GOBIERNO DE ESPAÑA
MINISTERIO DE JUSTICIA

TOXICOLOGICAL FINDINGS IN ROAD TRAFFIC FATALITIES

2020 Annual Report

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Colabora:

Toxicological Findings in Road Traffic Fatalities

2020 Annual Report

GOBIERNO DE ESPAÑA | MINISTERIO DE JUSTICIA

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Report presented by Antonio Alonso Alonso
The Director of the National Institute of Toxicology and Forensic Sciences

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Introductory note and acknowledgements

The National Institute of Toxicology and Forensic Sciences (INTCF), the Institute of Legal Medicine and Forensic Sciences of Catalonia (IMLCFC), the Basque Institute of Legal Medicine (IVML), the Institute of Legal Medicine and Forensic Sciences of Aragon (IMLCFA), and the Institute of Legal Medicine and Forensic Sciences of Murcia (IMLCFM), with the collaboration of the National Road Safety Observatory (ONSV) of the Directorate-General for Traffic (DGT), present the current report about the deaths that occurred in road traffic accidents during 2020. Deaths were investigated from the toxicological point of view throughout the national territory.

The year 2020 has been an exceptional one. Road mobility has been reduced as a consequence of the pandemic caused by the SARS-CoV-2 virus. It has produced a decrease in the number of road accidents and therefore of fatal victims reaching a historical minimum of 873 deceased in 24 hours in the interurban roads. It supposes a decrease of 21% respecting 2019 [1].

A fundamental novelty of this report is that, in addition to the toxicological analyses performed by the INTCF, this year the toxicological analyses performed by four IMLCFs (IMLCFC, IVML, IMLCFA and IMLCFM) are incorporated. It has allowed obtaining the toxicological data of drivers and pedestrians deceased in traffic accidents during 2020 in all the autonomous communities in the national territory. This collaboration between the INTCF and the IMLCF has redounded in the obtainment of the statistical data much more complete than the previous years, which has made it possible to gather toxicological information in a representative number from the total of the cases of drivers and pedestrians deceased in road traffic accidents during 2020.

The information presented in this report related to the toxicological findings come from the requests made by the different Judicial Bodies. The information presented in this report refers to the toxicological analyses performed by the INTCF (centre of reference in terms of toxicological matters) and by the IMLCF equipped with a chemical-toxicological analysis laboratory (IMLCFC, IVML, IMLCFA and IMLCFM) from post mortem samples of 597 drivers and 136 pedestrians deceased in traffic accidents during the year 2020. Their objective is to show the toxicological analyses results related to the presence of alcohol, drugs of abuse and psychoactive drugs. Therefore, it shows the incidence of consumption of each of these three types of toxic substances, either alone or in combination. The study relates these toxicological findings to several epidemiological variables, such as gender, age, type of vehicle, or day of the week when the fatal accident occurred. This year, in addition to the global data, the partial data of the two autonomous communities with the highest incidence of cases (Andalusia and Catalonia) are presented. These data, as well as those presented in previous reports, provide information that is highly relevant for those working on traffic-accident prevention. Finally, the report presents a

comparative study of the post mortem toxicological data obtained in the previous years to show the evolution of some of the evaluated parameters.

The INTCF wishes to express its honest acknowledgement to all the medical examiners, facultative, specialists, and laboratory assistants of the INTCF and the IMLCF that intervened in the chemical-toxicological analyses related to these cases.

We are also grateful for the contribution of the following IMLCFs in collecting and sending post mortem samples to the INTCF for analysis, without whose contribution this report would not have been possible:

- Institute of Legal Medicine and Forensic Sciences of Andalucía
- Institute of Legal Medicine and Forensic Sciences of Castilla y León
- Institute of Legal Medicine and Forensic Sciences of Castilla-La Mancha
- Institute of Legal Medicine of Galicia (IMELGA)
- Institute of Legal Medicine and Forensic Sciences of the Comunidad Valenciana
- Institute of Legal Medicine and Forensic Sciences of Madrid
- Institute of Legal Medicine and Forensic Sciences of the Islas Canarias
- Institute of Legal Medicine of Extremadura
- Institute of Legal Medicine and Forensic Sciences of Navarra
- Institute of Legal Medicine and Forensic Sciences of Asturias
- Institute of Legal Medicine and Forensic Sciences of Cantabria
- Institute of Legal Medicine of the Islas Baleares
- Institute of Legal Medicine of La Rioja
- Institute of Legal Medicine and Forensic Sciences of Ceuta y Melilla
- Institute of Legal Medicine and Forensic Sciences of Aragón

Our gratitude to the National Road Safety Observatory of the Directorate-General for Traffic is due to the work done by the detailed review of each of the cases presented by the criteria established by the Directorate-General for Traffic.

Moreover, as the INTCF director, I would like to express my special thanks to all the staff of the informatics section of the Madrid, Seville, and Barcelona Departments. They have set up and performed the statistical searches in the INTCF LIMS system and to David Barroso Domínguez for the effort completing the treatment of all the data.

The director of the National Institute of
Toxicology and Forensic Sciences
Dr. Antonio Alonso Alonso

General information

FIGURE 1: NUMBER OF FATALITIES (n = 808) ANALISED BY THE DIFFERENT INSTITUTIONS

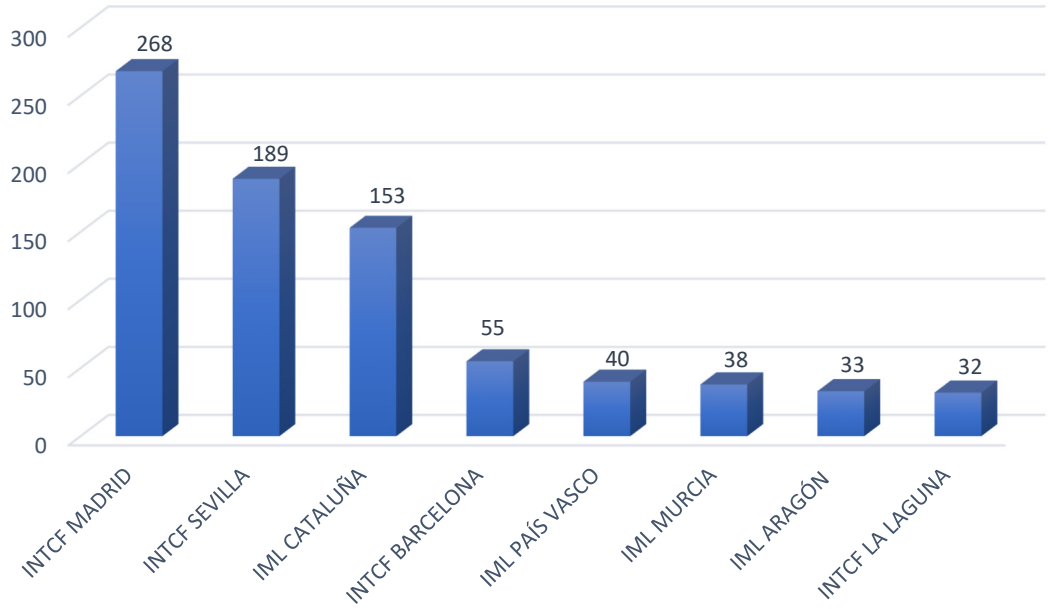


FIGURE 2: ACTIVITY SCOPE OF THE INTCF

FIGURE 3: DISTRIBUTION BY AUTONOMOUS COMMUNITIES

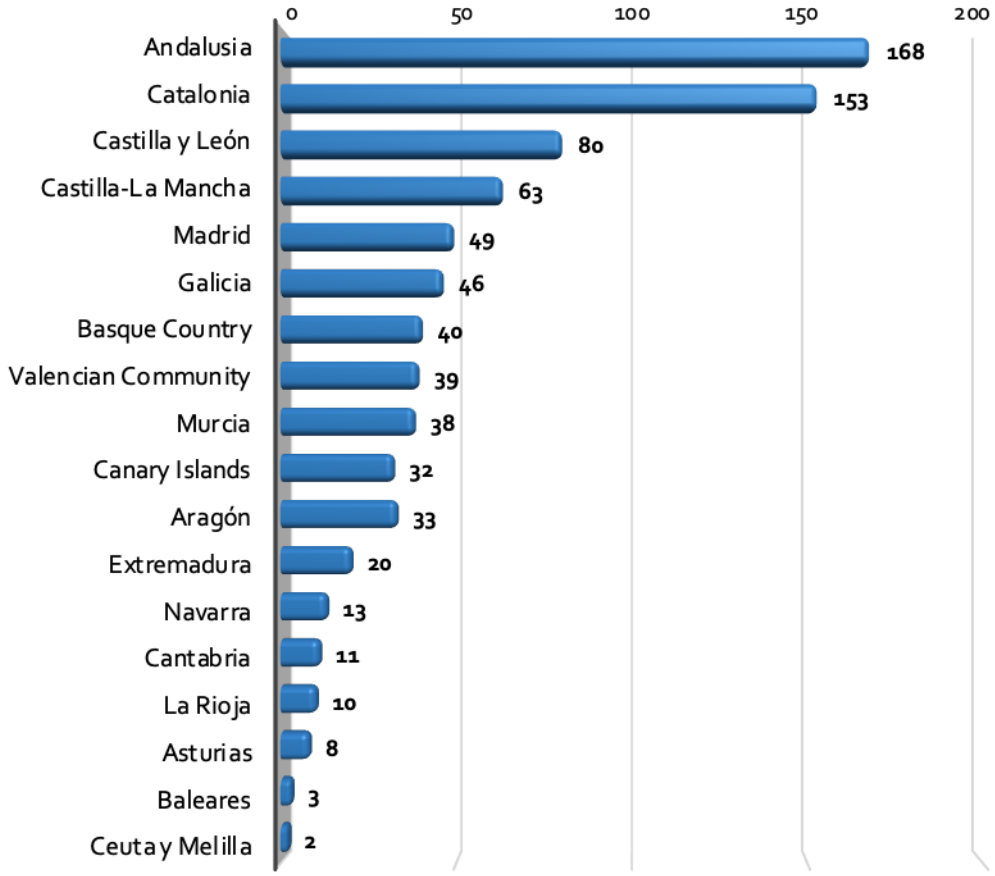
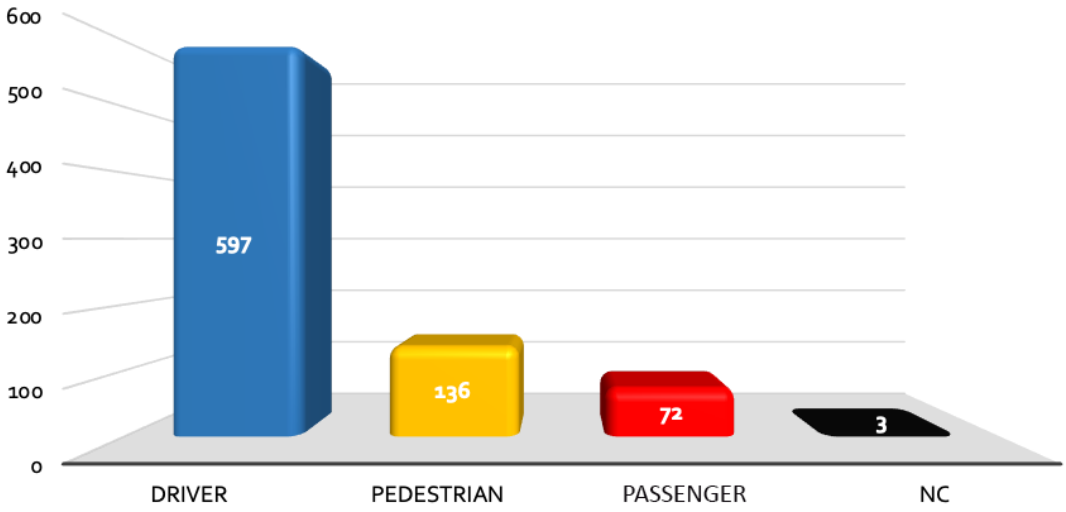


FIGURE 4: NUMBER OF FATAL VICTIMS CLASSIFIED (n = 808) BY THEIR ROLE IN THE ACCIDENT



Drivers (n = 597)

FIGURES 5 and 6: FATALITY PERCENTAGE BY GENDER AND AGE RANGE (597 DRIVERS)

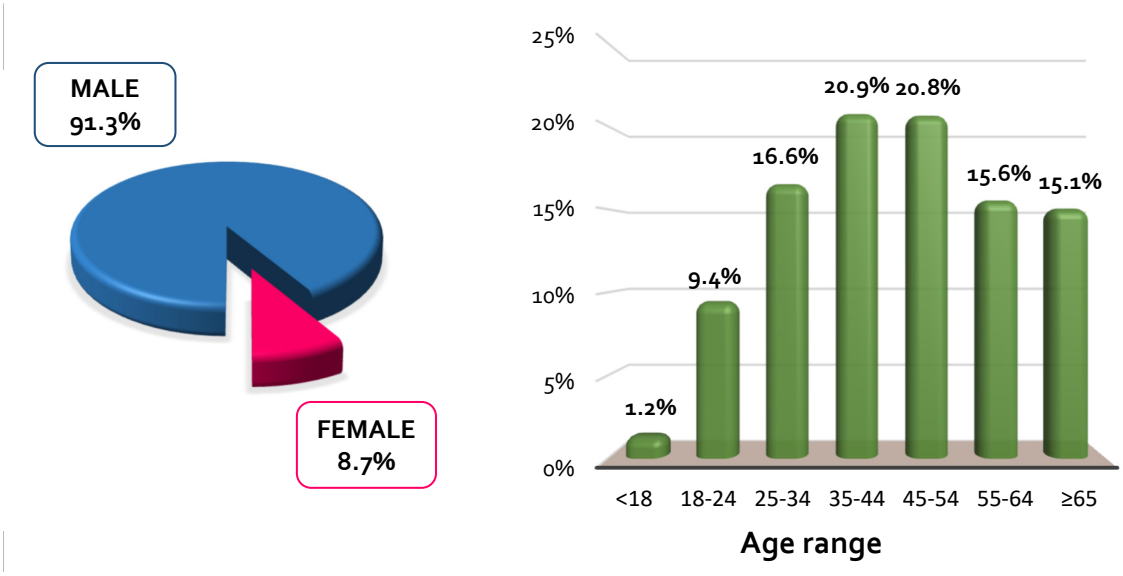
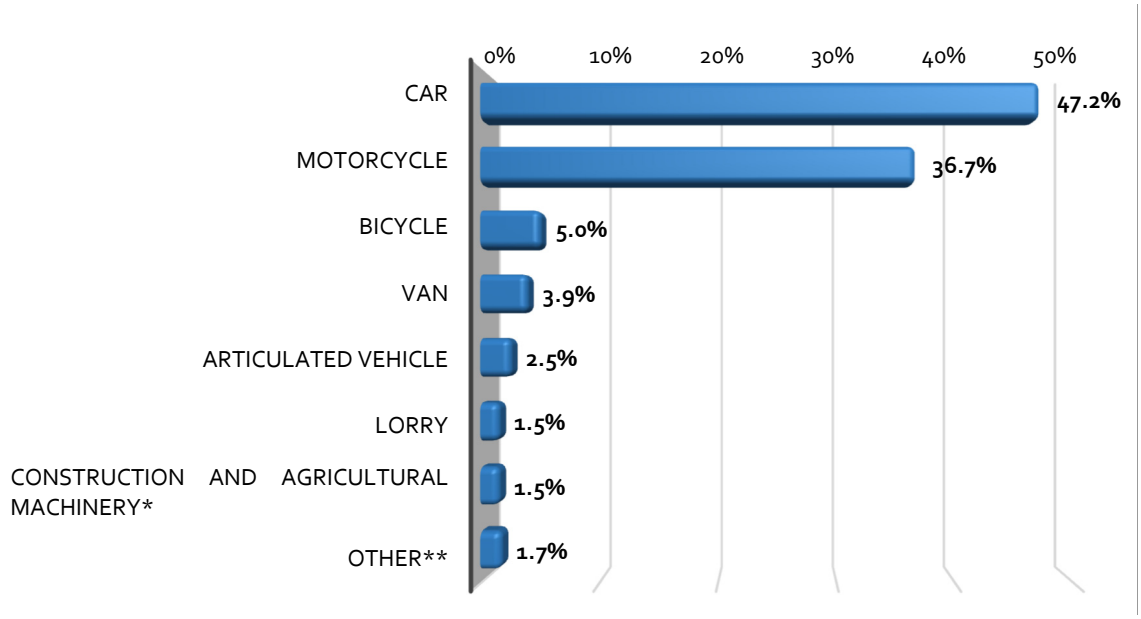


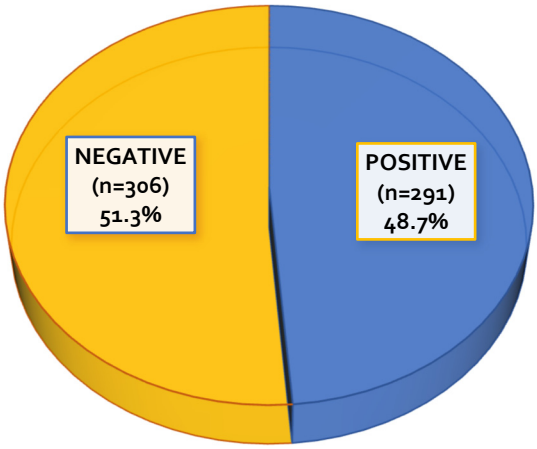
FIGURE 7: PERCENTAGE DISTRIBUTION BY VEHICLE TYPE (597 DRIVERS)



* Construction and agricultural machinery: tractor, dumper, crane.

** Other: quadricycle, scooter.

FIGURE 8: PERCENTAGE DISTRIBUTION ACCORDING TO TOXICOLOGICAL RESULTS (597 DRIVERS)



In this report, a "positive" result is considered as the result of a confirmatory test demonstrating the presence of any drug of abuse or psychoactive drug regardless of the quantity, or blood alcohol concentration higher than 0.3 g/l [2].

From this figure, it should be noted that from 597 drivers who died in road traffic accidents and underwent an autopsy, 291 (**48.7%**) yielded positive toxicological results for alcohol, drugs of abuse and psychotropic drugs, alone or in combination.

FIGURE 8B: PERCENTAGE DISTRIBUTION OF THE RESULTS BY MONTHS (597 DRIVERS)

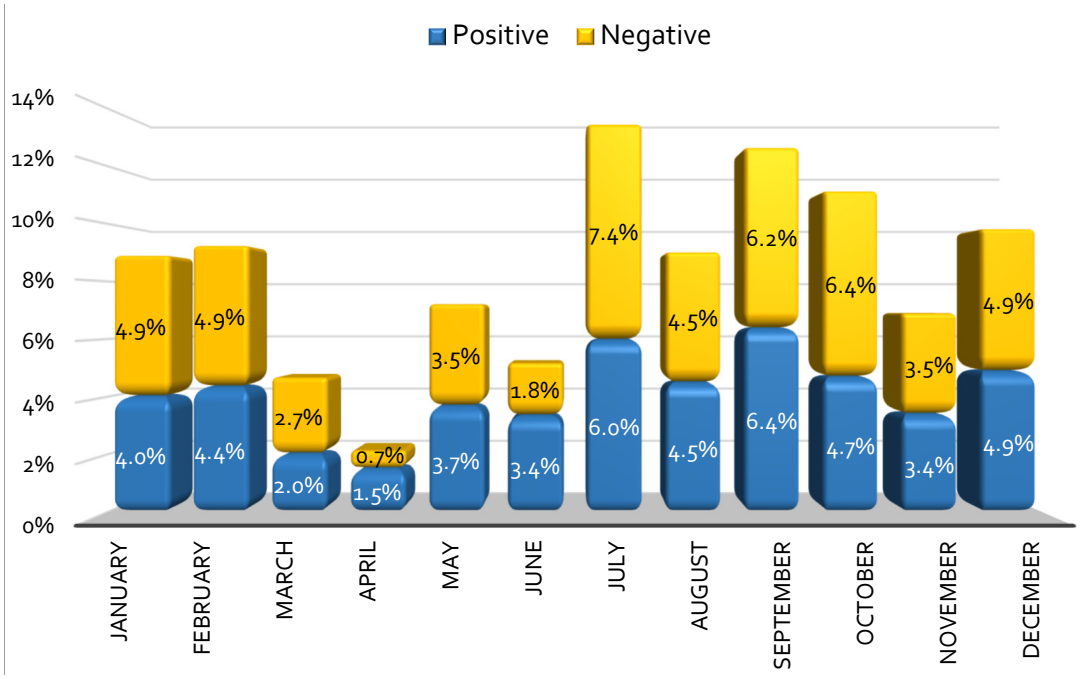


FIGURE 9: PERCENTAGE DISTRIBUTION ACCORDING TO THE TOXICOLOGY RESULTS AND TYPE OF VEHICLE (597 DRIVERS)

