.9969	-0.1370	0.6056
Oxazepam	0.5	1.5	6.8	3.6	9.7	10.9	87	82	0.9986	-0.0101	0.0744
Alprazolam	0.3	1.0	9.9	10.6	6.1	0.5	87	98	0.9956	-0.0308	0.2094
Lorazepam	0.4	1.2	12.0	6.0	6.1	0.5	86	90	0.9993	-0.0068	0.0442
Clonazepam	0.3	0.8	8.4	14.0	4.2	8.0	87	88	0.9980	-0.0101	0.0788
Nordiazepam	0.4	1.2	4.9	13.6	4.1	0.7	84	91	0.9942	-0.0504	0.1250
Flunitrazepam	0.3	1.0	9.4	0.6	6.6	10.4	82	87	0.9938	-0.0741	0.1748
Diazepam	0.4	1.2	8.4	0.2	6.6	8.8	78	86	0.9959	-0.0068	0.3004
THC	0.4	1.1	9.3	0.8	2.6	8.6	40	47	0.9979	-0.0242	0.0336

Table 3. Method validation data (intra-assay precision and inter-assay precision and accuracy (expressed as the bias))

	Intra-assay (CV %)		Inter-assay					
	A/A_{PI}		Precision (CV %)			Bias (%)		
Compound	20 µg/l	100 µ/L	5 µg/l	50 µg/l	150 µ/L	5 µg/l	50 µg/l	150µ/L
Morphine	4.5	7.4	12.1	5.8	9.0	2.3	4.7	6.7
Codeine	1.7	6.0	18.4	6.5	6.6	-0.9	2.6	4.5
Amphetamine	4.9	7.7	12.1	5.4	4.4	-6.7	4.6	2.3
6-Acetylmorphine	5.5	6.3	15.8	5.2	3.2	-13.3	-2.5	-2.4
MDA	5.9	9.8	12.2	9.0	11.2	-2.4	7.8	5.0
Methamphetamine	7.4	5.7	17.0	8.4	9.4	3.1	-0.4	-2.1
MDMA	3.8	6.5	11.2	10.3	7.7	4.1	4.9	5.1
Benzoylecgonine	7.8	8.5	19.4	17.9	11.3	0.1	-0.2	1.1
MDEA	14.2	7.1	14.1	10.3	10.0	4.1	1.5	-3.8
Zopiclone	8.8	8.8						
Tramadol	19.9	5.8	17.1	12.5	13.2	-1.7	-4.9	-1.0
Cocaine	8.9	5.8	16.5	9.7	7.4	-0.9	-6.3	-1.9
Zolpidem	7.4	5.1	13.1	9.2	7.7	-0.5	-1.9	-0.7
7-Aminoflunitrazepam	7.1	6.4	16.4	8.2	9.5	-6.3	1.1	-8.2
Amitriptyline	11.6	9.8	17.2	14.1	13.7	-2.5	0.4	-4.7
Methadone	15.0	7.6	12.5	8.8	10.7	-7.3	8.4	-5.7
Oxazepam	14.0	6.3	11.2	14.9	11.3	9.6	4.0	2.0
Alprazolam	15.3	9.9	14.2	12.6	10.5	-9.1	7.4	-1.9
Lorazepam	5.3	5.7	13.6	5.5	5.3	-11.1	-1.0	-1.0
Clonazepam	5.7	4.4	12.0	6.2	7.4	-10.1	5.4	3.2
Nordiazepam	8.5	9.2	8.5	9.3	5.9	2.9	2.0	2.9
Flunitrazepam	8.6	6.2	13.8	9.5	8.7	-9.3	3.3	-2.3
Diazepam	6.7	5.1	11.5	9.8	8.9	-1.3	7.6	-4.9
THC	3.0	6.7	9.1	5.0	6.5	-4.5	-2.8	0.0

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Authors: *Åsa Forsman[1], Robert Kronstrand[2], Gunnel Ceder[2], Linda Renner[1], Magnus Hjälmdahl[1].*

[1] The Swedish National Road and Transport Research Institute (VTI)
[2] The National Board of Forensic Medicine (RMV)

14.1 Description of the roadside driver sample

The Swedish roadside driver sample was collected during one year, from March 2008 to February 2009. In all, 6372 drivers provided saliva samples. The survey design described below is a compromise between the DRUID recommended design (see Annex 1 of the Summary Report) and practical considerations. A main deviation from the recommended design is that only one geographic region is included in the study, the results may therefore not be representative for the whole country. The reason for this limitation is that Sweden is divided in 21 counties and each county is a separate police authority. It was not practically possible to include more than a few authorities and we finally choose three counties in which we have had previous collaboration with the police. These counties were Södermanland, Örebro, and Östergötland, situated in the mid-south of Sweden (see map in figure 14.1). We have no reason to believe that the use of drugs and medicines differ to any large extent between the three counties so the whole area is regarded as one region.

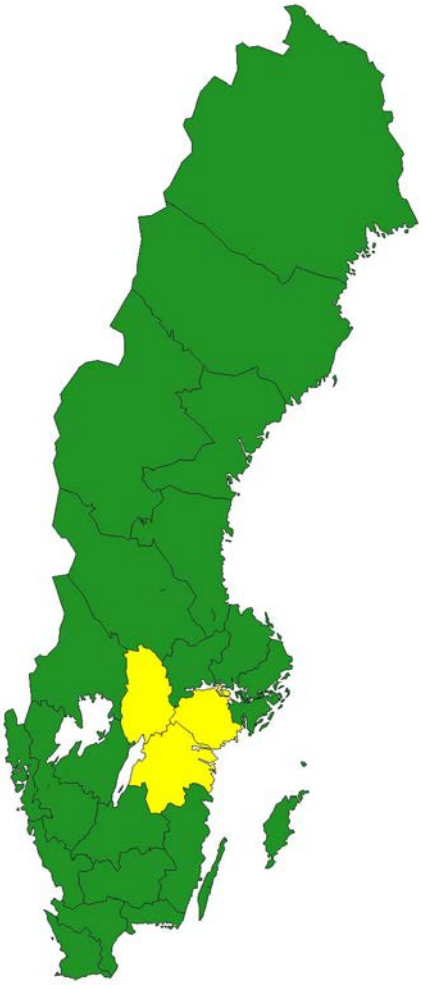

Figure 14.1. The study region in Sweden

Another deviation is that drivers positive for alcohol (over 0.2 g/l) was excluded from the study. The procedure at the test sits was that the police first conducted a breath test and if the screening instrument showed a positive result, the driver were taken care of by the police and were not asked to participate in the study.

Moreover, we did not collect all the recommended information about the refusers, such as gender, age and reason for refusal. However, we have information of the general age and gender distribution among the drivers in the study area from a previous study that can be used for comparison (Forsman et al., 2007).

Within each county, 12-15 test sites on rural roads and 5 test sites on urban roads where selected. The sites were located along the major roads (motorways excluded) in order to ensure an effective sampling also during hours with low traffic flow. The police chose test sites that were large enough to accommodate the setup with both the police and the research staff with equipment. Moreover, the test sites were spread out over the whole county.

Only drivers of personal cars and vans were included in the study. The tables below include all drivers who provided a saliva sample and were 18 years of age or older.

The distribution between rural and urban road types was chosen to resemble the real distribution of traffic which is approximately 78% on rural roads and 22% on urban roads in the study region (Björketun and Eriksson, 2001). In the actual sample, two thirds came from rural roads and one third from urban roads (Table 14.1).

Table 14.1. Distribution of drivers by road type

Road type	Distribution of sample
Rural	67%
Urban	33%

The distribution of drivers by the quarter is shown in table 14.2. In our study design, the number of collected samples was spread out evenly between seasons. However, the seasons did not coincide with quarters and therefore the number of samples differs between the quarters.

Table 14.2. Distribution of drivers by the quarter

Season	Distribution of sample
Quarter 1 (Jan-Mar)	29%
Quarter 2 (Apr-Jun)	32%
Quarter 3 (Jul-Sep)	24%
Quarter 4 (Oct-Dec)	15%

The sampling scheme regarding time of the day and time of the week were worked out to fit requirements of the police. As a consequence, the data collection was concentrated to day time. Almost half of the samples were collected during 10-16 on weekdays (table 14.3). In comparison with actual traffic distribution, the number of sampled drivers was overrepresented during daytime and underrepresented during mornings and evenings in weekdays and evenings in weekends. Only slight deviations are found in the other periods. Also, the time periods have been fully covered, there were no systematic periods missing within the eight specified time periods.