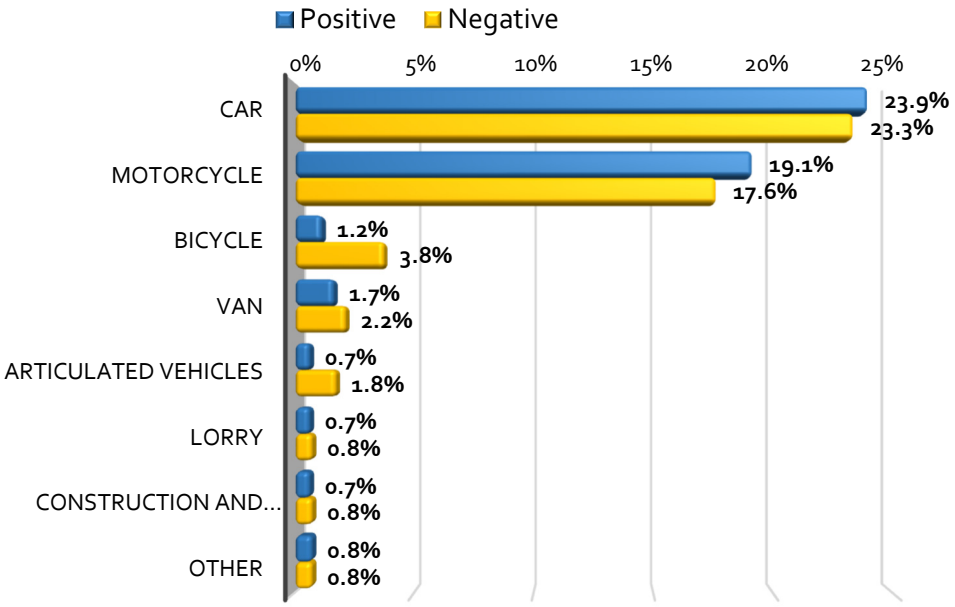
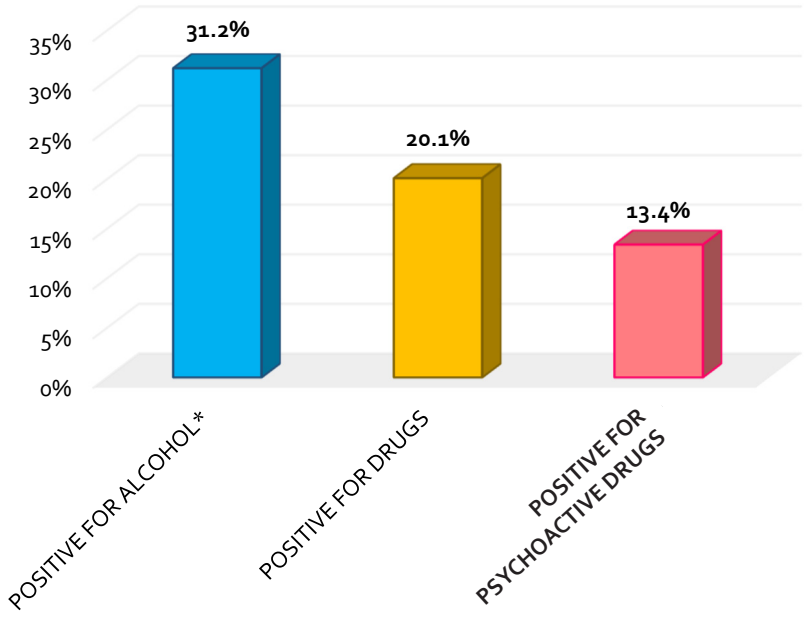


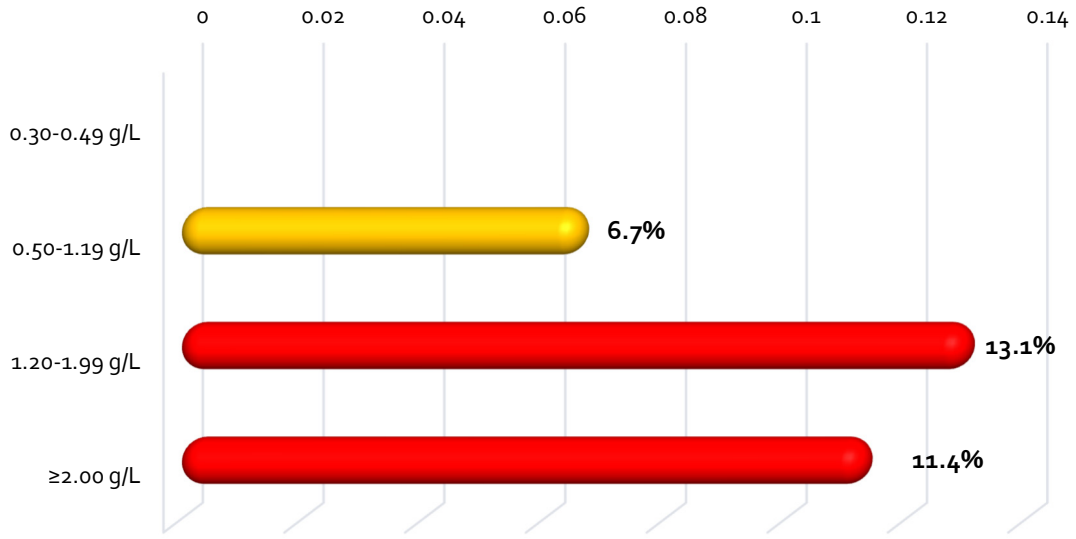
FIGURE 10: DRIVERS (n = 597). PERCENTAGE DISTRIBUTION ACCORDING TO THE TYPE OF SUBSTANCE DETECTED

(substance associations not considered)



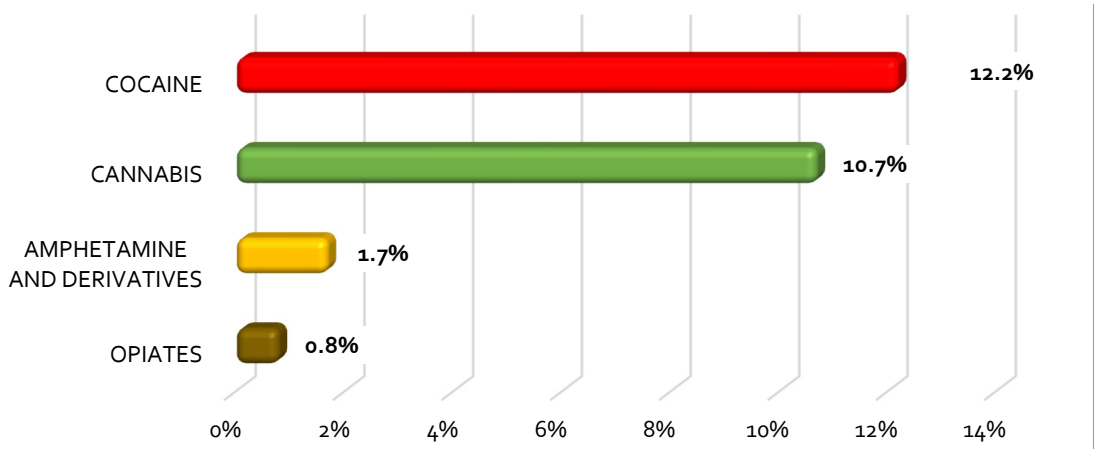
* Positive for alcohol: alcohol concentration in blood equal or higher than 0.30 g/l.

FIGURE 11: DRIVERS (n = 597). DISTRIBUTION ACCORDING TO THE BLOOD ALCOHOL CONCENTRATION (BAC)



24.5% of the drivers demonstrated a blood alcohol concentration equal or higher than 1.20 g/l.

FIGURE 12: DRIVERS (n = 597). PERCENTAGE DISTRIBUTION OF THE DETECTED DRUGS



Regardless of whether there were associated uses of drugs of abuse, alcohol and / or psychotropic drugs, by itself the most used drug was cocaine (12.2%), followed by cannabis (10.7%).

FIGURE 13: DRIVERS (n = 597). PERCENTAGE DISTRIBUTION ACCORDING TO THE DETECTED DRUG AND TYPE OF VEHICLE

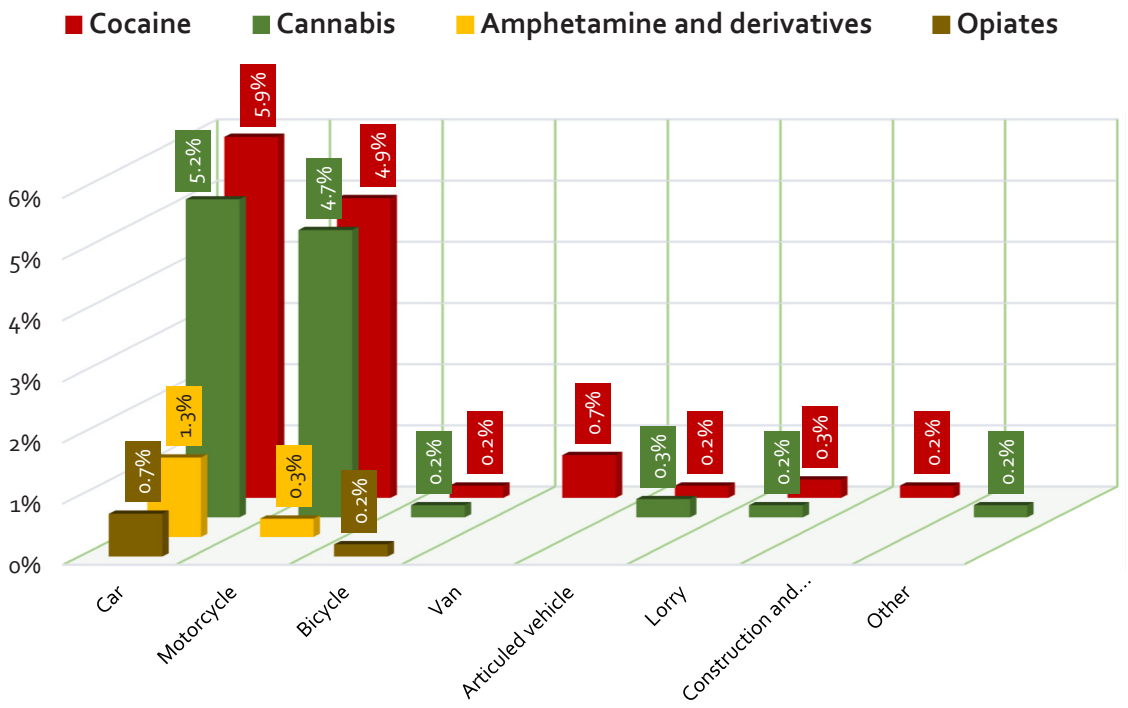
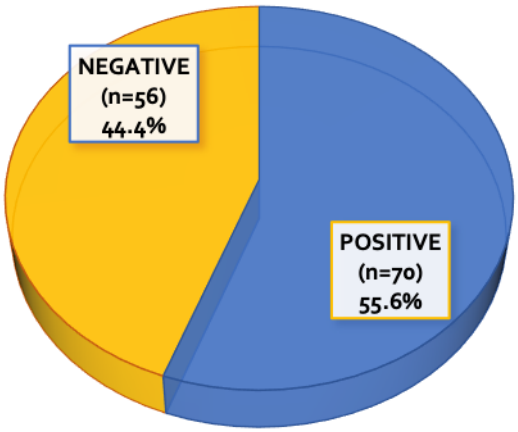


FIGURE 14: ANDALUSIA. PERCENTAGE DISTRIBUTION ACCORDING TO TOXICOLOGICAL RESULT (126 DRIVERS)



From this figure, it should be noted that from 126 drivers who died in traffic accidents and underwent autopsy, 70 (**55.6%**) yielded positive toxicological results for alcohol, drugs of abuse and psychotropic drugs, alone or in combination.

FIGURE 15: ANDALUSIA. PERCENTAGE DISTRIBUTION ACCORDING TO TOXICOLOGICAL RESULT AND TYPE OF VEHICLE (126 DRIVERS)

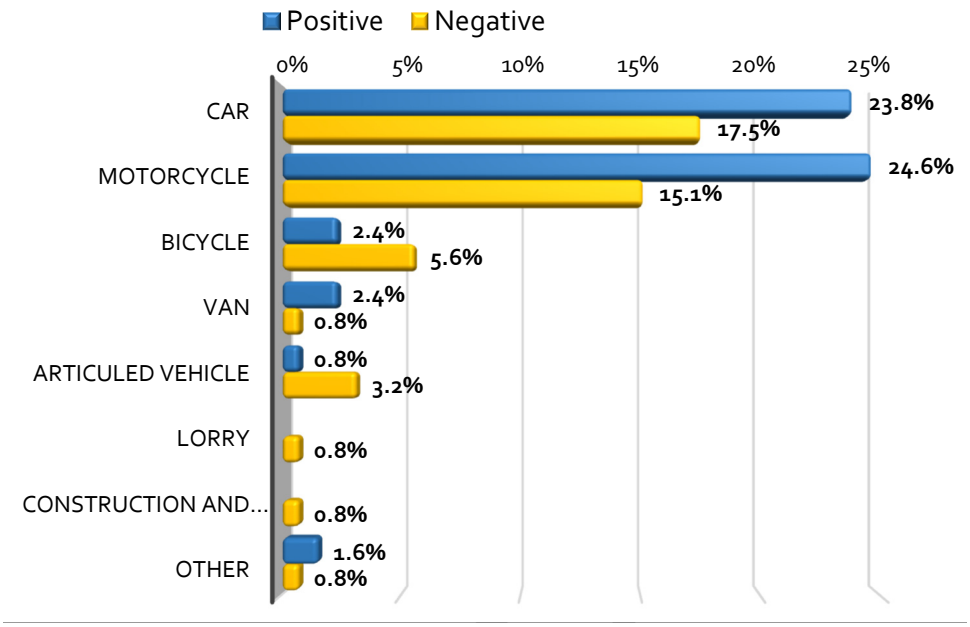
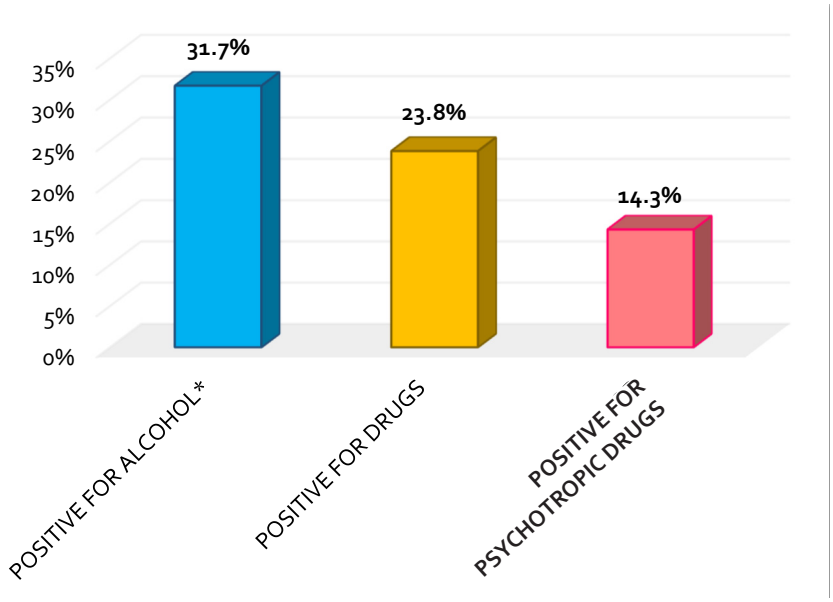
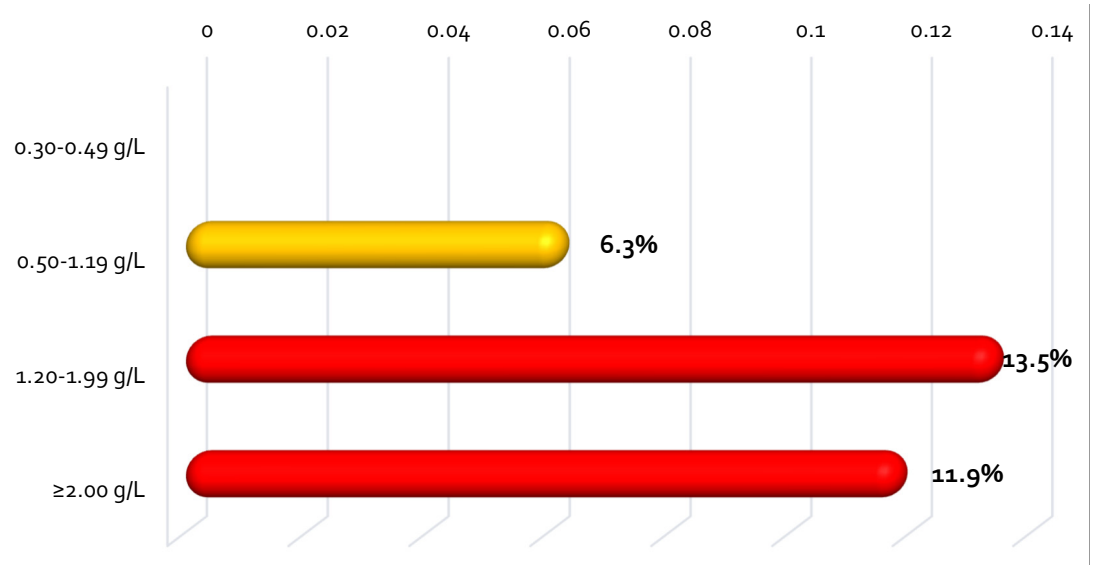


FIGURE 16: ANDALUSIA. DRIVERS (n = 126). PERCENTAGE DISTRIBUTION ACCORDING TO THE DETECTED TYPE OF SUBSTANCE
(substance associations not considered)



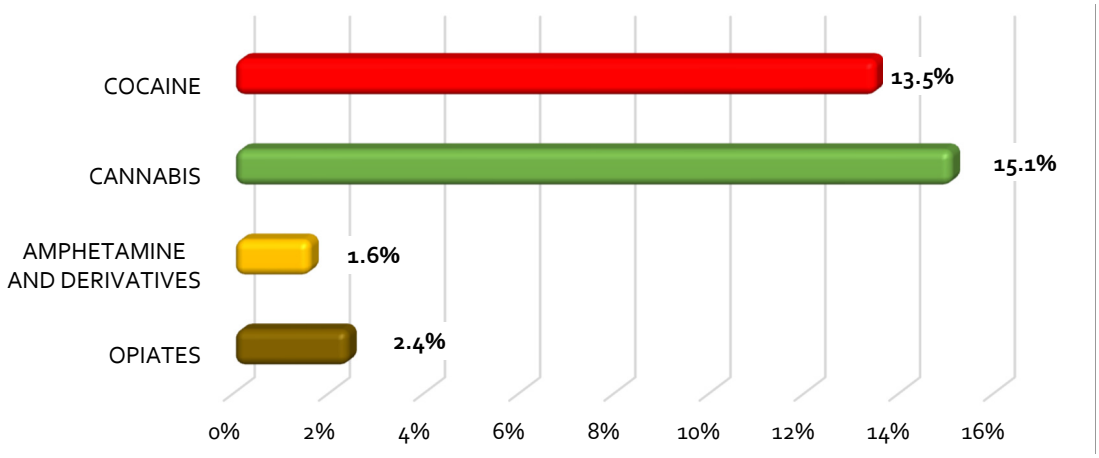
* Positive for alcohol: blood alcohol concentration equal or greater than 0.30 g/l.

FIGURE 17: ANDALUSIA. DRIVERS (n = 126). DISTRIBUTION ACCORDING TO THE BLOOD ALCOHOL CONCENTRATION



25.4 % of the drivers demonstrated a blood alcohol concentration equal or greater than 1.20 g/l.

FIGURE 18: ANDALUSIA. DRIVERS (n = 126). PERCENTAGE DISTRIBUTION OF THE DRUGS DETECTED



Regardless of whether there was associated use of drugs of abuse, alcohol, and psycho-pharmaceuticals, cannabis was the most consumed by itself (15.1%), followed by cocaine (13.5%).

FIGURE 19: ANDALUSIA. DRIVERS (n = 126). PERCENTAGE DISTRIBUTION ACCORDING TO THE DETECTED DRUG AND THE TYPE OF VEHICLE

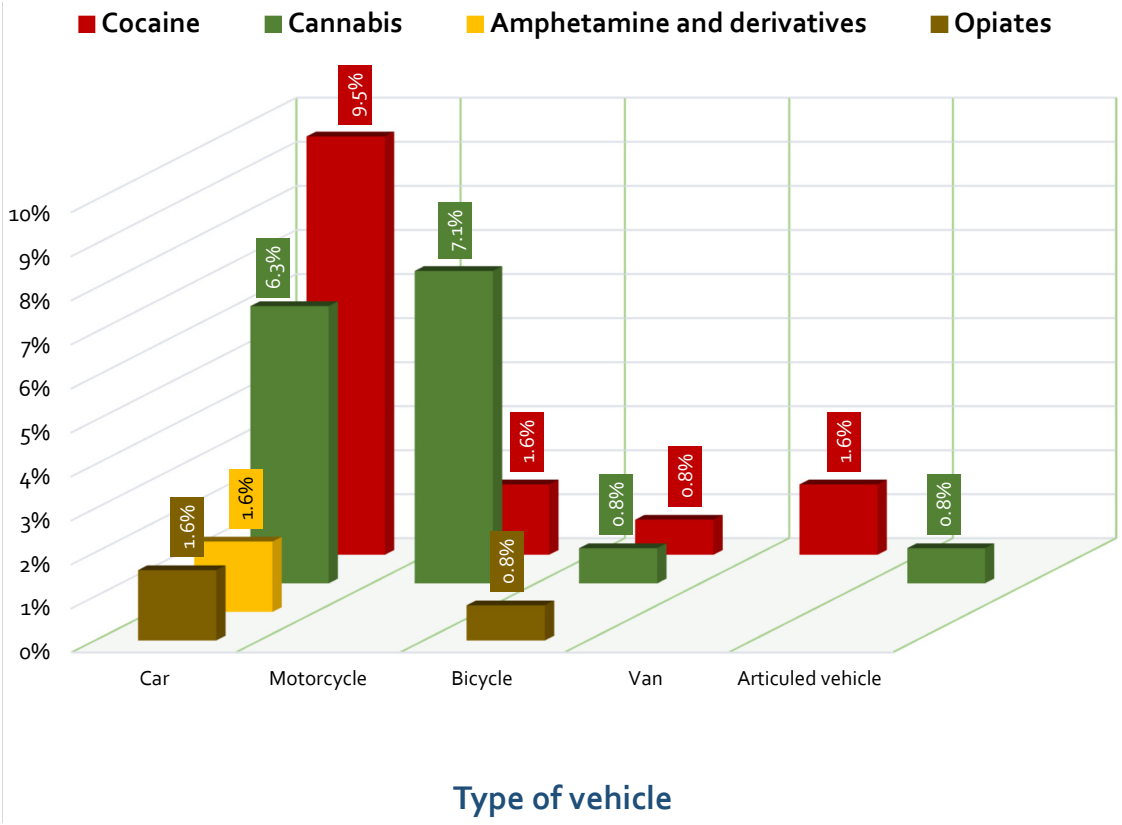
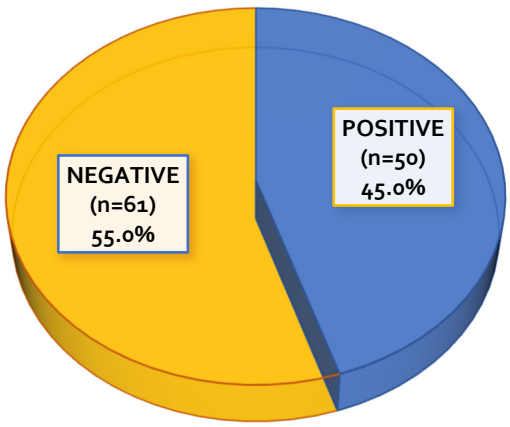


FIGURE 20: CATALONIA. PERCENTAGE DISTRIBUTION ACCORDING THE TOXICOLOGICAL RESULT (111 DRIVERS)



It is important to highlight in this figure that from 111 deceased drivers in traffic accidents that underwent an autopsy, 50 (45.0%) showed positive toxicological results for alcohol, drugs of abuse, and psychopharmaceuticals, alone or in combination.

FIGURE 21: CATALONIA. PERCENTAGE DISTRIBUTION ACCORDING TO THE TOXICOLOGICAL RESULTS AND TYPE OF VEHICLE (111 DRIVERS)

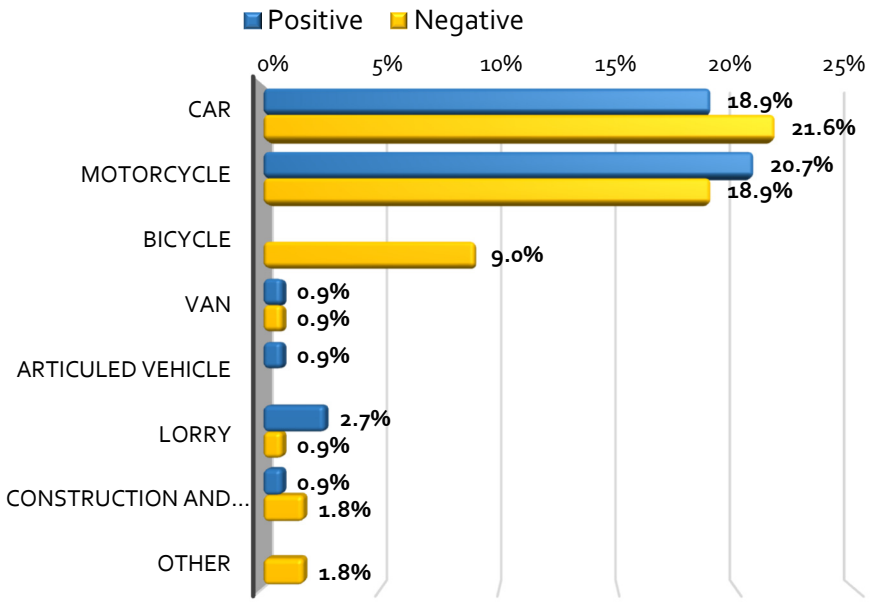
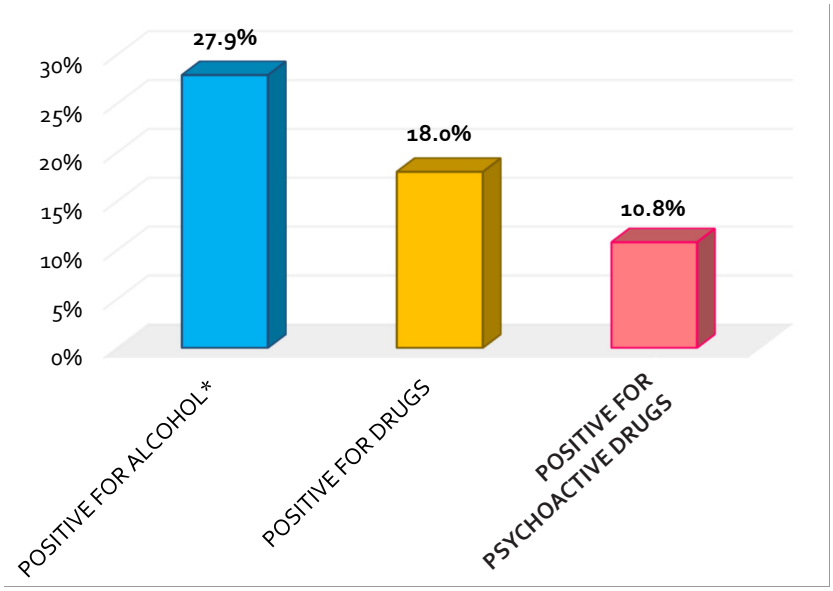
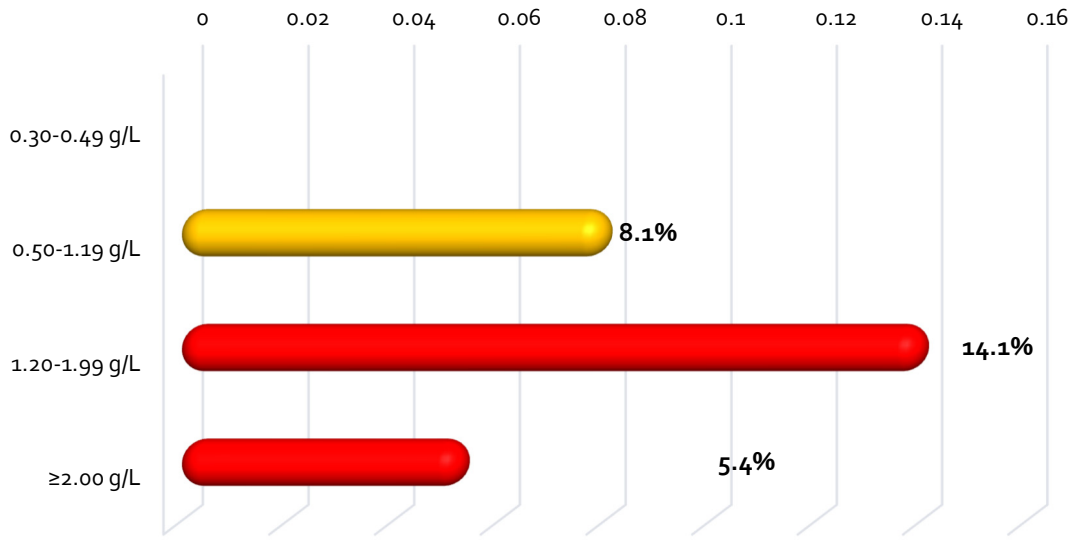


FIGURE 22: CATALONIA. DRIVERS (n = 111). PERCENTAGE DISTRIBUTION ACCORDING TO THE DETECTED SUBSTANCE TYPE
(substance associations not considered)



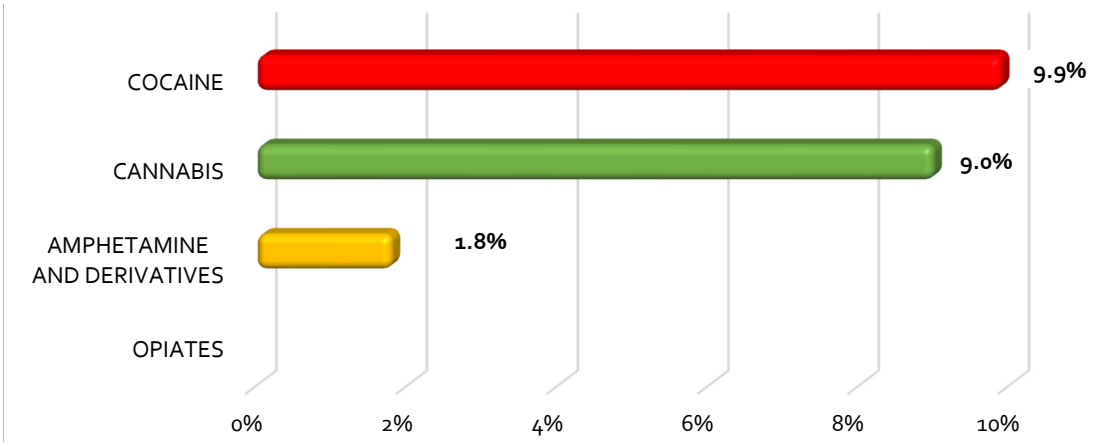
* Positive for alcohol: alcohol blood level equal or greater than 0.30 g/l.

FIGURE 23: CATALONIA. DRIVERS (n = 111). DISTRIBUTION ACCORDING THE ALCOHOL BLOOD LEVEL



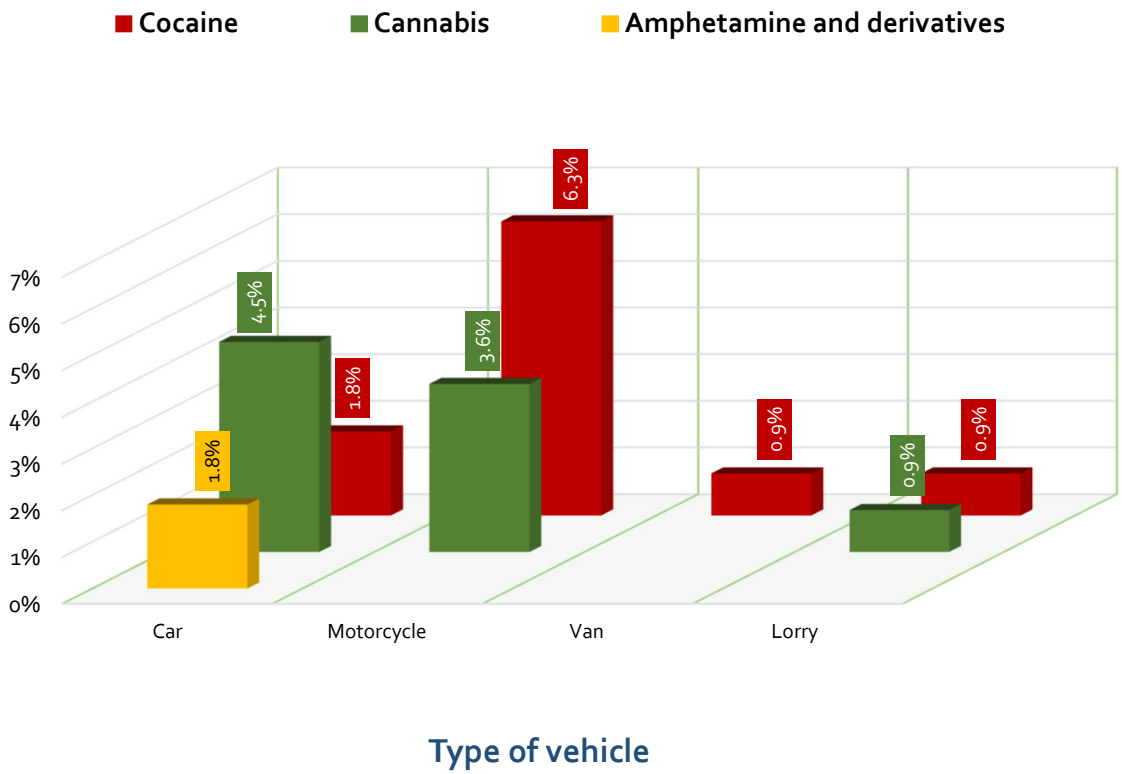
19.5 % of the drivers showed a blood alcohol level equal or greater than 1.20 g/l.

FIGURE 24: CATALONIA. DRIVERS (n = 111). PERCENTAGE DISTRIBUTION OF THE DETECTED DRUGS



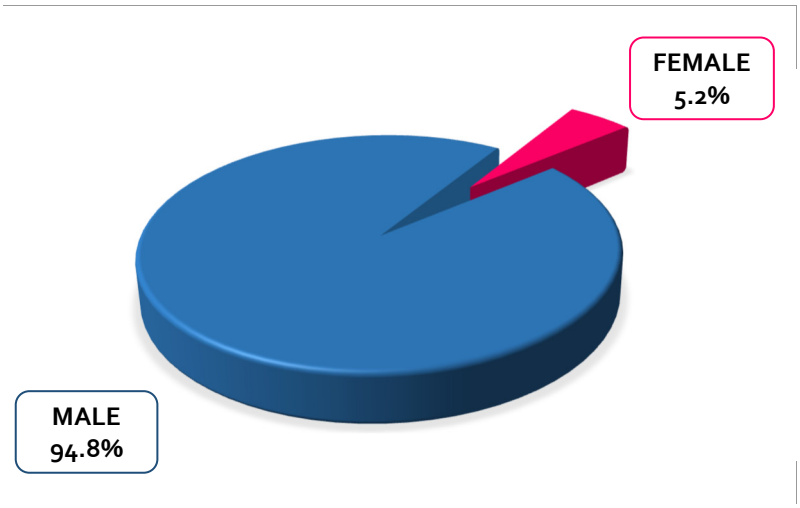
Regardless of whether there was associated use of drugs of abuse, alcohol and psychotropic drugs, the most commonly used drug on its own was cocaine (9.9%), followed by cannabis (9.0%).

FIGURE 25: CATALONIA. DRIVERS (n = 111). PERCENTAGE DSITRIBUTION ACCORDING OF THE DETECTED DRUG AND TYPE OF VEHICLE



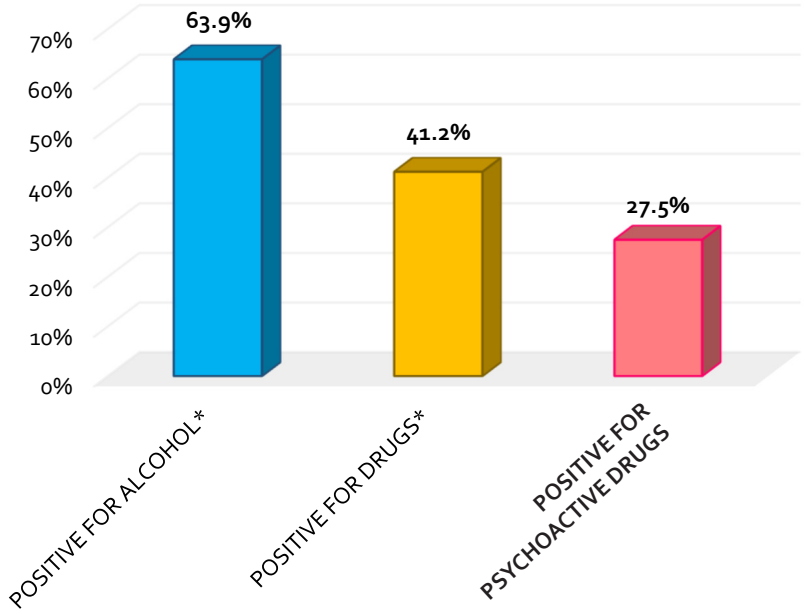
DRIVERS: CASES WITH POSITIVE TOXICOLOGICAL RESULTS (n = 291)

FIGURE 26: POSITIVE DRIVERS (n = 291). PERCENTAGE BY GENDER



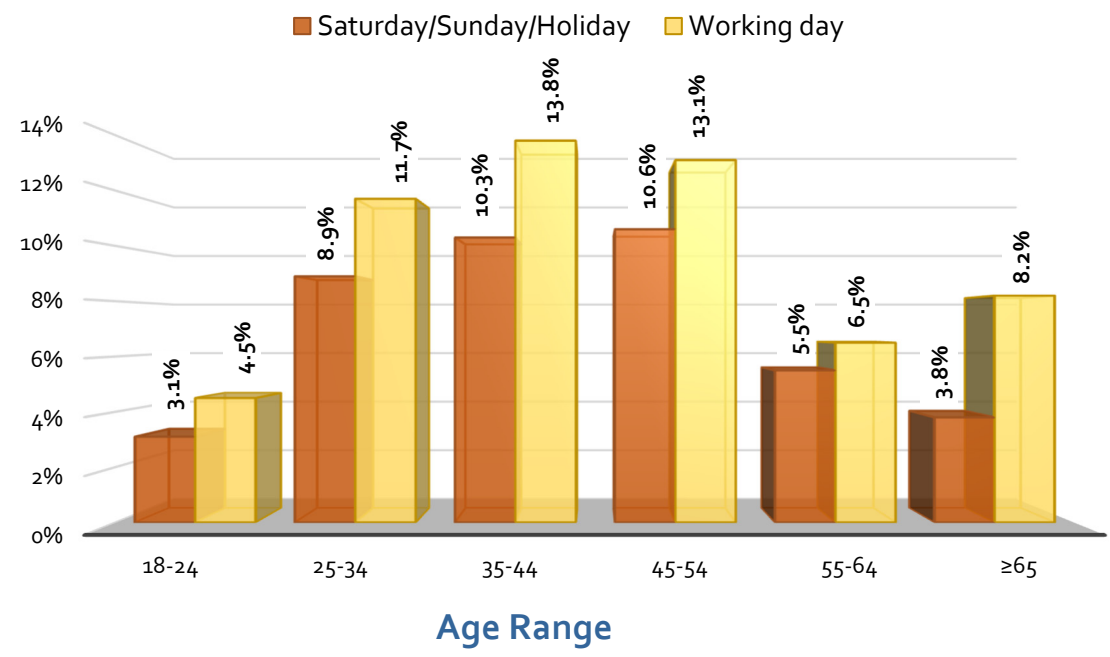
94.8% of the drivers with positive results were male.

FIGURE 27: POSITIVE DRIVERS (n = 291).
PERCENTAGE ACCORDING TO SUBSTANCE TYPE
(substance associations not considered)



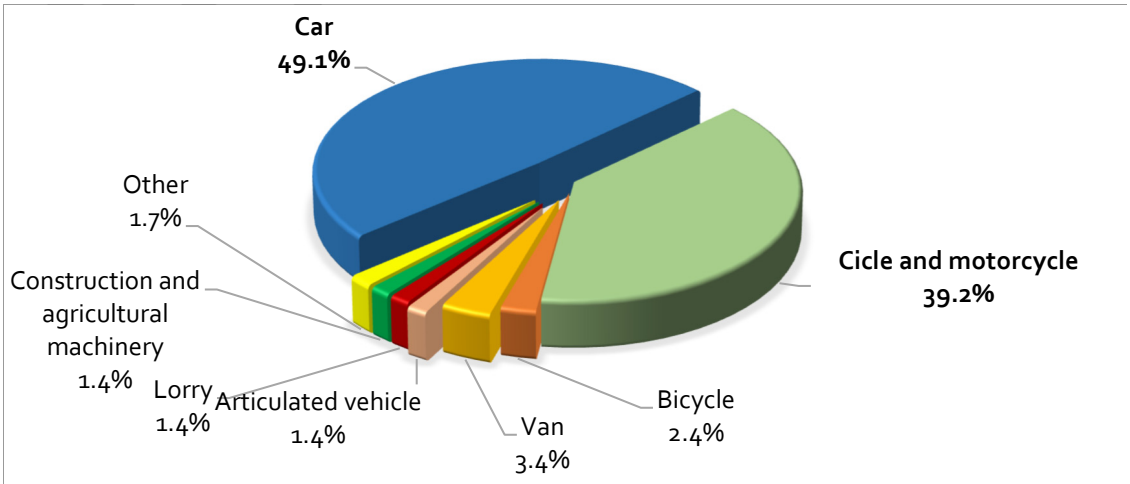
* Positive for alcohol: blood alcohol concentration equal or greater than 0.30 g/l [2].

FIGURE 28: POSITIVE DRIVERS (n = 291). PERCENTAGE ACCORDING TO AGE RANGE AND DAY OF THE WEEK



68.4% of the drivers with positive toxicological results were in the age range of 25 to 54 years. 57.8% of the deceased drivers with positive toxicological results in all the national territory were produced in working days, regardless of the age range.

FIGURE 29: POSITIVE DRIVERS (n = 291). PERCENTAGE ACCORDING TO TYPE OF VEHICLE



49.1% of the drivers with positive toxicological results were driving a car and 39.2% a motorcycle or scooter.

FIGURE 30: POSITIVE DRIVERS (n = 291). CLASSIFICATION OF THE RESULTS ACCORDING TO THE TYPE AND/OR THE COMBINATION OF THE DETECTED SUBSTANCES

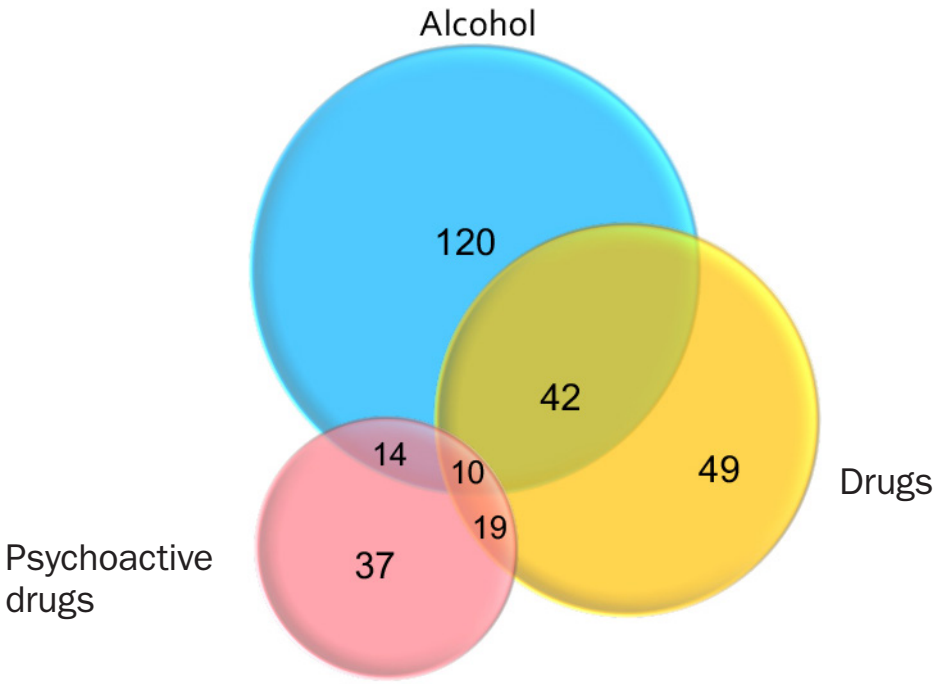
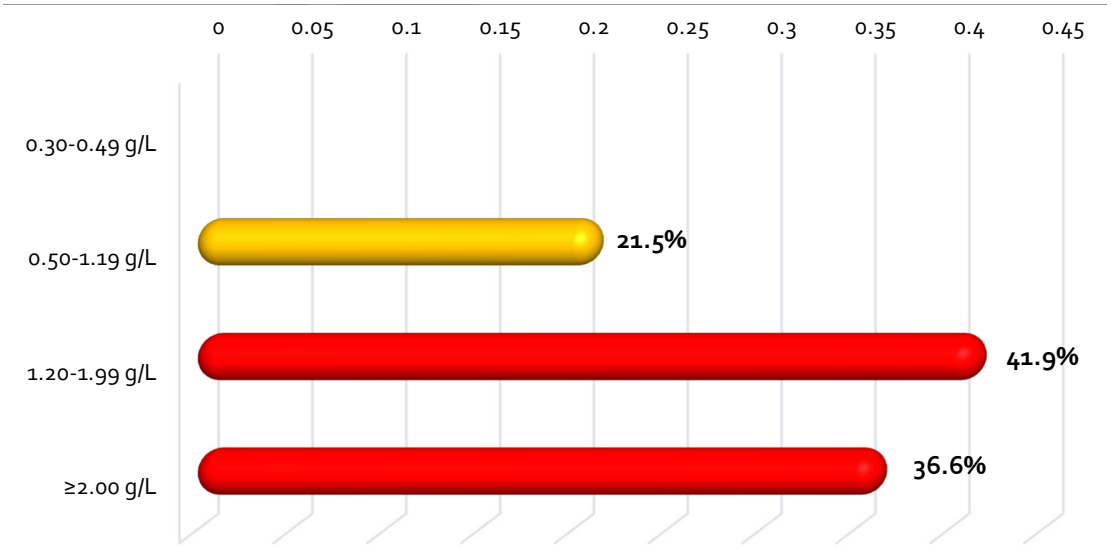
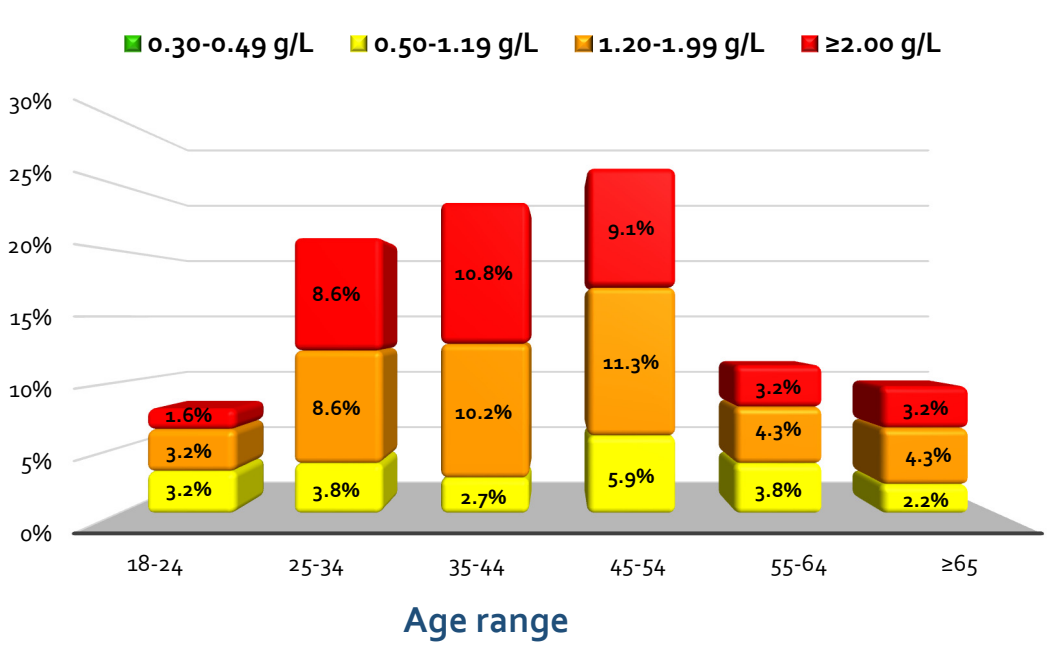