Table 14.3. Distribution of drivers by time period

Time period	Distribution of sample
1: Weekday 04-10	6%
2: Weekday 10-16	49%
3: Weekday 16-22	9%
4: Weekday 22-04	4%
5: Weekend 04-10	5%
6: Weekend 10-16	22%
7: Weekend 16-22	3%
8: Weekend 22-04	2%

At the sampling site, cars where stopped at random with no respect to the age or gender of the driver. Thus, the drivers stopped by the police should be representative of the driver population at the specific places and times. However, the distribution could be affected by non-response which will be discussed in chapter 3. The sampled distribution is shown in 14.4.

Table 14.4. Distribution of drivers by age category and gender

Age category	Males	Females	All
18-24 years	4%	2%	**7%**
25-34 years	9%	5%	**13%**
35-49 years	20%	10%	**30%**
50- years	37%	13%	**50%**
All ages	**70%**	**30%**	**100%**

14.2 Roadside data collection and analysis

The collection of data at the test sites was done in collaboration between the police and a team of civil test leaders. The civil team was recruited among students at the University of Linköping. At the test site, which typically was a parking space alongside the road, the police and the test team was parted by a certain distance. The reason for this was to protect the integrity of drivers that may be positive for alcohol in the police control and also to make sure that the drivers didn't feel pressured by the police to participate in the study.

The procedure at the test site was as follows:

1.1. When there was free capacity at the test site, the police stopped the next possible driver and conducted a breath test.
1.2. If the test was negative, the police informed the driver that VTI was performing a research study and that participation was voluntary and anonymous.
1.3. If the driver wanted to participate, he or she drove a short distance to the test team. If they didn't want to participate they simply drove pass the team.
1.4. The team informed the driver about the study and asked for a saliva sample. The driver was informed again that participation was voluntary and anonymous.
1.5. If the breath test was positive for alcohol, the driver was taken care of by the police, and was not asked to participate in the research study.

The collection of data was organised in blocks, with three sampling sessions in each block. All test sites within a block were visited in a sequence and within the same time period. Only drivers of personal cars and vans were included.

Participation in the study was completely anonymous. Afterwards, we could not trace the drivers who provided saliva samples.

The study was approved by the Regional Ethical Review Board in Linköping.

14.2.1 Substances

The substances included in the study and their classification are shown in table 14.5. Note that the groups are mutually exclusive, that is, a driver could only be included in one of the groups. For example, if Zoldipem is the only substance found in a driver, he or she will be included in the group of Z-drugs. However, if both Zoldipem and Morphine are found, he or she will be included in the multiple drugs group.

As mentioned in the description of the roadside driver sample, drivers positive for alcohol in the breath test were excluded from the study. Therefore, Ethanol was not included in the analysis of the saliva samples. However, the screening instrument is set on 0.2 g/l (the legal limit in Sweden) and therefore, there might be drivers with a blood alcohol concentration below 0.2 g/l in the data set.

Table 14.5. Classification of substances

Type	Group	Analyticalfindings
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
	THCCOOH**	THCCOOH
	THC	THC or THC+THCCOOH
	illicitopiates	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 (diaz + oxaz) or (diaz + nordiaz + oxaz) nordiaz or (nordiaz + oxaz) 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)
	multipledrugs	all combinations except(drug+THCCOOH)

*Not included in the Swedish study.
** Not analysed in saliva.

14.2.2 Toxicological analysis

The toxicological analysis was made at the forensic toxicology laboratory at the National Board of Forensic Medicine.

The saliva samples were collected with the Statsure device. The analytical method is based on UPLC-MS/MS and includes the DRUID core substances and some additional drugs and metabolites commonly used in Sweden. In total twenty-nine drugs and metabolites were included. Samples were

extracted on a Gilson ASPEC XL-4 robot. Aliquots of 0.4 ml saliva-buffer mixture (from the Statsure device) were loaded and extracted on 130 mg Bond Elute Certify columns. A Waters Quattro Premier XE tandem-quadruple MS combined with an Acquity UPLC was used for the analysis. High-resolution separation was performed by a linear gradient chromatography on a 50x2.1 mm i.d. HSS-T3 UPLC-column with 1.8 µm particles using mobile phases consisting of 5 mM ammonium acetate buffer, pH 5 (A) and methanol with 0.05% acetic acid (B). Two MRM-transitions were used for each compound and criteria for their relative area intensities were set for positive identification. The most intense transition was used for quantification. Nine deuterated internal standards with different chemical properties were selected for the quantification. Cut-off levels were set according to the common decision within DRUID (see Annex 2 of Summary Report for a list of applied cut-offs).