FIGURE 31: ALCOHOL-POSITIVE DRIVERS (n = 186). DISTRIBUTION BY THE BLOOD ALCOHOL CONCENTRATION



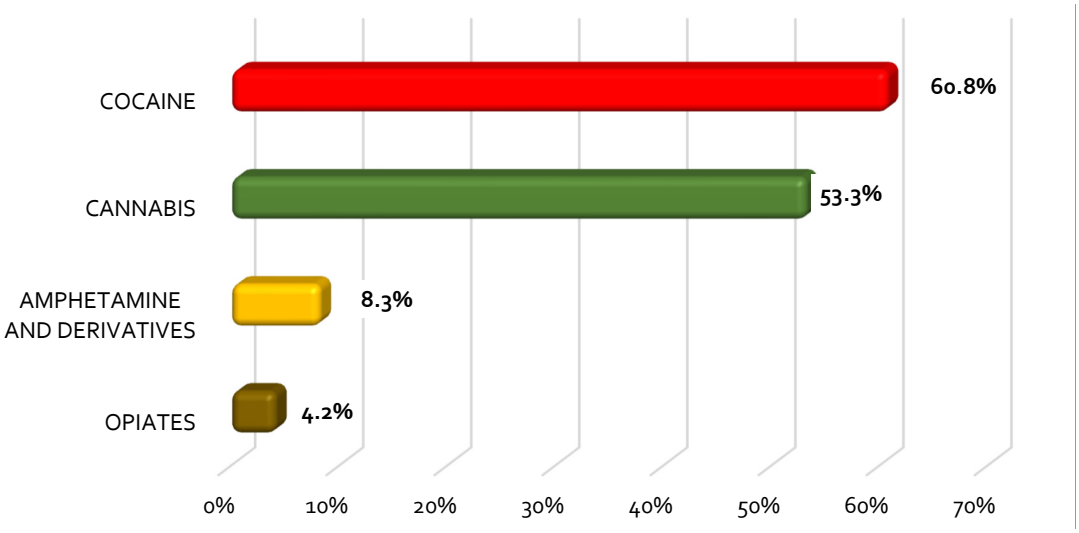
78.5% of the drivers with positive results of alcohol showed an equal or greater blood alcohol concentration than 1.20 g/l.

FIGURE 32: ALCOHOL-POSITIVE DRIVERS (n = 186). DISTRIBUTION BY THE BLOOD ALCOHOL CONCENTRATION AND AGE RANGE



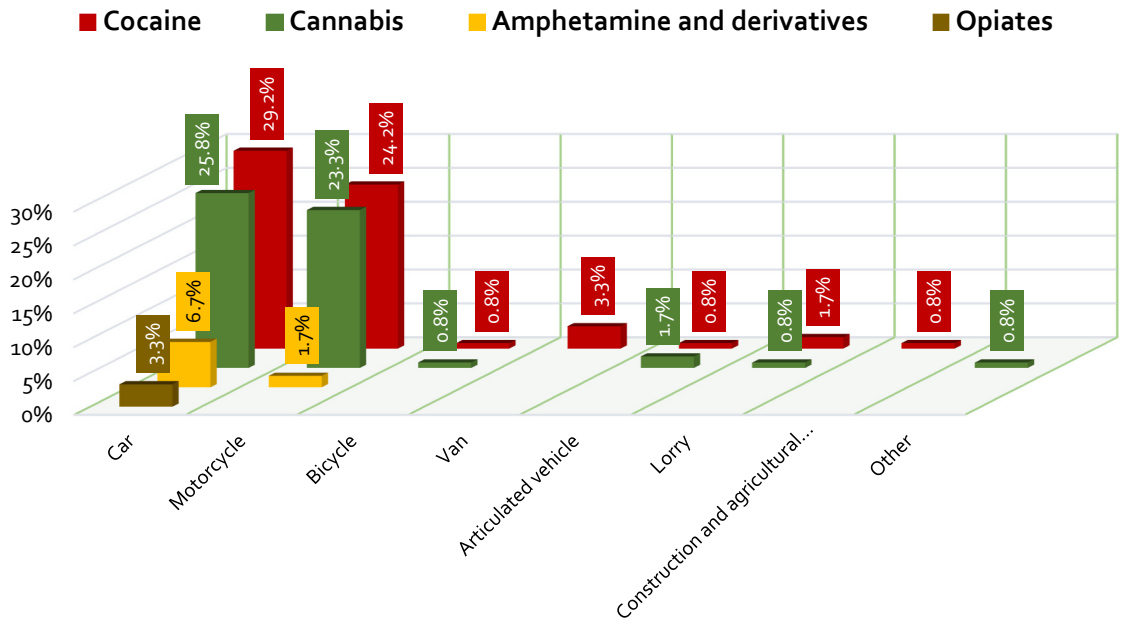
58.6% of the drivers with positive results for alcohol, with a blood alcohol concentration equal or greater than 1.20 g/l, are between the age range of 25-54 years.

FIGURE 33: DRUGS-POSITIVE DRIVERS (n = 120). PERCENTAGE DISTRIBUTION OF THE DETECTED DRUGS



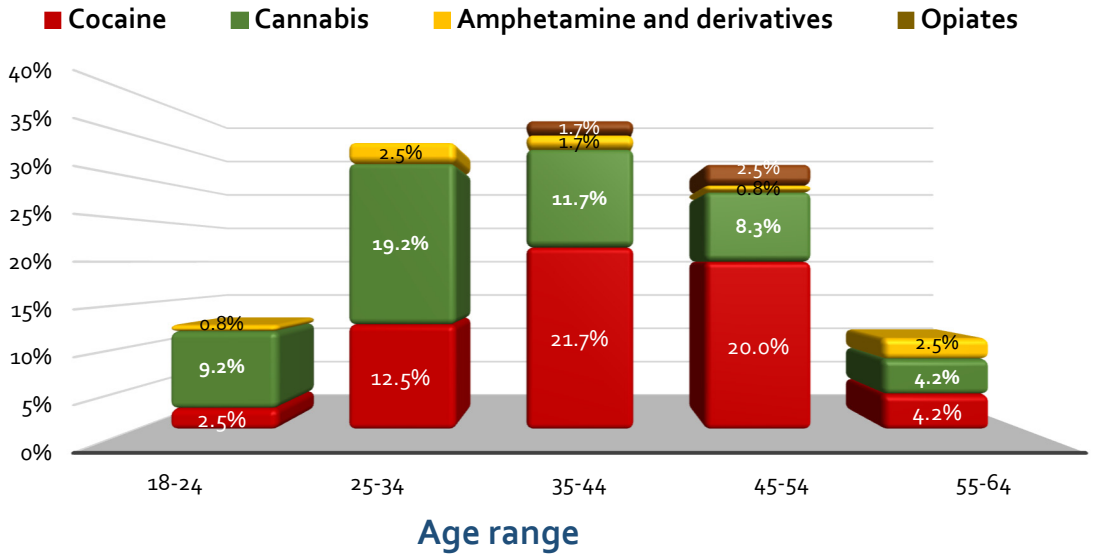
Regardless of whether there was associated use of drugs of abuse, alcohol and/or psychotropic drugs, the most commonly used drug on its own was cocaine (60.8%), followed by cannabis (53.3%).

FIGURE 34: DRUGS-POSITIVE DRIVERS (n = 120). PERCENTAGE DISTRIBUTION BY THE DETECTED DRUG AND THE TYPE OF VEHICLE



The highest percentages correspond to cocaine (53.4%) cannabis (49.1%), in drivers of car and motorcycle.

FIGURE 35: DRUGS-POSITIVE DRIVERS (n = 120). DISTRIBUTION ACCORDING TO THE DETECTED DRUG AND AGE RANGE



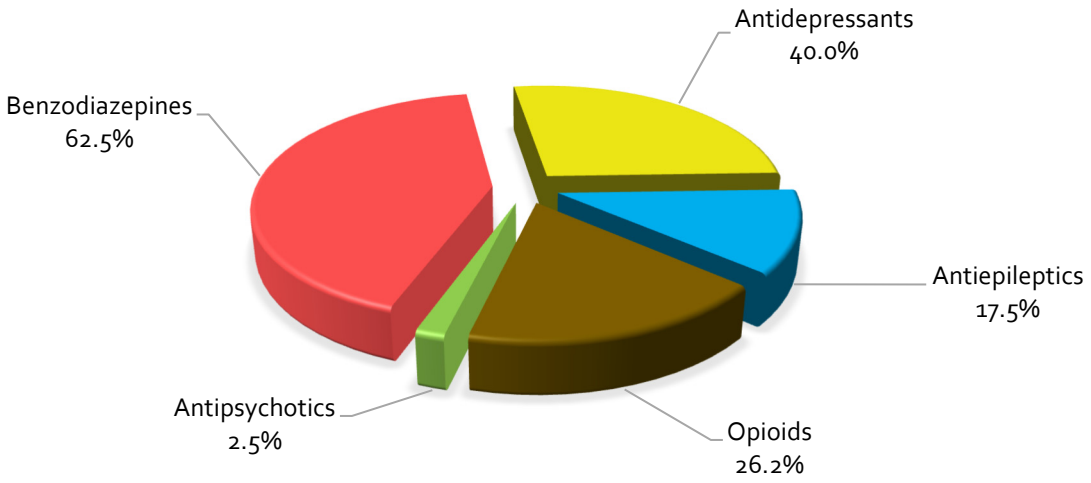
The highest percentages correspond to the consumption of cocaine (54.2%) and / or cannabis (39.2%), in drivers with an age range of 25 to 54 years.

TABLE 1: ALCOHOL AND DRUGS POSITIVE DRIVERS (n = 52). DISTRIBUTION OF THE CASES ACCORDING TO THE DETECTED DRUG

The most detected frequent combinations have been:	
Alcohol and cocaine	51.9%
Alcohol and cannabis	23.1%
Alcohol, cocaine and cannabis	15.4%
Alcohol, cocaine, cannabis and amphetamine derivatives	3.8%
Alcohol, cannabis and amphetamine derivatives	3.8%
Alcohol, and amphetamine derivatives	1.9%

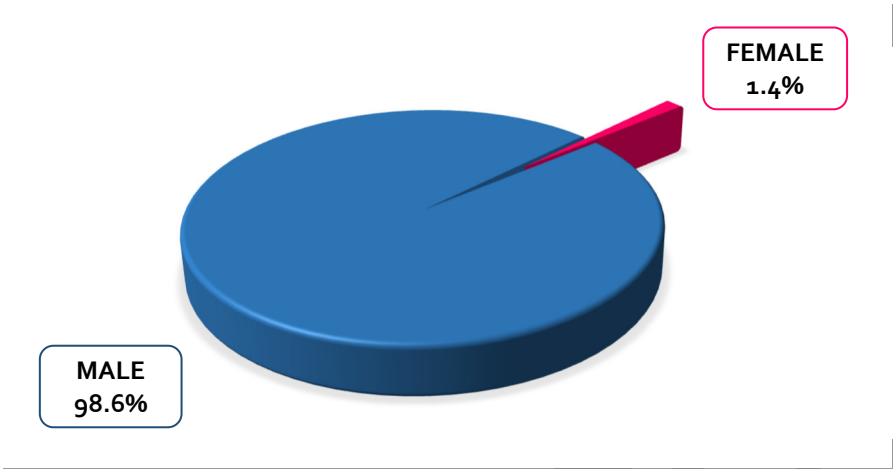
The consumption associated to alcohol and drugs of abuse of major prevalence have been at first the consumption of alcohol and cocaine (51.9%), followed by alcohol and cannabis consumption (23.1%) and that of alcohol, cocaine, and cannabis (15.4%).

FIGURE 36: DRIVERS POSITIVE FOR PSYCHOACTIVE DRUGS (= 80). PERCENTAGE DISTRIBUTION OF THE PSYCHOTROPICS DETECTED



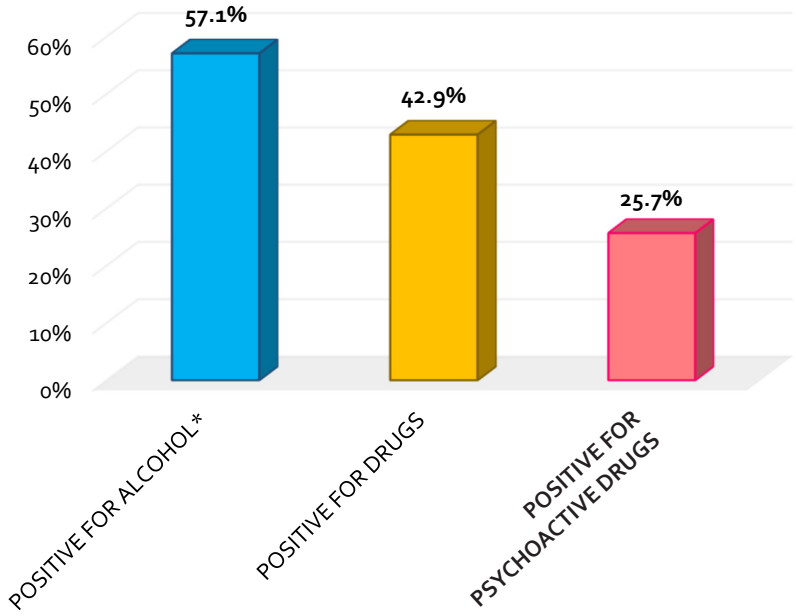
The term «opioids» refers to the psychotropics (tramadol, oxycodone, methadone…) which bind to the opiates receptors of the central nervous system, excluding heroine.

FIGURE 37: ANDALUSIA. POSITIVE DRIVERS (n = 70).
DISTRIBUTION BY GENDER



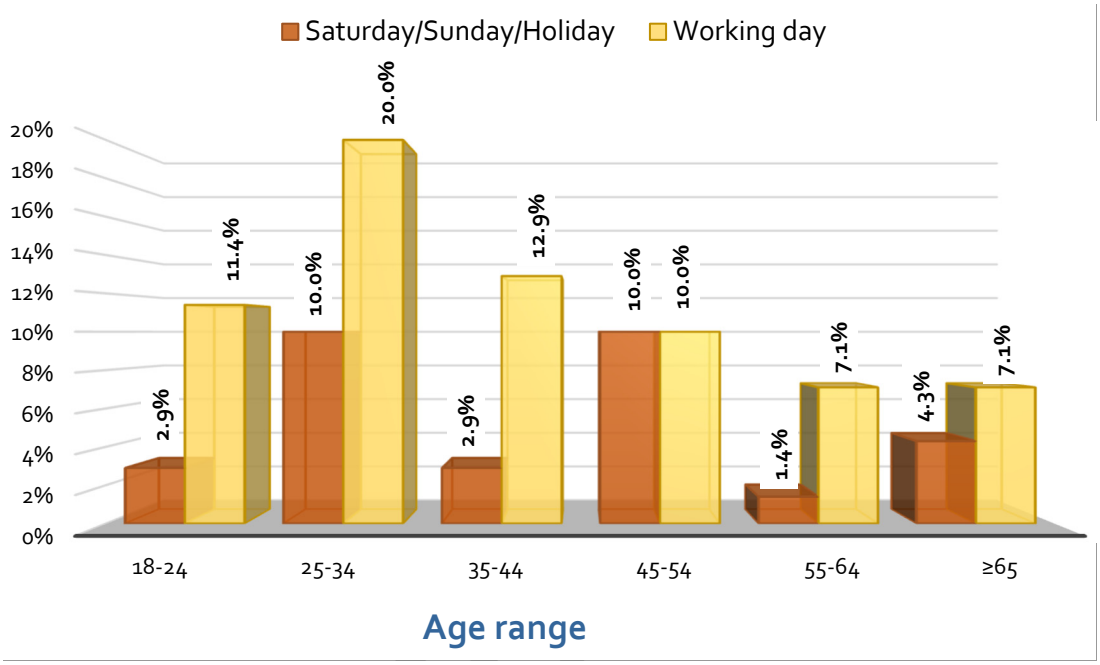
98.6% of the drivers with positive toxicological results corresponded to male.

FIGURE 38: ANDALUSIA. POSITIVE DRIVERS (n = 70).
DISTRIBUTION ACCORDING TO THE DETECTED SUBSTANCE TYPE
(substance associations not considered)



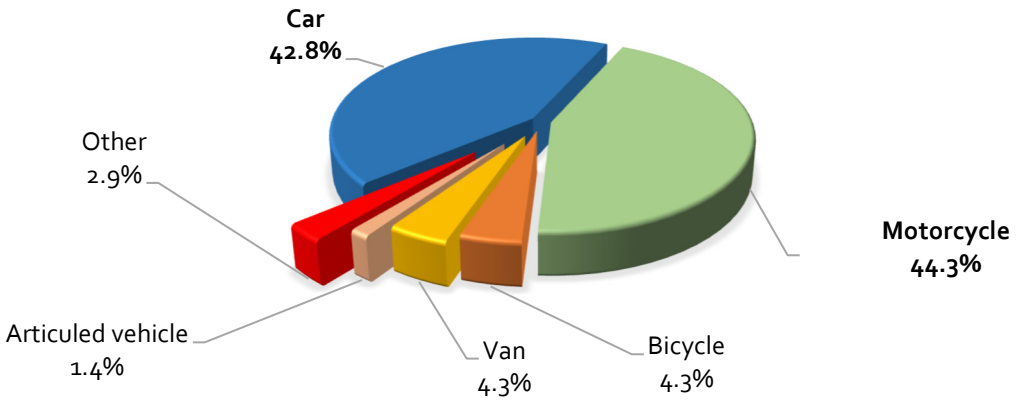
* Positive for alcohol: blood alcohol concentration equal to or greater than 0.30 g/l.

FIGURE 39: ANDALUSIA. POSITIVE DRIVERS (n = 70). PERCENTAGE BY AGE RANGE AND DAY OF THE WEEK



68.5% of the deceased drivers with positive toxicological results in Andalusia were produced in working days, whatever the age range.

FIGURE 40: ANDALUSIA. POSITIVE DRIVERS (n = 70). DISTRIBUTION BY TYPE OF VEHICLE



44.3% of the drivers with positive toxicological results were driving a motorcycle and 42.8% a car.