14.2.3 Questionnaire

A short questionnaire was filled out for each driver, the collected information was:

- Gender
- Age
- Type of vehicle (personal car or van)
- If the vehicle was registered in Sweden or not
- Car ownership (private or supplied by the company)

14.2.4 Statistical analysis

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 was calculated by dividing the weighted number of positives for this substance by the weighted total of samples. Because lower and upper confidence limits calculated using traditional approximations may result in limits outside the (0.1) interval, a more elaborate approximation was used. To the end, the Wilson confidence interval formula is used as it is supplied by SAS as one of the available options.

More information on the method can be found in chapter 3 and annex 2 of the general report.

14.3 Non-response

The response rate at the roadside was 62% (6 372 out of 10 223). Five of these drivers were younger than 18 and therefore omitted from the analysis. The drivers could deny participation at two different occasions. Firstly after the police control when the police had informed them that VTI conducted a research study and secondly when they had been stopped by the research team and received more information about the study. Almost all of the non-respondents decided not to participate at the first occasion.

We did not collect any information about the non-respondents. However, a similar study was conducted in the same three counties a few years ago (Forsman et al., 2007). That study was restricted to test for alcohol and therefore the drivers could not deny participation. All data in that study was collected by the police. In figure 14.2, the age and gender distribution of the DRUID sample and the sample from the previous study (control) is compared. As can be seen, there are no major differences between the data. There is a tendency that old drivers are more willing to participate than young drivers, but this effect is small.

All drivers stopped by the police were asked to conduct a breath test to screen for alcohol and drivers who provided a positive test were not included in the study. In total, 0.18% (18 out of 10223) of the drivers tested positive for alcohol (≥ 0.2 g/l).

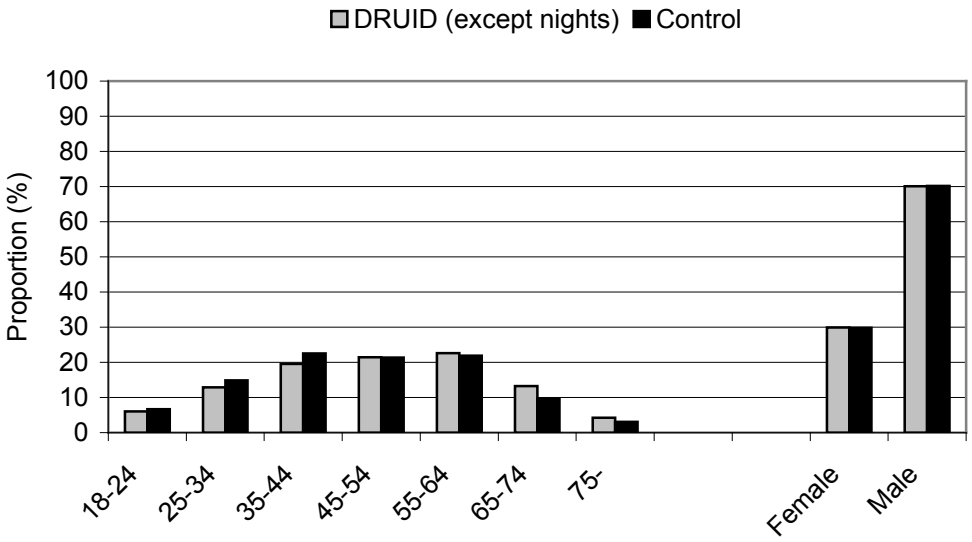

Figure 14.2. Age and gender distribution in the DRUID study (grey bars) and in a previous study used for control (black bars). The control study did not include nights so nighttime drivers are excluded from the DRUID data.

Apart from the non response at the roadside, 168 of the 6367 saliva samples (2.6%) provided from drivers at least 18 years of age could not be analysed because of too little saliva or some other problem with the sample. Thus, we have toxicological results for 6199 drivers.

14.4 Results

The prevalence of the different substance categories are shown in table 14.6. The prevalence of the illicit drugs are very low, 0.07% for amphetamine and 0.03% for THC. Because of the wide confidence intervals it is not possible to conclude which is the most prevalent illicit drug. Moreover, there is no illicit drug included in the multiple drugs category.

Medicinal drugs are more prevalent than illicit drugs and medicinal opioids is the most prevalent category. The most common substance of the medicinal opioids is Tramadol.

Cocaine and illicit opiates were not found at all in the Swedish sample.

Table 14.6. Adjusted general distribution of substance categories (N=6199)

Substance category	Prevalence (%)	Confidence interval (%)
Negative	98.66	98.34 - 98.92
Amphetamine	0.07	0.03 - 0.17
Cocaine	-	-
THC	0.03	0.01 - 0.12
Illicit opiates	-	-
Benzodiazepines	0.19	0.11 - 0.33
Z-drugs	0.31	0.20 - 0.48
Medicinal opioids	0.63	0.46 - 0.86
Multiple drugs	0.12	0.06 - 0.25

The prevalence of the different substance categories by gender and age and by time period are shown in table 14.7 and table 14.8. These results are highly uncertain due to the low prevalence and a low

number of subjects in several subgroups. Therefore, no certain conclusions can be drawn from the prevalences in table 14.7 and table 14.8. However, some interesting tendencies are found.

The total prevalence of illegal and medicinal drugs increase with age category and the highest prevalence are found among those 50 years or older. No substance at all was found among the male drivers in the age category 18-24. Among the female drivers in the same age category, Tramadol was found in one driver resulting in the prevalence 0.39 for medicinal opioids. All illicit drugs were found among the male drivers but the prevalence of medicinal drugs was higher among the female drivers.

Table 14.7. Adjusted general distribution of substance categories by gender and age(N=6187)

	Prevalence (%) (Confidence interval, %)				
Substance category	**18-24**	**25-34**	**35-49**	**50-**	**Total**
Men	N=278	N=541	N=1216	N=2308	N=4343
Negative	100	99.48 (98.55-98.82)	99.08 (98.38–99.47)	98.17 (97.50-98.66)	98.77 (98.39-99.05)
Amphetamine	-	0.13 (0.02-0.85)	0.22 (0.07-0.67)	0.03 (0.00-0.23)	0.09 (0.04-0.24)
Cocaine	-	-	-	-	-
THC	-	0.21 (0.05-0.99)	0.04 (0.00-0.38)	-	0.04 (0.01-0.16)
Illicit opiates	-	-	-	-	-
Benzodiazepines	-	0.08 (0.01-0.76)	0.30 (0.12-0.79)	0.08 (0.02-0.32)	0.14 (0.06-0.30)
Z-drugs	-	-	0.04 (0.00-0.38)	0.64 (0.38-1.08)	0.32 (0.19-0.54)
Medicinal opioids	-	0.09 (0.01–0.77)	0.28 (0.10-0.75)	0.89 (0.57-1.39)	0.53 (0.35-0.79)
Multiple drugs	-	-	0.04 (0.00-0.38)	0.20 (0.08-0.49)	0.11 (0.04-0.26)
Women	N=142	N=288	N=632	N=782	N=1844
Negative	99.61 (99.72-99.96)	98.52 (96.44-99.39)	99.00 (97.93-99.52)	97.50 (96.06-98.42)	98.39 (97.71-98.88)
Amphetamine	-	-	-	-	-
Cocaine	-	-	-	-	-
THC	-	-	-	-	-
Illicit opiates	-	-	-	-	-
Benzodiazepines	-	-	0.20 (0.04-0.91)	0.63 (0.25-1.53)	0.31 (0.14-0.69)
Z-drugs	-	0.17 (0.02-1.56)	0.08 (0.01-0.71)	0.55 (0.21-1.43)	0.27 (0.11-0.63)
Medicinal opioids	0.39 (0.04-3.28)	0.53 (0.13-2.16)	0.72 (0.30-1.68)	1.25 (0.66-2.38)	0.87 (0.53-1.40)
Multiple drugs	-	0.78 (0.24-2.55)	-	0.07 (0.01-0.68)	0.16 (0.05-0.47)
Total	N=420	N=829	N=1848	N=3090	N=6187
Negative	99.88 (99.00-99.99)	99.17 (98.35-99.58)	99.05 (98.51-99.40)	98.00 (97.42-98.46)	98.66 (98.34-98.92)
Amphetamine	-	0.09 (0.01-0.57)	0.14 (0.05-0.43)	0.02 (0.00-0.17)	0.07 (0.03-0.17)
Cocaine	-	-	-	-	-
THC	-	0.14 (0.03-0.67)	0.03 (0.00-0.25)	-	0.03 (0.01-0.12)
Illicit opiates	-	-	-	-	-
Benzodiazepines	-	0.06 (0.01-0.51)	0.27 (0.12-0.61)	0.21 (0.10-0.46)	0.19 (0.11-0.33)
Z-drugs	-	0.06 (0.01-0.51)	0.06 (0.01-0.30)	0.62 (0.39-0.98)	0.31 (0.20-0.48)
Medicinal opioids	0.12 (0.01-1.00)	0.23 (0.07-0.81)	0.43 (0.22-0.83)	0.98 (0.68-1.42)	0.63 (0.46-0.86)
Multiple drugs	-	0.25 (0.08-0.84)	0.03 (0.00-0.25)	0.17 (0.07-0.40)	0.12 (0.06-0.25)