FIGURE 41: ANDALUSIA. POSITIVE DRIVERS (n = 70). CLASSIFICATION OF THE RESULTS ACCORDING TO THE TYPE AND/OR COMBINATION OF THE DETECTED SUBSTANCES

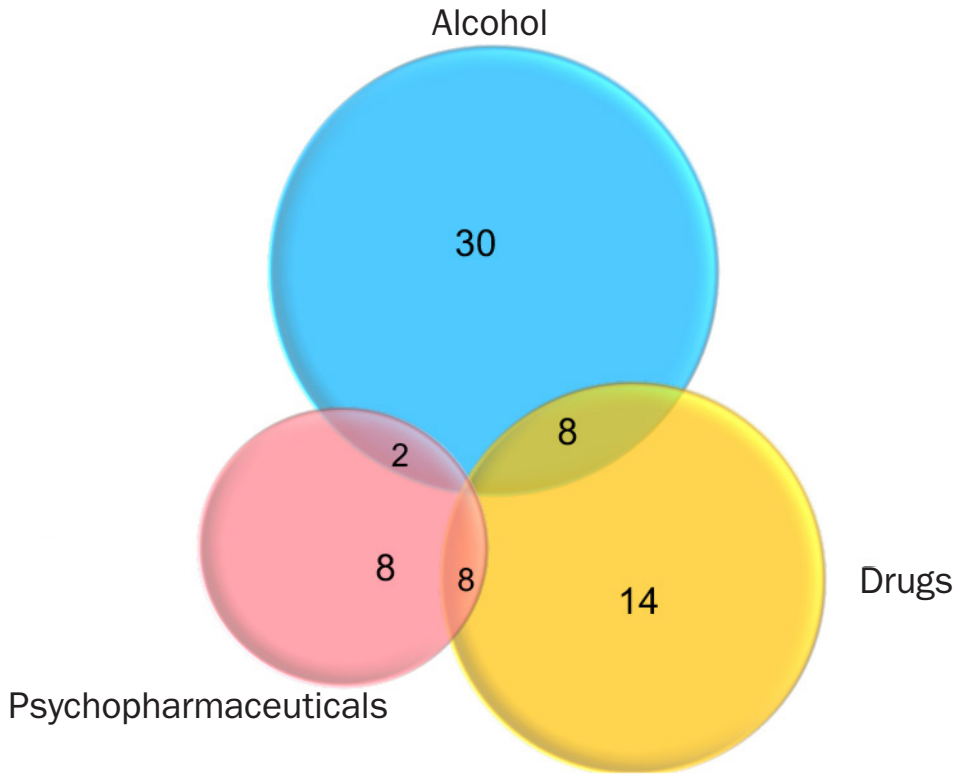
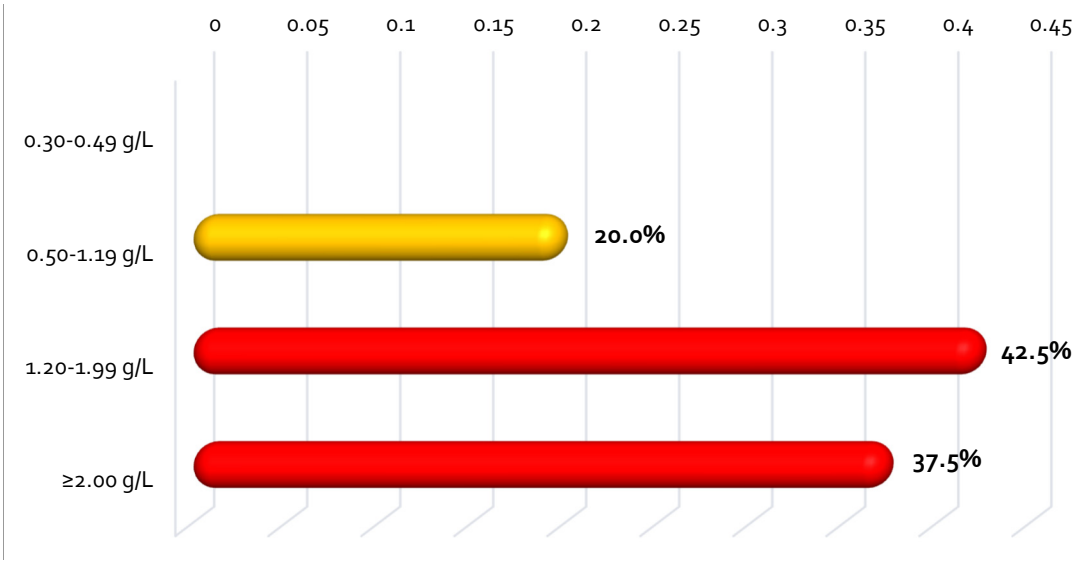
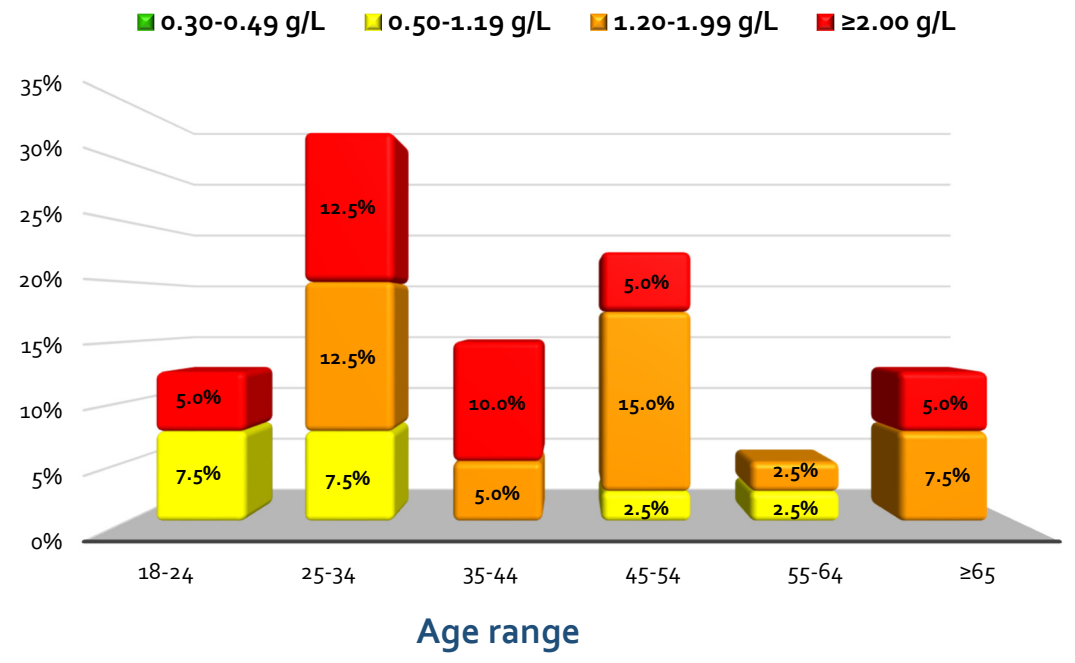


FIGURE 42: ANDALUSIA. ALCOHOL-POSITIVE DRIVERS (n = 40). DISTRIBUTION ACCORDING TO THE BLOOD ALCOHOL CONCENTRATION



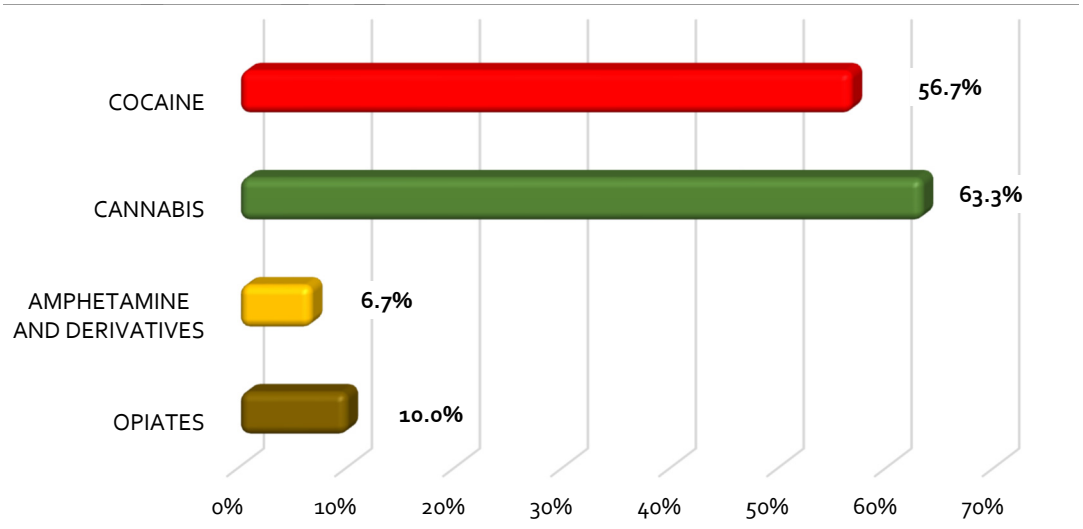
80.0% of the drivers with positive results of alcohol showed a blood alcohol concentration equal or greater than 1.20 g/l.

FIGURE 43: ANDALUSIA. ALCOHOL-POSITIVE DRIVERS (n = 40).
DISTRIBUTION ACCORDING TO THE BLOOD ALCOHOL CONCENTRATION AND AGE RANGE



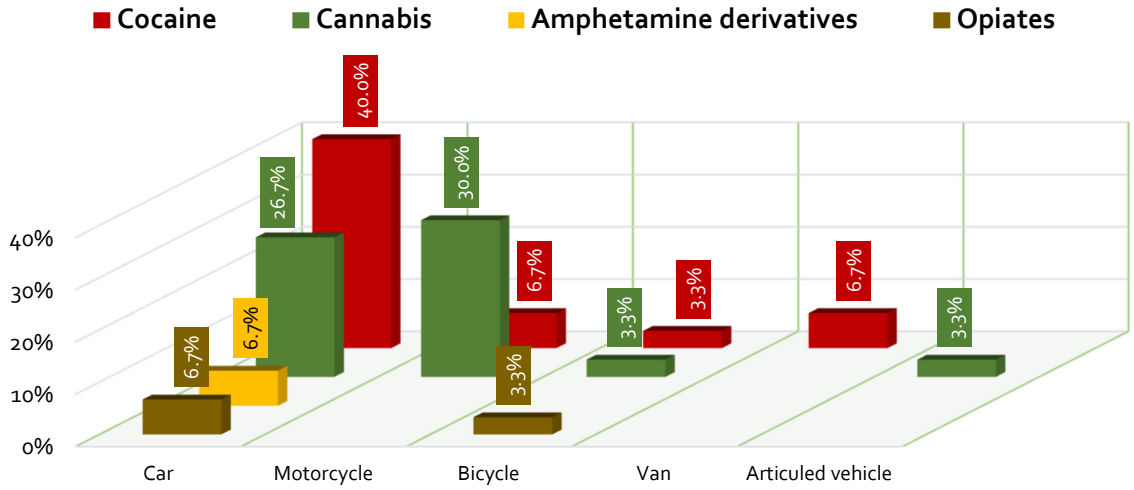
60.0% of the drivers with positive results for alcohol, with the blood alcohol concentration equal to or greater than 1.20 g/l, is among the age range of 25-54 years.

FIGURE 44: ANDALUSIA. DRUGS-POSITIVE DRIVERS (n = 30).
DISTRIBUTION OF THE DETECTED DRUGS



Regardless of whether there was associated use of drugs of abuse, alcohol and/or psychotropic drugs, the most commonly used drug on its own was cannabis (63.3%), followed by cocaine (56.7%).

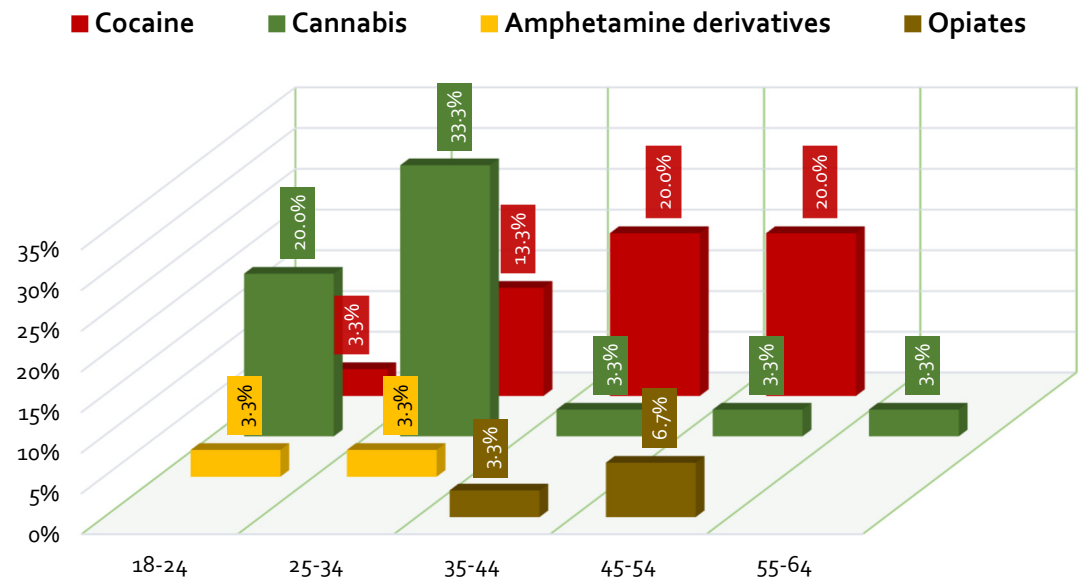
FIGURE 45: ANDALUSIA. DRUGS-POSITIVE DRIVERS (n = 30).
DISTRIBUTION ACCORDING TO THE DETECTED DRUG AND TYPE OF VEHICLE



Type of vehicle

The highest percentages correspond to cannabis use (56.7%) or cocaine use (46.7%), among car and motorcycle drivers.

FIGURE 46: ANDALUSIA. DRUGS-POSITIVE DRIVERS (n = 30).
DISTRIBUTION ACCORDING TO THE DETECTED DRUG AND AGE RANGE



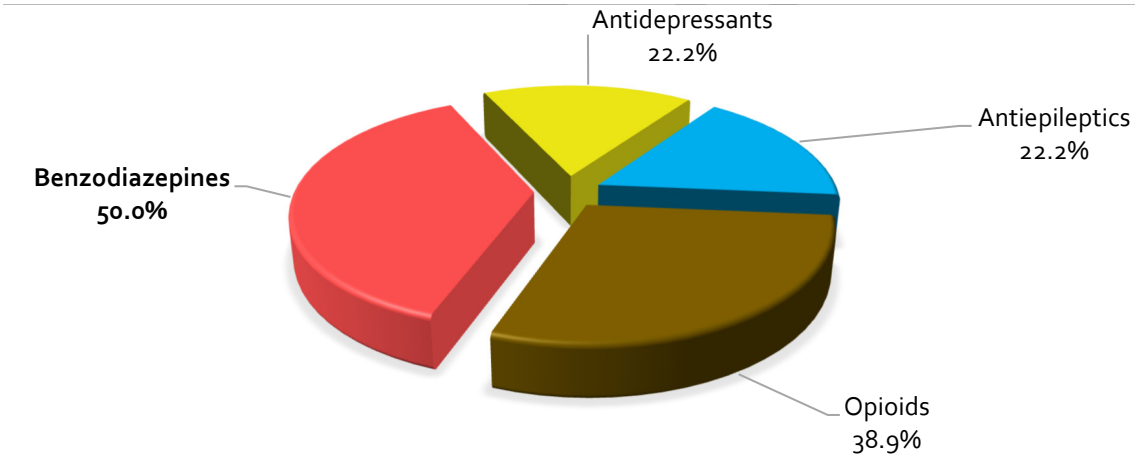
The highest percentages correspond to cocaine use (53.3%) and/or cannabis use (39.9%), in drivers aged 25-54.

TABLE 2: ANDALUSIA. DRIVERS POSITIVE FOR ALCOHOL AND DRUGS (n = 8). DISTRIBUTION OF THE CASES ACCORDING TO THE DETECTED DRUG

The most frequent combinations detected have been:	
Alcohol and cocaine	62.5%
Alcohol, cocaine, and cannabis	25.0%
Alcohol, cocaine, cannabis, and derivatives of amphetamine	12.5%

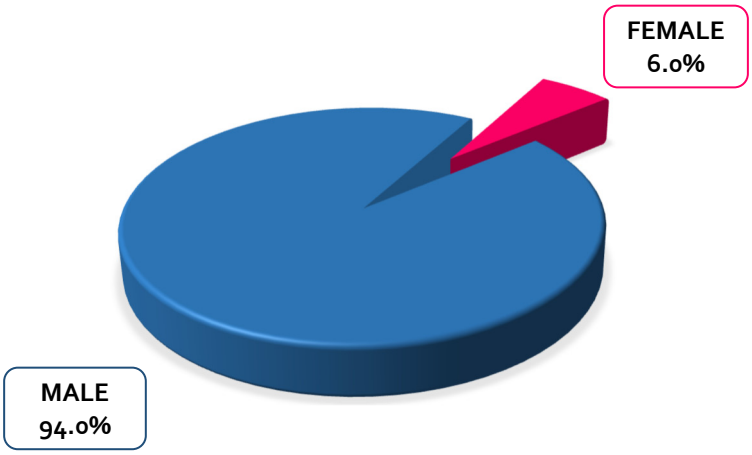
The most prevalent associated use of alcohol and drugs of abuse were, in the first place, the associated use of alcohol and cocaine (62.5%), followed by the associated use of alcohol, cocaine, and cannabis (25.0%) and the associated use of alcohol, cocaine, cannabis, and amphetamine derivatives (12.5%).

FIGURE 47: ANDALUSIA. DRIVERS POSITIVE FOR PSICOACTIVE DRUGS (n = 18). DISTRIBUTION OF THE DETECTED PSICOACTIVE DRUGS



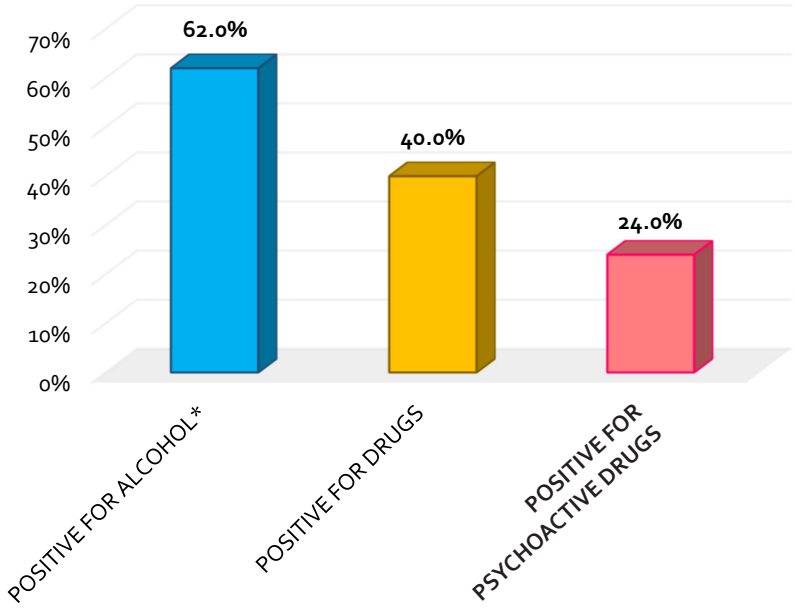
The term «opioids» makes reference to the pharmaceuticals (tramadol, oxycodone, methadone…) which bind to opioid receptors in the central nervous system, except heroine.

FIGURE 48: CATALONIA. POSITIVE DRIVERS (n = 50).
DISTRIBUTION BY GENDER



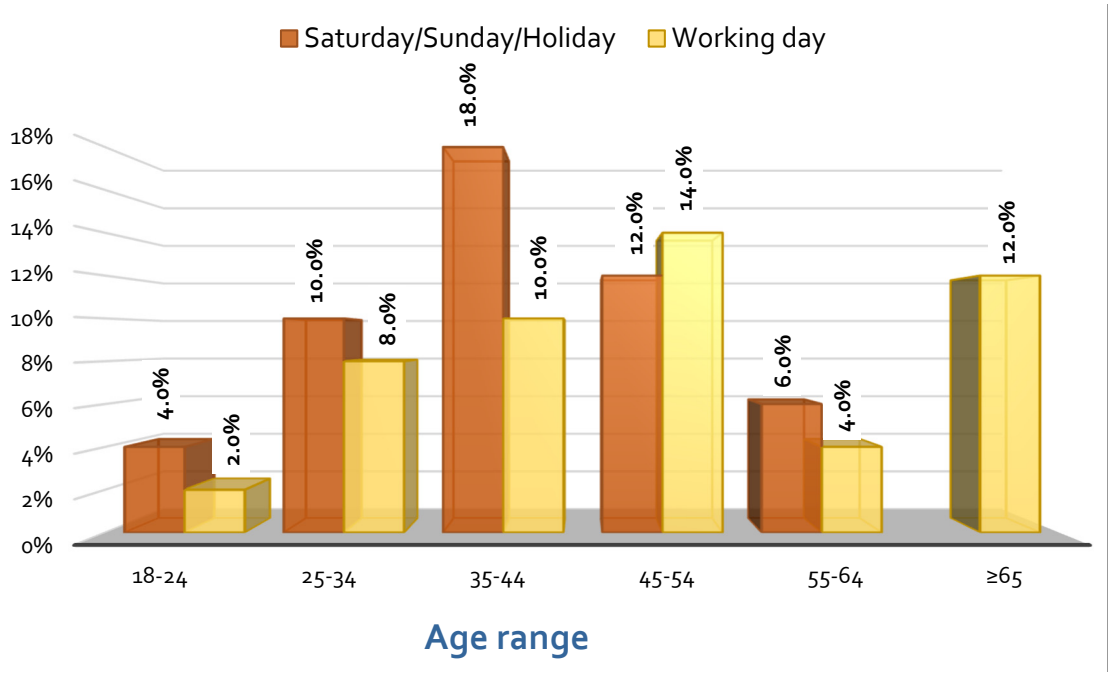
94.0% of the drivers with positive toxicological results corresponded to male.

FIGURE 49: CATALONIA. POSITIVE DRIVERS (n = 50).
DISTRIBUTION ACCORDING TO THE TYPE OF SUBSTANCE DETECTED
(possible associations not considered)



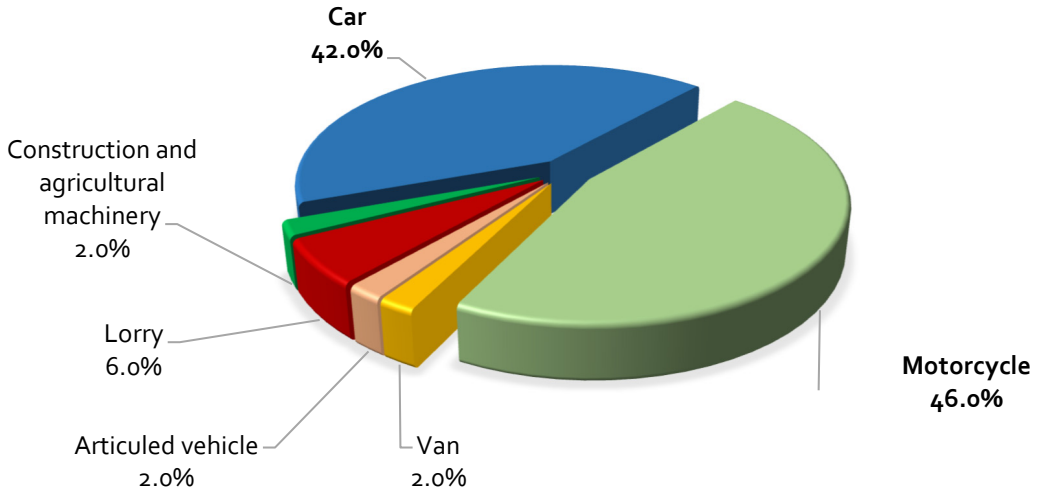
* Positive for alcohol: blood alcohol concentration equal or greater than 0.30 g/l.

FIGURE 50: CATALONIA. POSITIVE DRIVERS (n = 50).
DISTRIBUTION BY AGE RANGE AND DAY OF THE WEEK



72.0% of the drivers with positive toxicology results happened in the age range among 25 to 54 years. Within the age ranges up to 44 years (32%) and from 55-64 years (6%) the majority of fatalities were produced in weekends or holidays.

FIGURE 51: CATALONIA. POSITIVE DRIVERS (n = 50).
DISTRIBUTION ACCORDING TO THE TYPE OF VEHICLE



46.0% of the drivers with positive toxicological results were driving a motorcycle and 42.0% a car.

FIGURE 52: CATALONIA. POSITIVE DRIVERS (n = 50). CLASSIFICATION OF THE TYPE OF RESULTS AND COMBINATION OF DETECTED SUBSTANCES

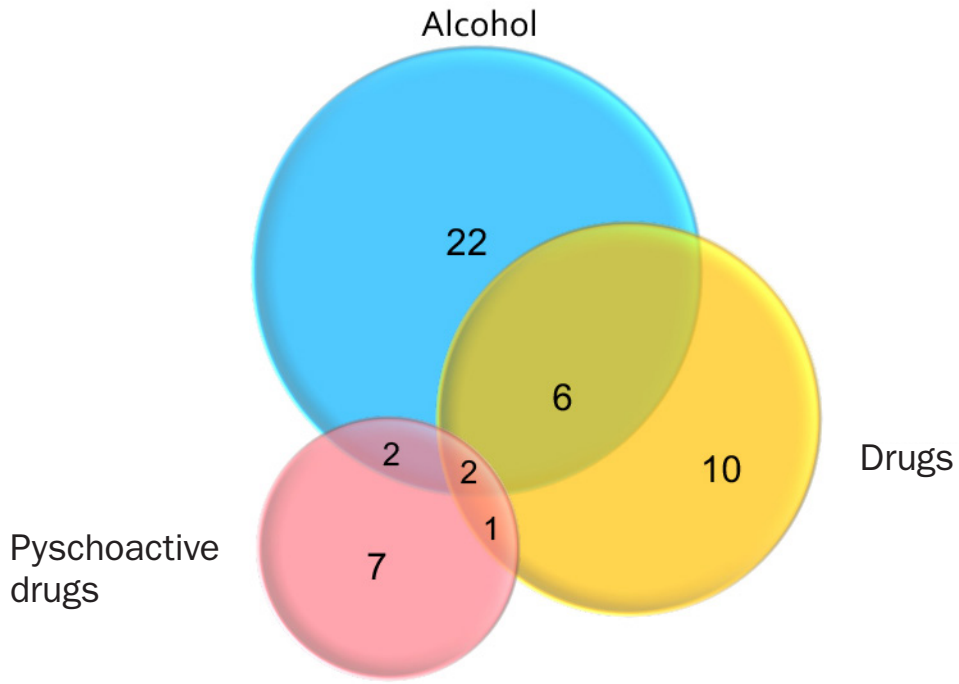
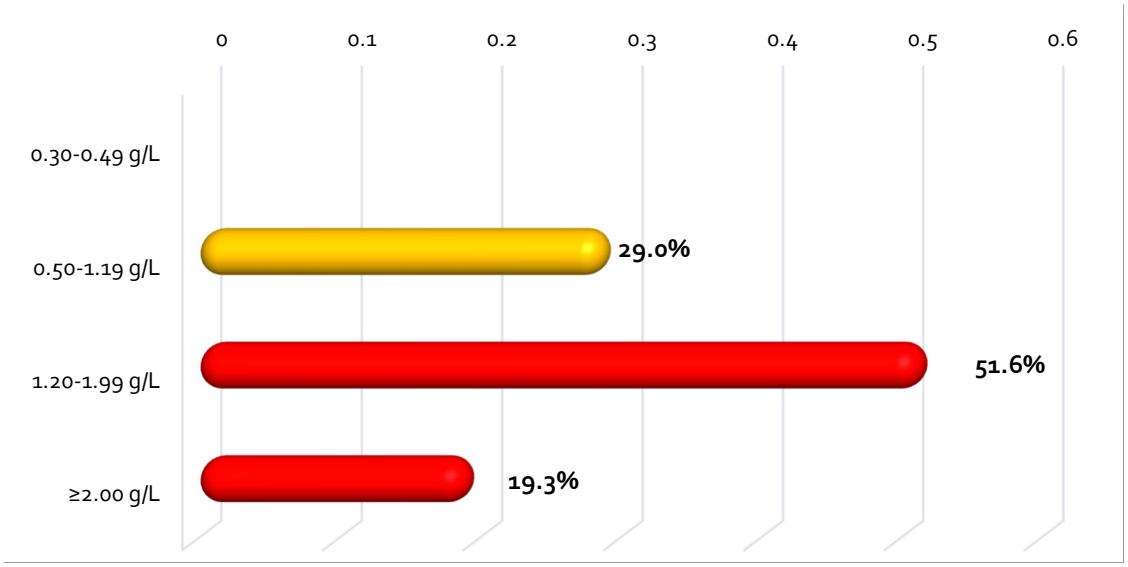
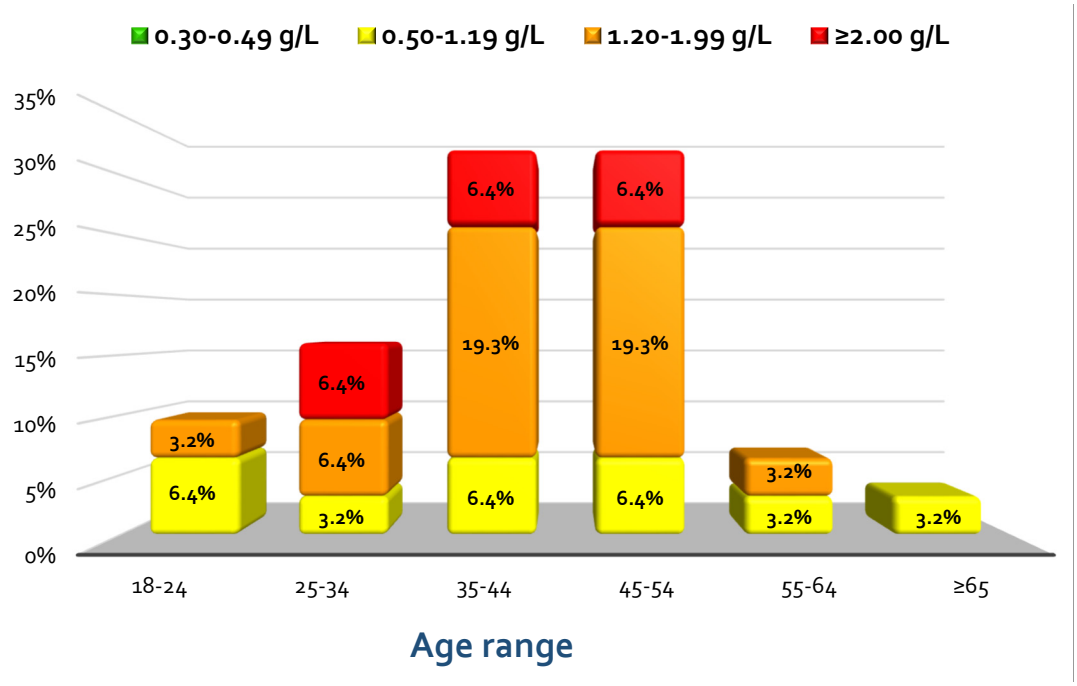


FIGURE 53: CATALONIA. ALCOHOL-POSITIVE DRIVERS (n = 31). DISTRIBUTION ACCORDING TO THE BLOOD ALCOHOL CONCENTRATION



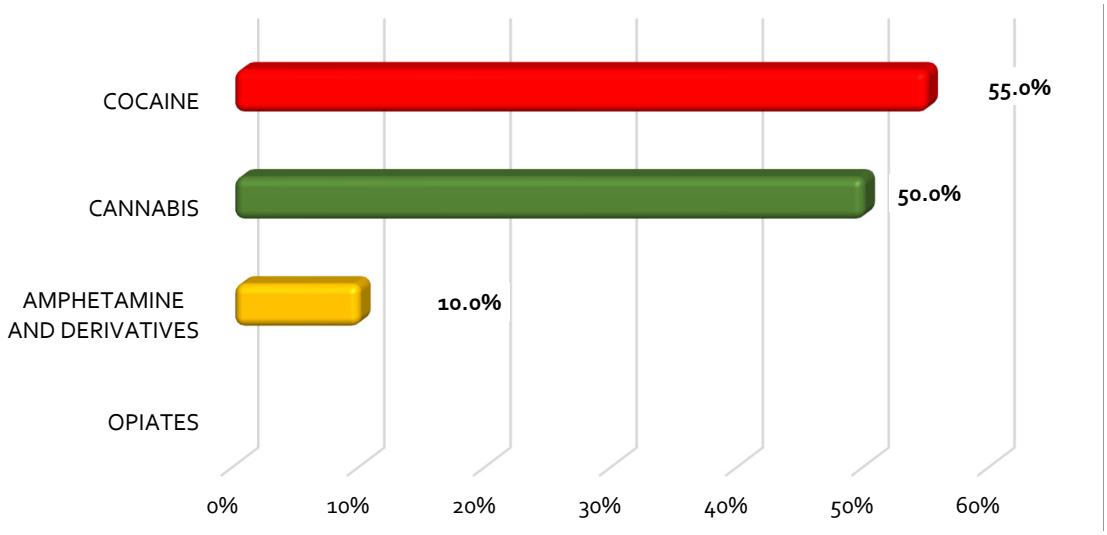
70.9% of the drivers positive for alcohol showed a blood alcohol concentration equal to or greater than a 1.20 g/l.

FIGURE 54: CATALONIA. ALCOHOL-POSITIVE DRIVERS (n = 31).
DISTRIBUTION ACCORDING TO THE BLOOD ALCOHOL CONCENTRATION AND AGE RANGE



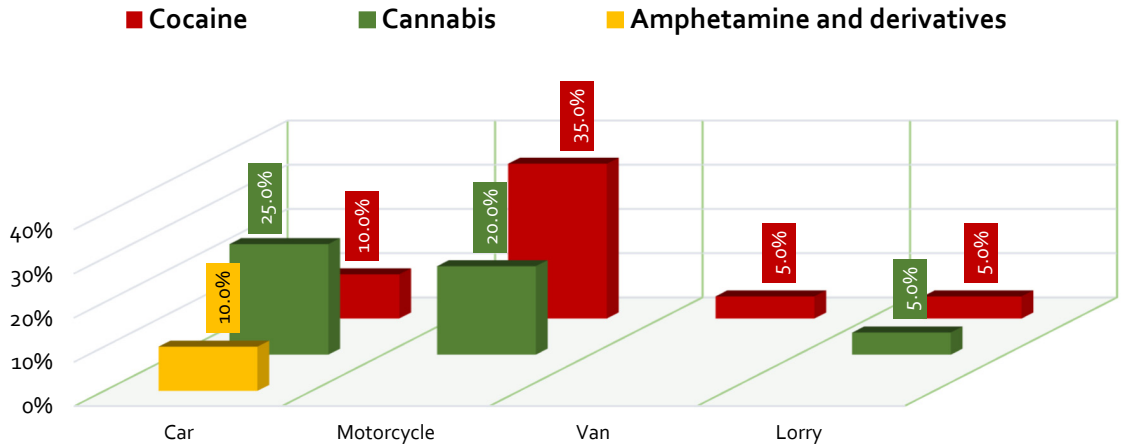
64.2% of the drivers with positive results for alcohol, with a blood alcohol concentration equal to or superior to 1.20 g/l, are within the age range of 25-54 years.

FIGURE 55: CATALONIA. DRUGS-POSITIVE DRIVERS (n = 20).
DISTRIBUTION OF THE DETECTED DRUGS



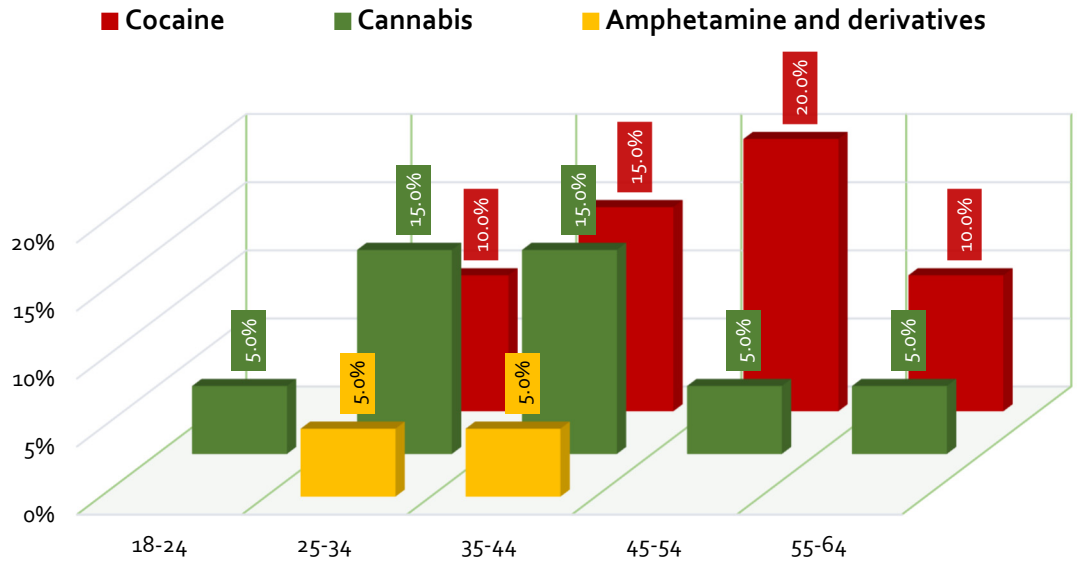
Regardless of whether there was associated use of drugs of abuse, alcohol and/or psychotropic drugs, on its own the most commonly used drug was cocaine (55.0%) followed by cannabis (50.0%).

FIGURE 56: CATALONIA. DRUGS POSITIVE DRIVERS (n = 20). DISTRIBUTION OF THE DETECTED DRUG AND TYPE OF VEHICLE



The highest percentages correspond to the consumption of cocaine (45.0%) cannabis (45.0%) in car and motorcycle drivers aged 25-54 years.

FIGURE 57: CATALONIA. DRUGS-POSITIVE DRIVERS (n = 20). DISTRIBUTION ACCORDING TO THE DETECTED DRUG AND AGE RANGE



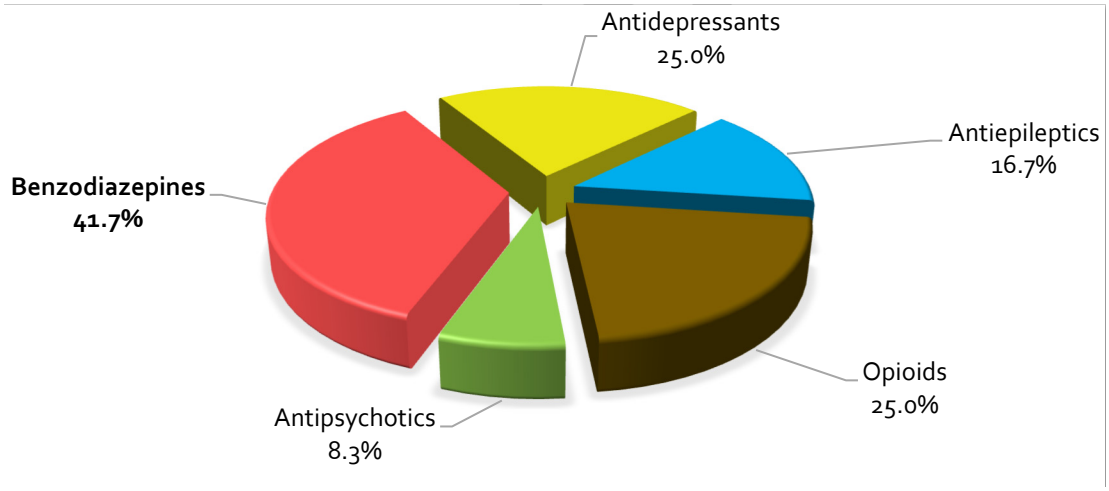
The highest percentages are for cocaine use (45.0%) and cannabis use (35.0%) among driverswithin the age range of 25-54 years.

TABLE 3: CATALONIA. DRIVERS POSITIVE FOR ALCOHOL AND DRUGS (n = 8). DISTRIBUTION ACCORDING TO THE DETECTED DRUG

The most frequent detected combinations have been:	
Alcohol and cocaine	50.0%
Alcohol and cannabis	25.0%
Alcohol, cocaine and cannabis	12.5%
Alcohol, cannabis and derivatives of amphetamine	12.5%

The most prevalent associated alcohol and drug use were, in the first place, the associated use of alcohol and cocaine (50.0%), followed by the associated use of alcohol and cannabis (25.0%).

FIGURE 58: CATALONIA. DRIVERS POSITIVE FOR PSYCHOACTIVE DRUGS (n = 12). DISTRIBUTION OF THE DETECTED PSYCHOACTIVE DRUGS



The term «opioids» refers to drugs (tramadol, oxycodone, methadone...) that bind to opioid receptors in the central nervous system, excluding heroin.

Pedestrians (n = 136)

FIGURE 59: PEDESTRIANS (n = 136). PERCENTAGE DISTRIBUTION BY GENDER

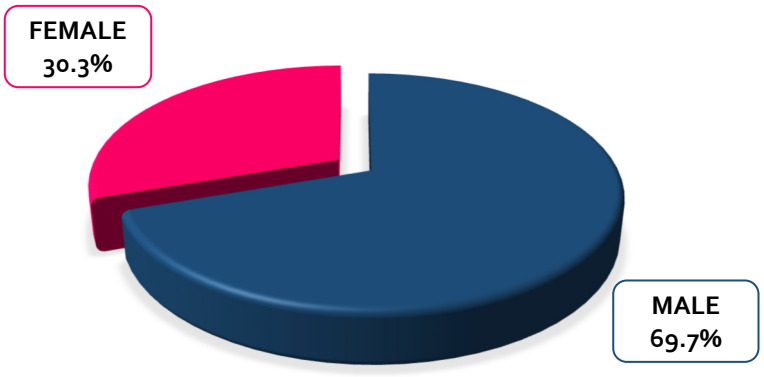


FIGURE 60: PEDESTRIANS (n = 136). PERCENTAGE DISTRIBUTION BY AGE RANGE

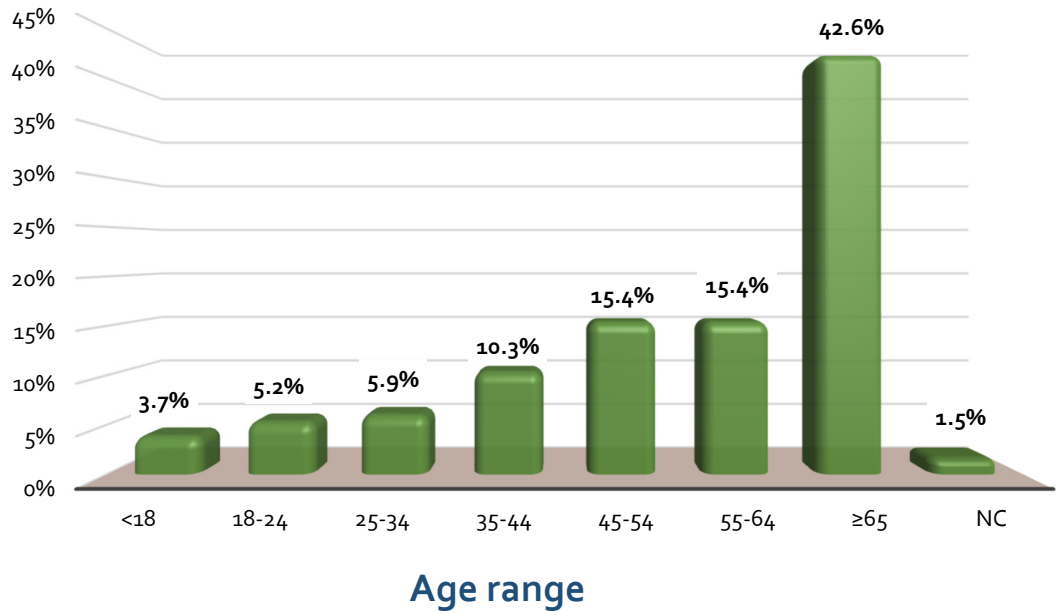
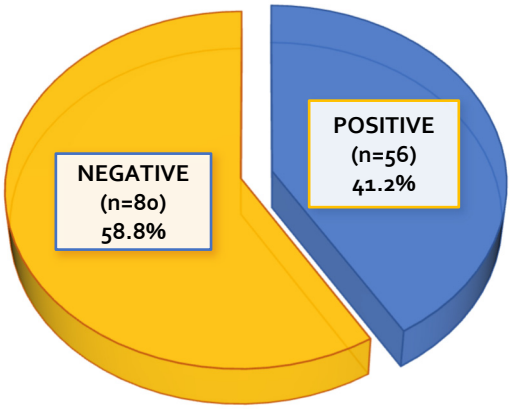
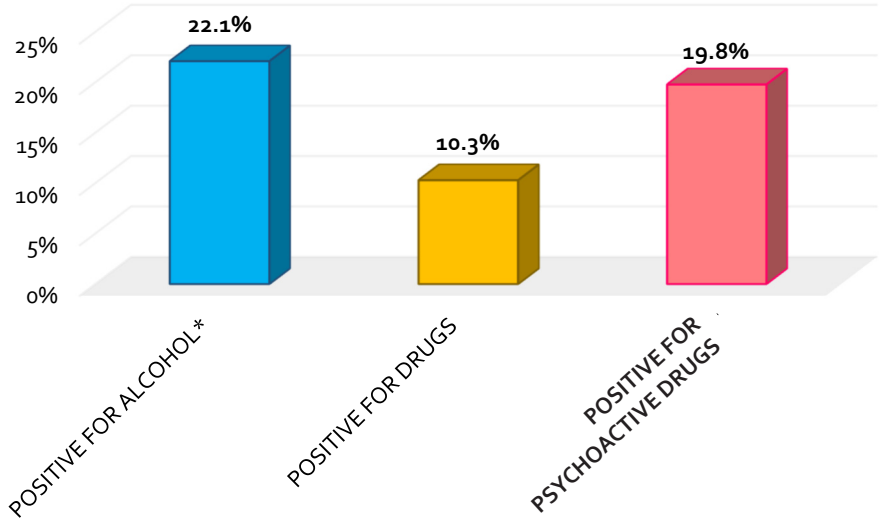


FIGURE 61: PEDESTRIANS (n = 136). PERCENTAGE DISTRIBUTION ACCORDING TO THE TOXICOLOGICAL RESULT



From 136 pedestrians deceased in road traffic accidents and subjected to autopsy, 56 (41.2%) showed positive toxicological results for alcohol, drugs of abuse, and psychotropic drugs, alone or in combination.