Only 127 samples were collected during weekend nights and no substance was found in any of these (table 14.8). During weekday nights, 3 out of 225 drivers were found positive for amphetamine, THC and zopiclone respectively.

The distribution of substance categories is similar for weekdays and weekend days. The largest difference is found for Z-drugs were the estimated prevalence is higher during weekdays than during weekend days.

Table 14.8. Adjusted general distribution of substance categories by time period (N=6199)

	Prevalence (%) (Confidence interval, %)				
Substance category	**Weekday 04-22 (N=4024)**	**Weekday 22-04 (N=225)**	**Weekend 04-22 (N=1823)**	**Weekend 22-04 (N=127)**	**Total (N=6199)**
Negative	98.56 (98.17-98.87)	98.67 (94.74-99.67)	98.83 (98.14-99.26)	100	98.66 (98.34-98.92)
Amphetamine	0.06 (0.02-0.19)	0.44 (0.05-3.82)	0.06 (0.01-0.36)	-	0.07 (0.03-0.17)
Cocaine	-	-	-	-	-
THC	0.01 (0.00-0.11)	0.44 (0.05-3.82)	0.06 (0.01-0.36)	-	0.03 (0.01-0.12)
Illicit opiates	-	-	-	-	-
Benzodiazepines	0.19 (0.10-0.37)	-	0.21 (0.07-0.60)	-	0.19 (0.11-0.33)
Z-drugs	0.39 (0.25-0.62)	0.44 (0.05-3.82)	0.08 (0.01-0.39)	-	0.31 (0.20-0.48)
Medicinal opioids	0.68 (0.48-0.97)	-	0.56 (0.29-1.08)	-	0.63 (0.46-0.86)
Multiple drugs	0.10 (0.04-0.24)	-	0.22 (0.08-0.61)	-	0.12 (0.06-0.25)

14.5 Discussion

The study was conducted in a relatively small area of Sweden which includes 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, we 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.

For practical reasons, the data collection outside the cities was conducted on the major roads (except motorways). Therefore, the results are not representative for minor rural roads. Moreover, the test sites were not selected randomly since there were a limited number of suitable test sites along the roads. It is therefore not possible to generalise the results to the entire network of major roads. However, the data collection was spread out on relatively many different test sites (42 sites on rural roads) and the sites were also spread out over the whole region. Therefore, it is after all reasonable to believe that the results fairly well represent the situation on all the major roads in the study region.

The response rate at the roadside was 62%. One explanation for the relatively large non response has to do with the set up at the test sites. For integrity reasons, there was a distance between the police control and the research team. It was relatively easy to drive off after the police control if the driver didn't want to participate in the study.

When comparing the age and gender distribution with a control sample from a previous study, we did not find any large deviations. Thus, the driver sample should be representative of the age and gender distribution on the roads.

The results showed a total prevalence of 1.34% for medicinal and illicit drugs. The prevalence for illicit drugs alone was as low as 0.10%. The most prevalent substance category (0.63%) was medicinal opioids.

When the results were divided by age and gender it was found that the total prevalence was higher for women and for older drivers. The results should be interpreted with care since there are large uncertainties in the results. However, the findings are realistic since mostly medicinal drugs were found and since, in the general public, the kind of substances included in the study is more often used by women than by men and the use increases with age (FHI, 2011).

The prevalence was of the same size for all time periods except for weekend nights were no substance was found in any of the drivers. However, only a small number of samples were collected during weekend nights.

The prevalence of alcohol was not included in this study. However, the police tested all drivers stopped at the test sites and 0.18% showed a positive result of alcohol in the breath test instruments (corresponding to ≥ 0.2 g/l). Moreover, a previous study conducted in the same region as the DRUID study during the period June 2006–May 2007 showed a prevalence of 0.24% (C.I.: 0.15%-0.32%) during daytime (7 am to 11 pm).In that study, the alcohol concentration was also measured by the breath test screening instruments.

14.6 Acknowledgements

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14.7 References

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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