FIGURE 62: PEDESTRIANS (n = 136). DISTRIBUTION ACCORDING TO THE TYPE OF SUBTANCE DETECTED (possible associations not considered)



* Positive for alcohol: blood alcohol concentration of 0.30 g/l or more.

FIGURE 63: PEDESTRIANS (n = 136). DISTRIBUTION ACCORDING TO THE BLOOD ALCOHOL CONCENTRATION

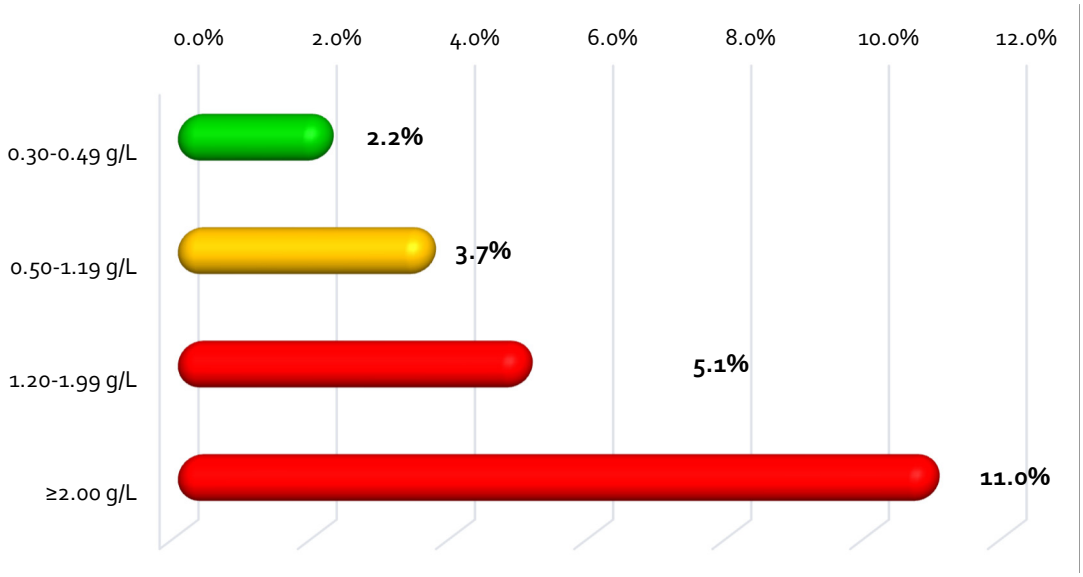
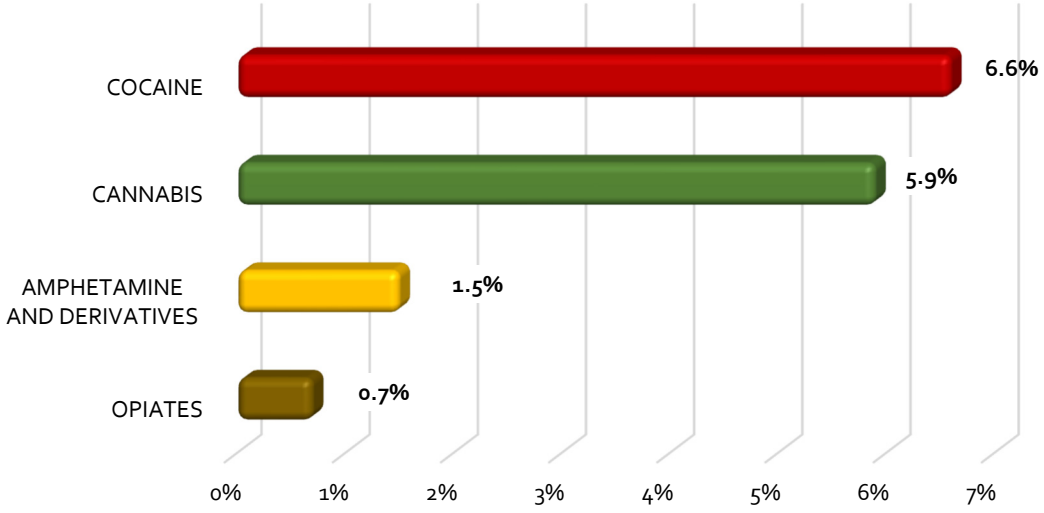
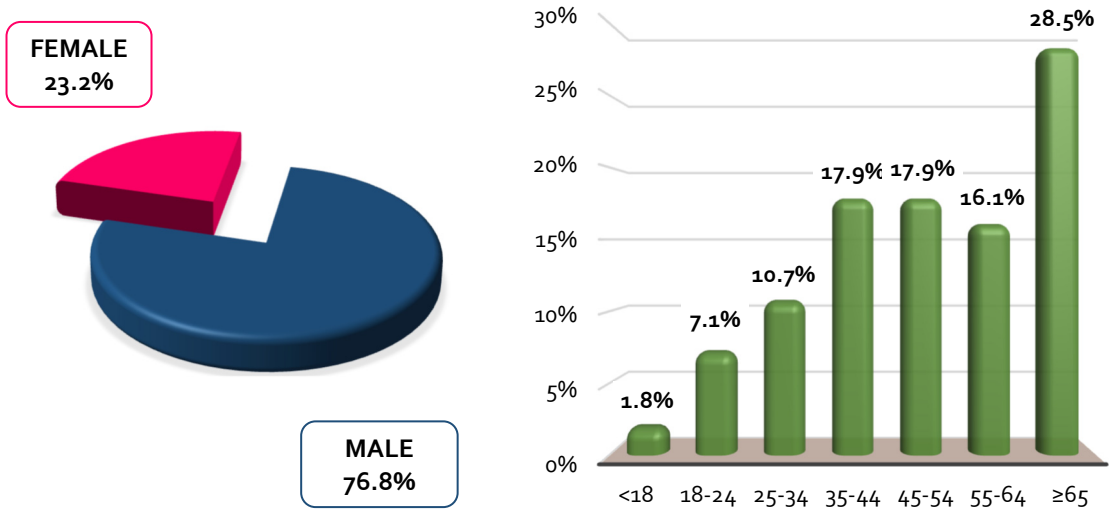


FIGURE 64: PEDESTRIANS (n = 136). DISTRIBUTION ACCORDING TO THE DRUGS DETECTED



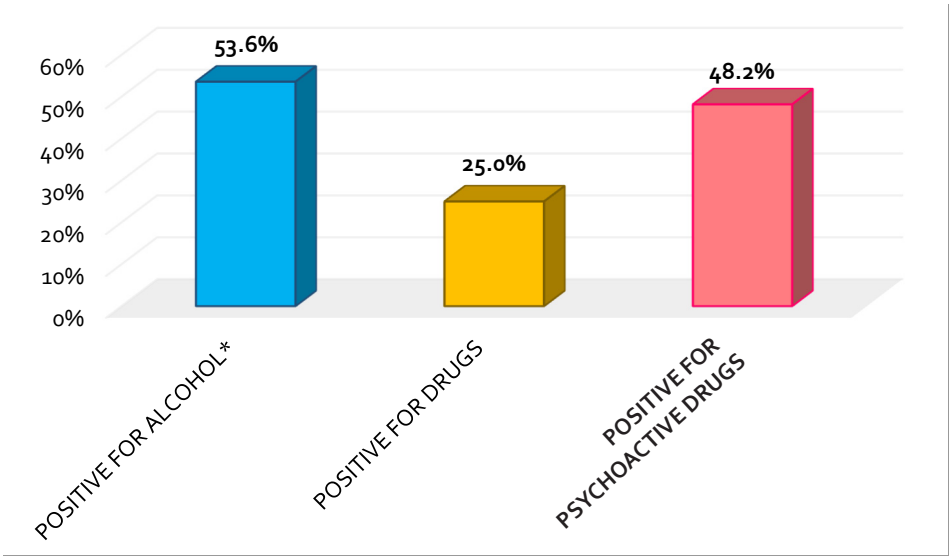
PEDESTRIANS – CASES WITH POSITIVE TOXICOLOGICAL RESULTS (n = 56)

FIGURES 65 and 66: POSITIVE PEDESTRIANS (n = 56). DISTRIBUTION BY GENDER AND AGE RANGE



76.8% of the deceased pedestrians by road traffic injuries, with positive toxicology results, corresponded to males. On the right is the distribution by age range, with the highest prevalence among pedestrians over 65 years old (28.5%).

FIGURE 67: POSITIVE PEDESTRIANS (n = 56). DISTRIBUTION ACCORDING TO THE TYPE OF SUBSTANCE DETECTED (possible associations not considered)



* Positive for alcohol: blood alcohol concentration equal to or greater than 0.30 g/l.

FIGURE 68: POSITIVE PEDESTRIANS (n = 56). CLASSIFICATION OF THE RESULTS ACCORDING TO THE TYPE AND COMBINATION OF DETECTED SUBSTANCES

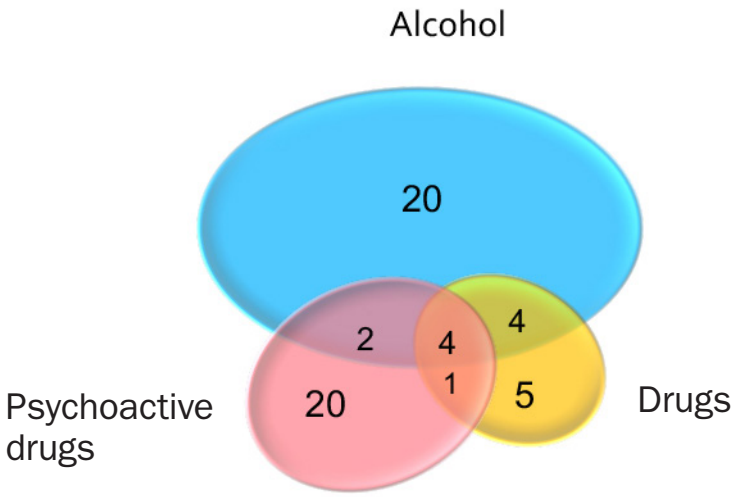
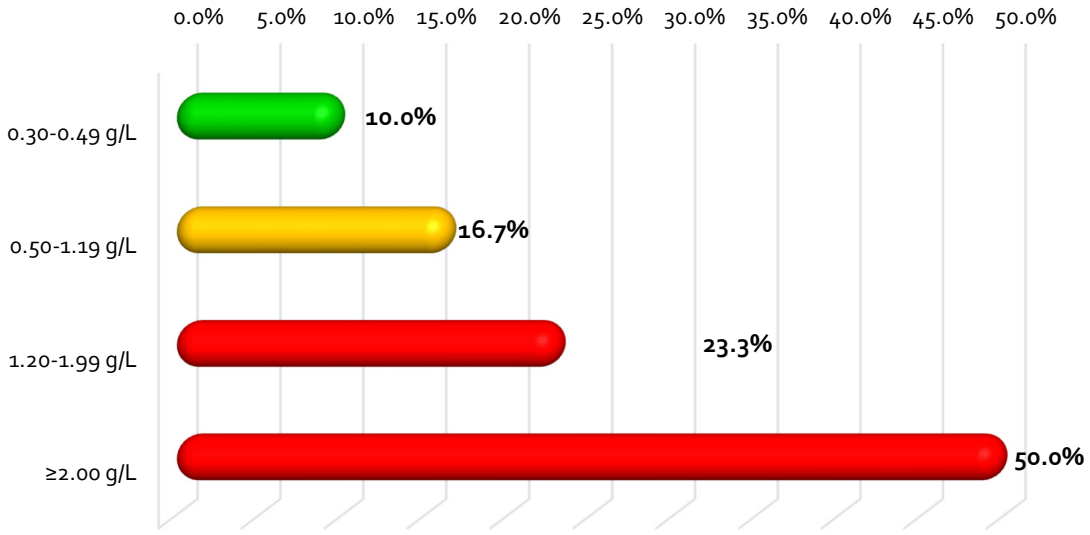


FIGURE 69: PEDESTRIANS POSITIVE FOR ALCOHOL (n = 30). DISTRIBUTION BY THE BLOOD ALCOHOL CONCENTRATION



73.3% of pedestrian fatalities that tested positive for alcohol had a blood alcohol concentration of 1.20 g/l or more.

FIGURE 70: PEDESTRIANS POSITIVE FOR ALCOHOL (n = 30). DISTRIBUTION ACCORDING TO THE BLOOD ALCOHOL LEVEL AND AGE

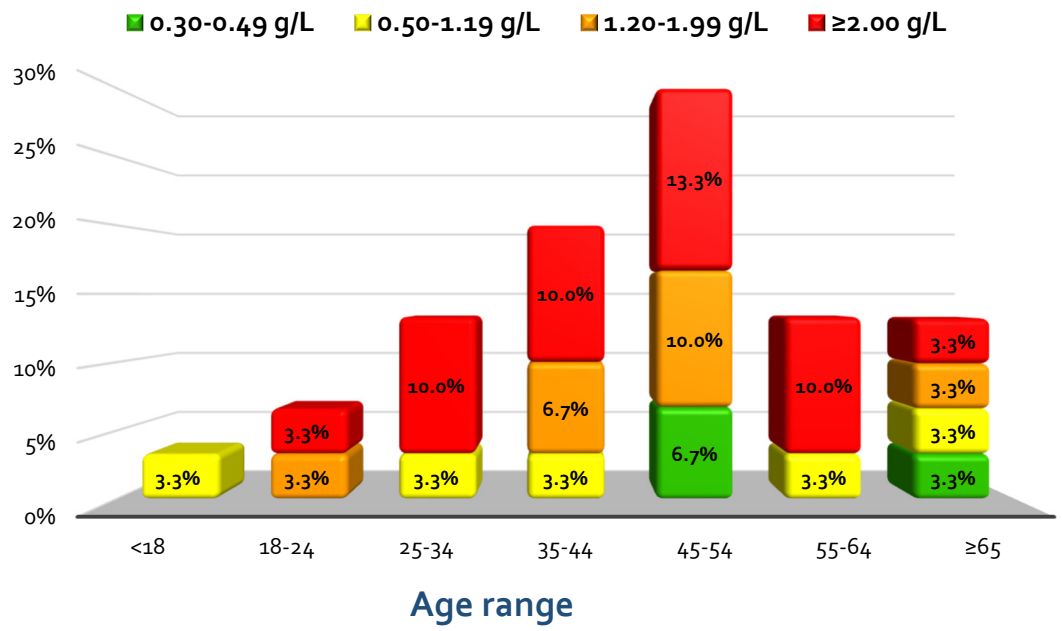
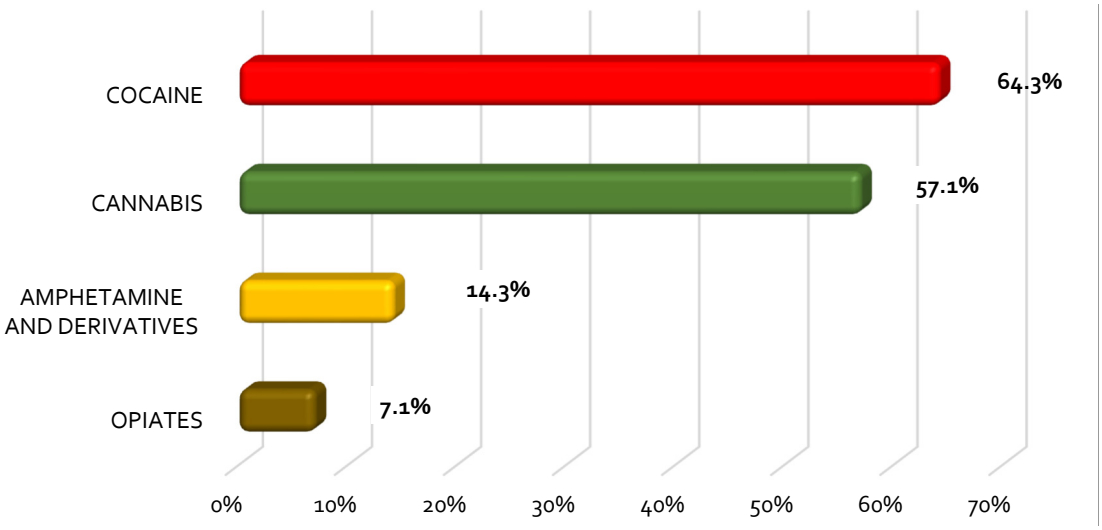


FIGURE 71: PEDESTRIANS POSITIVE FOR DRUGS (n = 14). DISTRIBUTION OF THE DETECTED DRUGS



Regardless of whether there was associated use of drugs of abuse, alcohol and/or psychotropic drugs, cocaine alone was the most commonly used drug (64.3%).

FIGURE 72: PEDESTRIANS POSITIVE FOR DRUGS (n = 14).
DISTRIBUTION ACCORDING TO THE DETECTED DRUG AND AGE RANGE

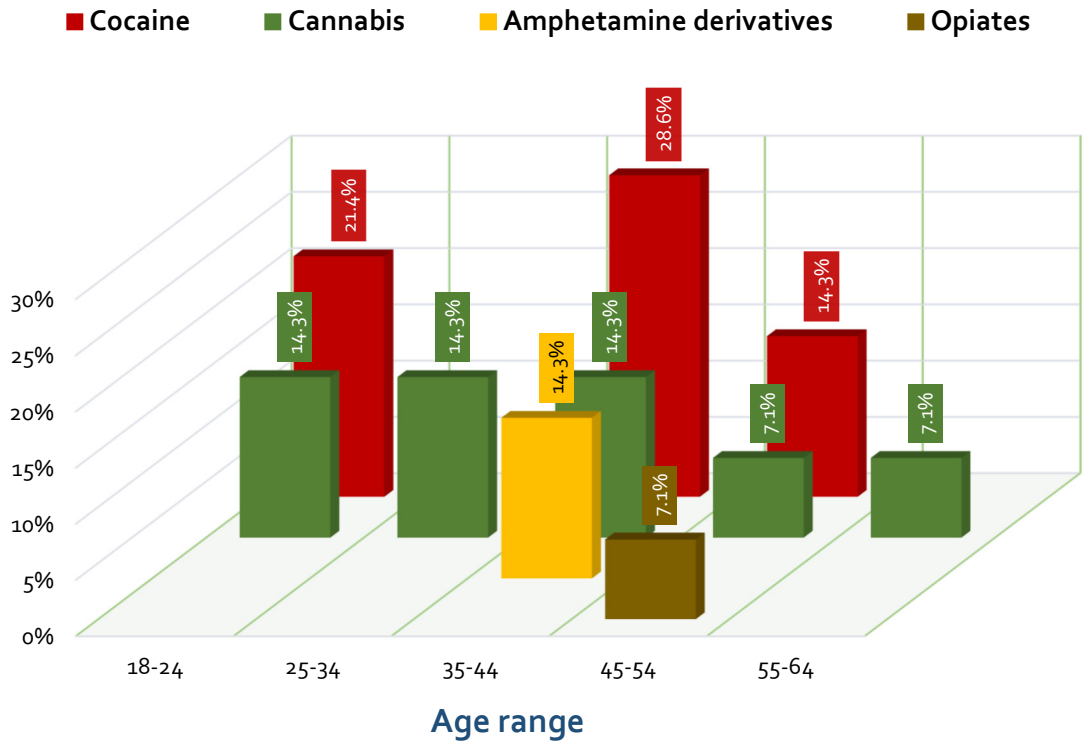
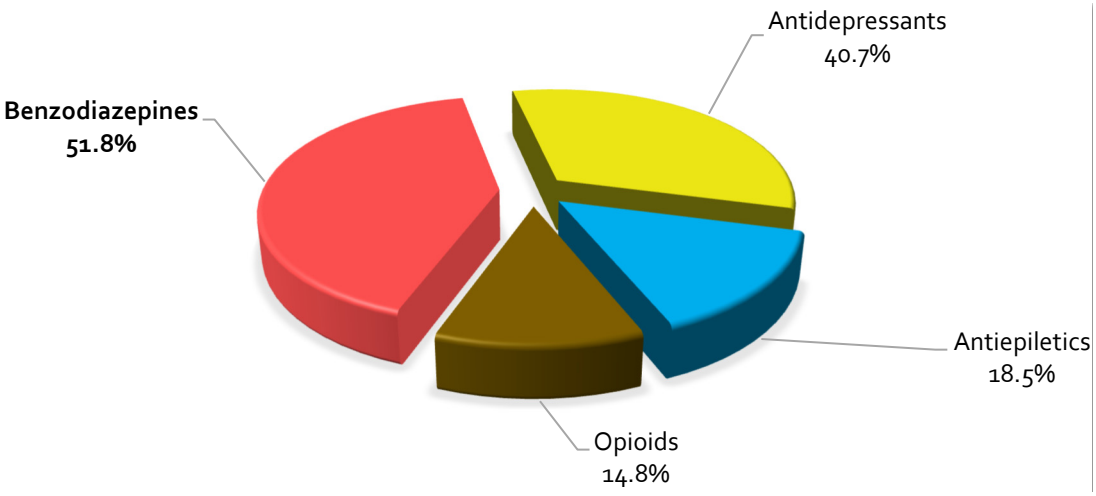


FIGURE 73: PEDESTRIANS POSITIVE FOR PSYCHOACTIVE DRUGS (n = 27).
DISTRIBUTION OF THE DETECTED PSYCHOACTIVE DRUGS



The term «opioids» refers to drugs (tramadol, oxycodone, methadone...) that bind to opioid receptors in the central nervous system, excluding heroin.

Comparative study

compared to previous years

FIGURE 74: EVOLUTION OF THE ANALISED FATALITIES

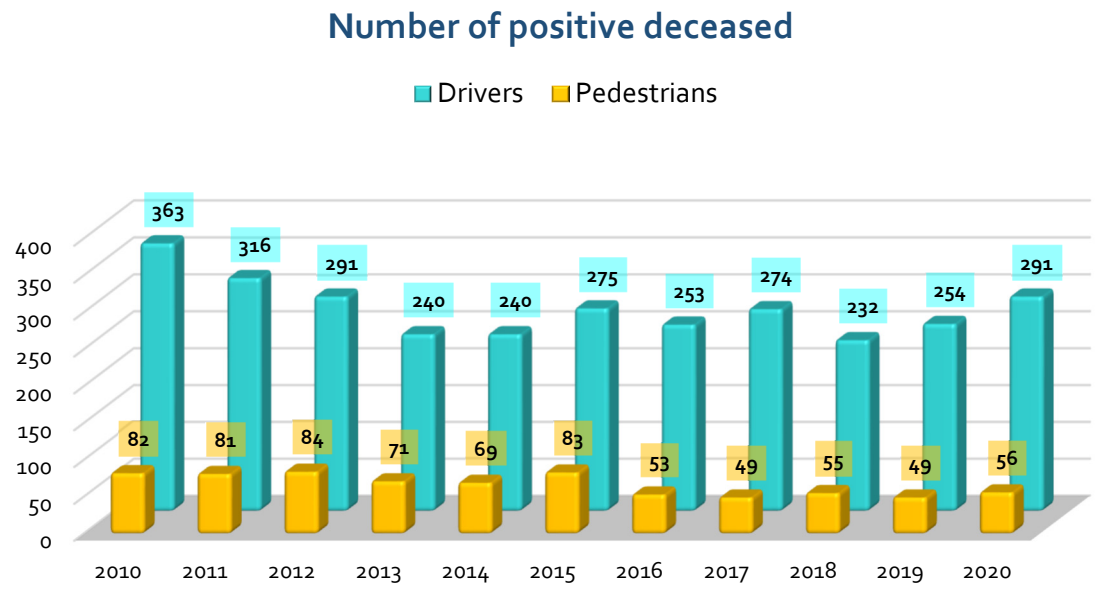


FIGURE 75: EVOLUTION OF THE PERCENTAGE OF DRIVERS ACCORDING TO THE RESULTS OVERTIME

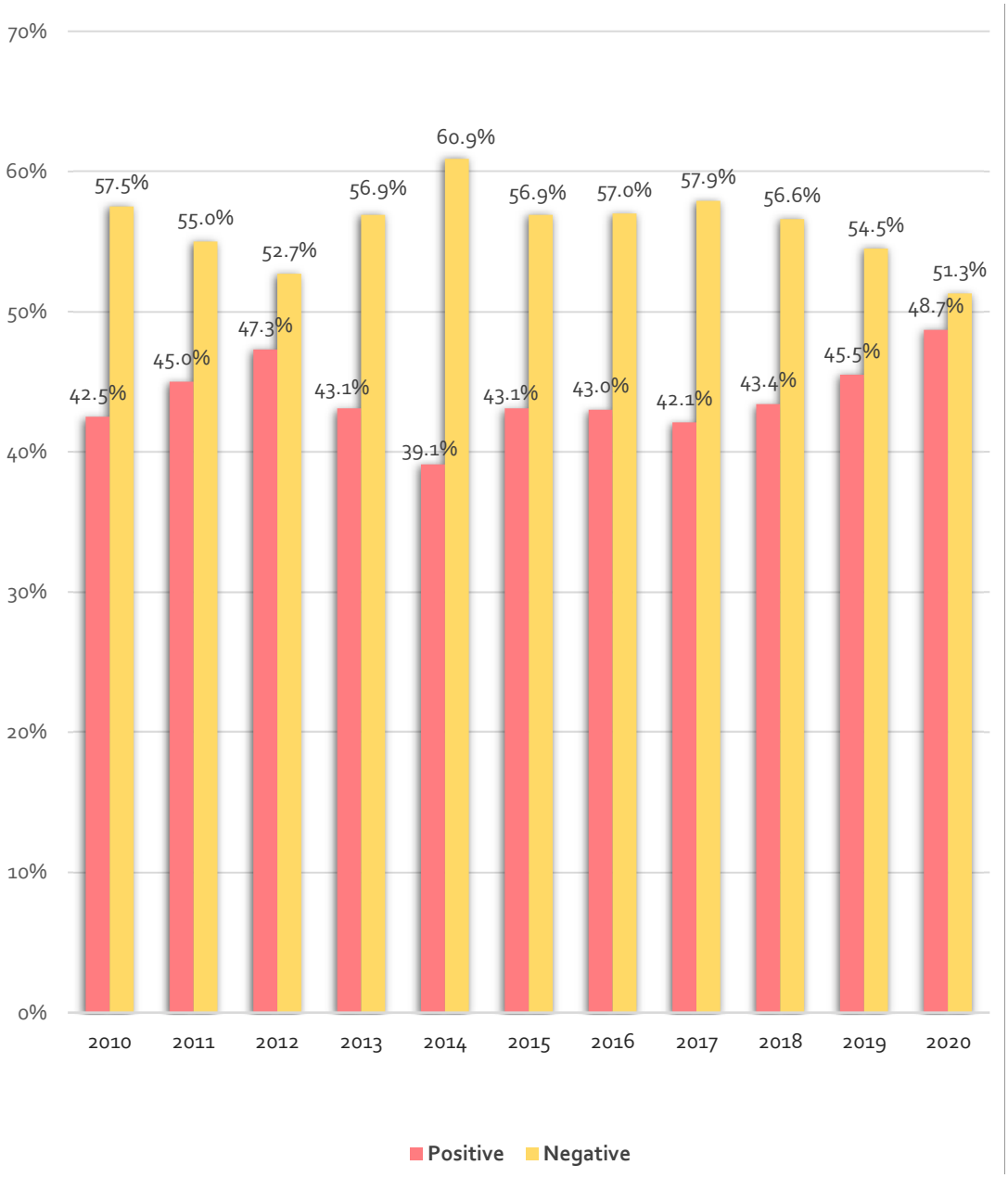
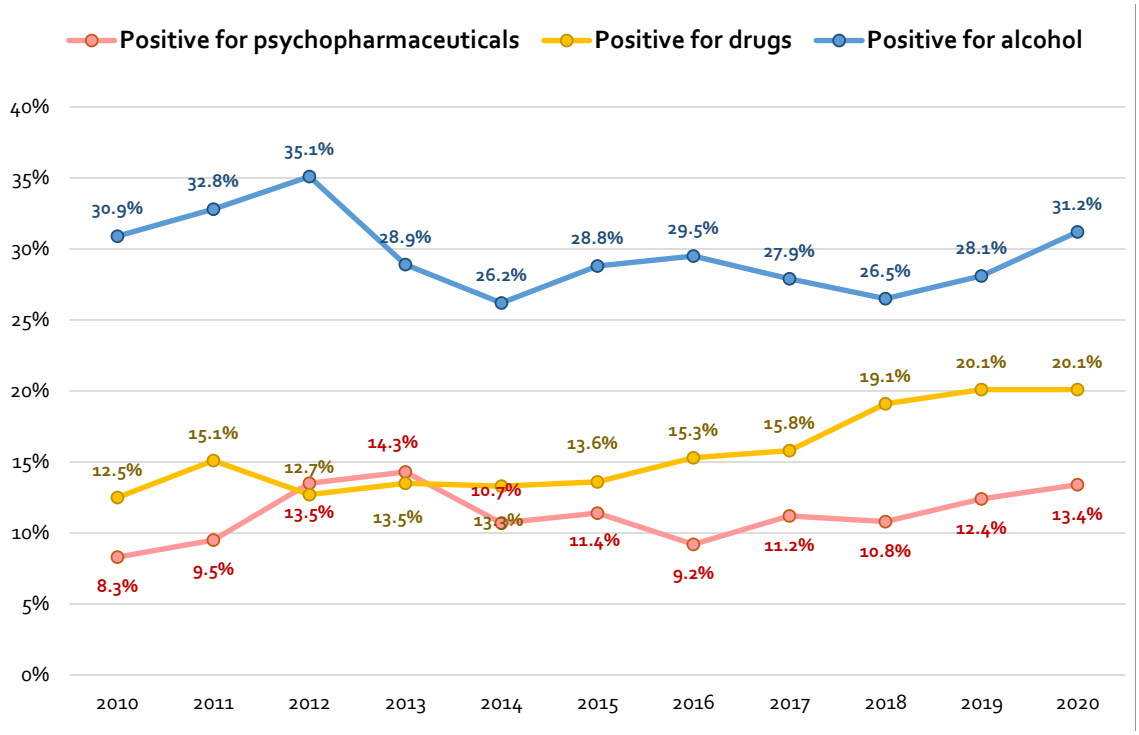


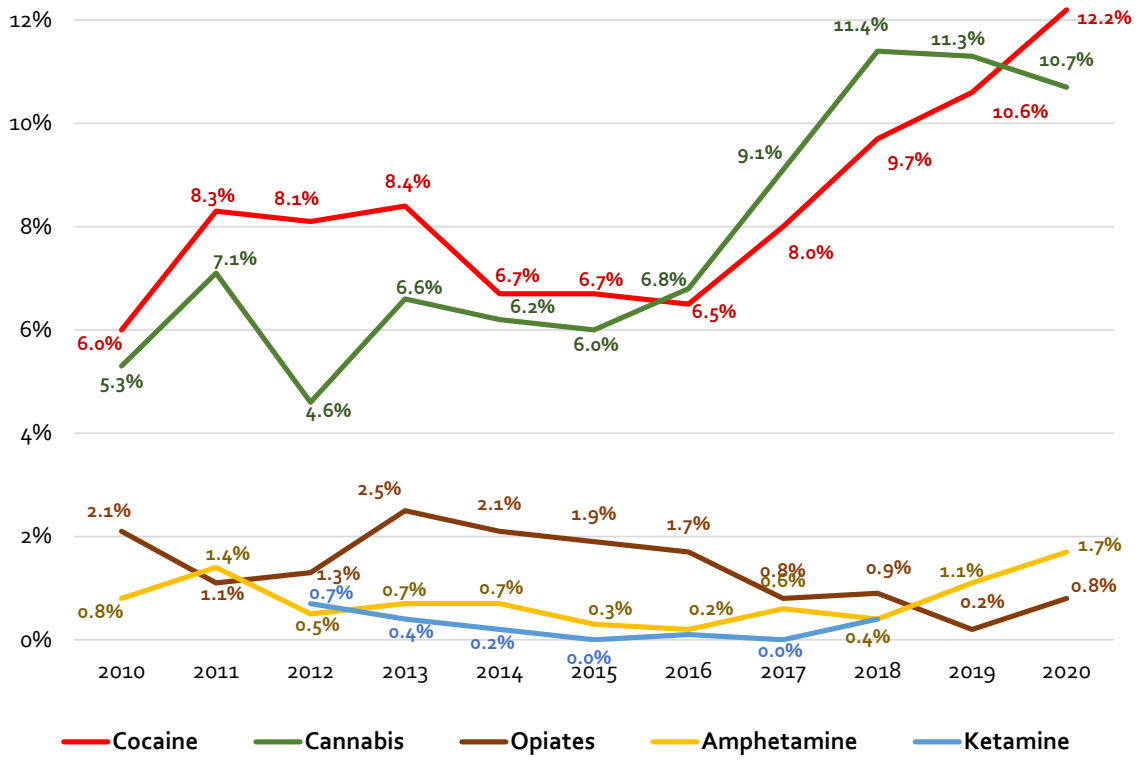
FIGURE 76: EVOLUTION OF THE PERCENTAGE OF PEDESTRIANS ACCORDING TO THE RESULTS OVERTIME

FIGURE 77: EVOLUTION OF THE PERCENTAGE OF DRIVERS ACCORDING TO THE TOXICOLOGICAL RESULTS OVERTIME



About alcohol consumption, in 2020 there was an increase of 3.1% in the consumption of alcohol by drivers deceased in traffic accidents concerning 2019. Regarding drug use, an upward trend was observed, with an increase of 7.6% compared to 2010 and the same percentages (20.1%) as in 2019. Finally, about psychotropic drugs, a slight increase (1.0%) is observed in compared to 2019.

FIGURE 78: EVOLUTION OF THE PERCENTAGE OF POSITIVE DRIVERS BY THE TYPE OF DRUG OVERTIME



Since 2016 there is a marked upward trend in the use of cannabis and cocaine among the deceased drivers in road traffic accidents. An increase in that period (2016-2020) of 5.7% in the case of cocaine and 3.9% in the case of cannabis, whose consumption decreases during 2020 compared to 2019 only by 0.6%.

Final considerations

SUMMARY OF FINAL CONSIDERATIONS WITH MAJOR MEDICAL-LEGAL AND SOCIAL IMPACT

From the obtained information and exposed in the report, we can extract the following conclusions of major impact, not only in the medical-legal sphere but also for its important implications in the field of road safety.

DRIVERS

An increase is detected in the alcohol, drugs of abuse, and psychopharmaceuticals consumption among the drivers deceased in road traffic accidents during 2020. Andalusia presents consumption rates above the national average, while Catalonia presents a rate under the national average.

From **597** drivers deceased in road traffic accidents and submitted to an autopsy and a toxicology analysis, **291** drivers, meaning a **48.7%**, (FIGURE 8) showed positive toxicology results for alcohol, drugs of abuse, and psychopharmaceuticals, alone or in combination. If we compare this data with the prevalence data of the alcohol and drugs consumption in the general population of drivers who underwent a drug test (**12%** following the DGT data in 2016 [3], or around **7%** in European drivers [4]), we can notice the great impact that the consumption of alcohol and drugs has in vial sinisters. The prevalence in the consumption of drugs inside the group of deceased drivers increases by over **36%** compared with the percentage of the drivers' general population in which has been detected the presence of drugs.

In the case of Andalusia, the ratio of deceased drivers that consumed alcohol, drugs of abuse, or psychopharmaceuticals was **55.6%** (70/126) (FIGURE 14) exceeding in 6.9 points the national media, while in the case of Catalonia the ratio was of **45.0%** (50/111) (FIGURE 20), meaning 3.7 percentage points under the national media.

Alcohol continues to be the most consumed substance by the deceased drivers, followed by cocaine and cannabis. Psychopharmaceuticals are in third place.

The global data for the percentage distribution according to the type of substance detected in the total of deceased drivers was the following: **31.2%** positive for alcohol, **20.1%** positive for drugs, and **13.4%** positive for psychopharmaceuticals (FIGURE 10). The data in Andalusia (**31.7%** were positive for alcohol, **23.8%** positive for drugs, and **14.3%** positive for psychopharmaceuticals) (FIGURE 16) reflected an increase of **3.7%** positive to drugs and an increase of **0.9%** in the consumption of psychopharmaceuticals compared to the national media. The data in Catalonia (**27.9%** positive for alcohol, **18.0%** positive for drugs, and **10.8%** positive for psychopharmaceuticals) (FIGURE 22) demonstrated a decrease in the consumption of alcohol (-**3.3%**), drugs (-**2.1%**), and psychopharmaceuticals (-**2.6%**) concerning the national average.

The deceased drivers with positive toxicological results were male in 95% of the cases, and 5% corresponded to women.

A vast majority of cases (**94.8 %**) with positive toxicological results corresponded to male drivers, and only **5.2 %** corresponded to female drivers (FIGURE 26), which is an epidemiological data of great transcendence in the road accidents prevention campaigns.

Most of the drivers with positive toxicological results were driving a car, motorbike, or moped.

The majority (**88.3%**) of drivers with positive toxicological results were driving a car (**49.1%**) or a motorcycle (**39.2%**) (FIGURE 29). In the case of Andalusia (FIGURE 40) and Catalonia (FIGURE 51) the motorcycle was the most used vehicle by drivers with positive toxicology results (**44.3%** and **46.0%** respectively), followed by the car (**42.8%** and **42.0%** respectively).

The age range of the majority of drivers with positive toxicological results was 25 to 54 years old.

68.4% of the drivers with positive toxicological results corresponded to an age range from 25 to 54 years (FIGURE 28).

In the overall data for the whole of Spain, as well as in Andalusia, most of the fatalities occurred on working days, regardless of the age group. In Catalonia, in the age ranges up to 44 years old, as well as in the 55-64 age range, most of the fatal accidents occurred on weekends or public holidays.

57.8% of the deceased drivers with positive toxicological results nationwide occurred on working days, irrespective of age group (FIGURE 28). The percentage was **68.5%** in Andalusia (FIGURE 39). However, in Catalonia, within the age ranges until 44 years (**32%**) and 55-64 years (**6%**), the majority of the fatalities were produced on weekends or public holidays (FIGURE 50).

The deceased drivers with positive results in alcohol showed a very high blood alcohol concentration, that was equal to or greater than 1.2 g/l, which correlates with very severe degrees of intoxication.

The percentage distribution inside the group of deceased drivers with positive toxicological results (n = 291), by the type of substance detected, was the following: **63.9%** (n = 186) were positive for alcohol (refers to blood alcohol concentrations ≥0.30 g/l), **41.2%** (n = 120) were positive for drugs and **27.5%** (n = 80) were positive for psychopharmaceuticals (FIGURE 27).

It is important to highlight that **78.5%** of the deceased drivers who tested positive for alcohol had a very high blood alcohol concentration, equal to or higher than 1.2 g/l, which correlates with very severe intoxication (FIGURE 31). The data was **80.0%** in Andalusia (FIGURE 42) and **70.9%** in Catalonia (FIGURE 53). And **58.3%** of the drivers with an equal to or greater blood alcohol concentration than 1.20 g/l have an age range of 25-54 years (FIGURE 32).

The overall data for Spain, as well as for Catalonia, indicates that the most commonly used drug of abuse among drivers who died was cocaine, followed by cannabis. In Andalusia the drug most commonly used by drivers who died was cannabis.

Regarding cases positive for drugs of abuse (n = 120), and regardless of whether there was associated use of drugs of abuse, alcohol and psychotropic drugs, cocaine alone was the most commonly used drug nationwide (**60.8%**) followed by cannabis (**53.3%**) (FIGURE 33). In Andalusia, the most consumed drug was cannabis (**63.3%**) followed by cocaine (**56.7%**) (FIGURE 44). In Catalonia the figures are similar to the national average, with cocaine being the most commonly used drug (**55.0%**) among drivers who died, followed by cannabis (**50.0%**) (FIGURE 55).

The overall data indicate that the psychotropic drugs most commonly used by the drivers deceased were benzodiazepines, followed by antidepressants and opioids.

The percentage distribution within the group of drivers deceased with positive results for psychotropic drugs (n = 80), according to the type of substance detected, was as follows: **62.5%** were positive in benzodiazepines, **40.0%** positive in antidepressants, and **26.2%** to opioids (FIGURE 36).

The most prevalent associated use of alcohol and drugs of abuse were, in first place, the associated use of alcohol and cocaine, followed by the associated use of alcohol and cannabis, and the associated use of alcohol, cocaine, and cannabis.

The most prevalent associated use of alcohol and drugs of abuse (n = 52) were, in the first place, the associated use of alcohol and cocaine (**51.9%**), followed by the associated use of alcohol and cannabis (**23.1%**) and the associated use of alcohol, cocaine, and cannabis (**15.4%**) (FIGURE 30 and TABLE 1).

The comparative study of the last ten years of the number of drivers with positive toxicological results shows an upward trend in the use of alcohol, drugs, and psychotropic drugs.

The comparative study from the last ten years of the number of drivers with positive toxicological results shows an increase in 2020 of **6.2%** compared to 2010 (FIGURE 75).

About alcohol consumption, there was an increase of **3.1%** in 2020 on the consumption of alcohol by drivers deceased in traffic accidents compared to 2019. An upward trend is observed in drugs, reaching an increase of **7.6%** compared to 2010, and remains at the same percentages (**20.1%**) as in 2019. Finally, for psychotropic drugs, a slight increase (**1.0%**) is observed compared to 2019 (FIGURE 77).

Since 2016, there has been a marked upward trend in the use of cannabis and cocaine among drivers who died in traffic accidents. An increase in this period (2016-2020) of **5.7%** for cocaine and **3.9%** for cannabis, whose use decreases during 2020 compared to 2019 by only **0.6%** (FIGURE 78).

PEDESTRIANS

In 2020, there is an increase in the proportion of pedestrian road traffic fatalities with positive toxicological results for alcohol, drugs of abuse, and psychotropic drugs, alone or in combination, compared to 2019.

From **136** pedestrians deceased in road traffic accidents and autopsied, 56 (equivalent to **41.2%**) tested positive for alcohol, drugs of abuse and psychotropic drugs, alone or in combination (FIGURE 61).

The gender distribution of pedestrian fatalities with positive toxicological results is different from the distribution of driver fatalities. **76.8%** of pedestrian fatalities with positive toxicological results were male and **23.2%** were female (FIGURE 65).

The distribution by age range revealed a major prevalence in pedestrians of 65 years and over.

The distribution by age range revealed a major prevalence in pedestrians of 65 years and over (**28.5%**) (FIGURE 66).

Alcohol continues to be the substance most commonly consumed by pedestrians deceased in pedestrian crashes, closely followed by psychotropic drugs and thirdly by drugs of abuse.

The highest prevalence of pedestrians testing positive was for alcohol (**53.6%**), followed by psychotropic drugs (**48.2%**) and then drugs of abuse (**25.0%**) (FIGURE 67).

Most of the pedestrian fatalities who tested positive for alcohol had a very high blood alcohol concentration, of 1.2 g/l or more, which correlates with severe intoxication.

It is worth noticing that **73.3%** of the pedestrians who died with positive results for alcohol had a blood alcohol content of 1.20 g/l or more (FIGURE 69).

The overall data indicate that the psychotropic drugs most commonly used by pedestrian fatalities were benzodiazepines, followed by antidepressants and anti-epileptic drugs.

The percentage distribution within the group of pedestrian fatalities testing positive for psychotropic drugs (n = 27), according to the type of substance detected, was as follows: **51.8%** positive for benzodiazepines, **40.7%** positive for antidepressants, **18.5%** positive for antiepileptics, and **14.8%** for opioids.

Methodology

1. NATIONAL INSTITUTE OF TOXICOLOGY AND FORENSIC SCIENCES

1.1. Analytical techniques used and participation in intercomparison

- Enzyme immunoassay.
- Gas chromatography with flame ionization detector and headspace autoanalyzer (HS-GC-FID).
- High-performance liquid chromatography with diode-array detector (HPLC-DAD).
- Gas chromatography coupled to mass spectrometry (GC-MS).
- Gas chromatography coupled to tandem mass spectrometry (GC-MSMS).
- High-performance liquid chromatography coupled to tandem mass spectrometry (UPLC-MSMS).
- Liquid chromatography coupled to high-resolution mass spectrometry (LC-HRMS).

All reported results for drugs and psychotropic drugs [5] have been confirmed by analytical techniques based on mass spectrometry [6-15].

All analytical results have been obtained within the quality system implemented at the INTCF in accordance with **ISO** 17025. The INTCF is, in particular, accredited by the **Spanish National Accreditation Body (ENAC)** for the quantitative determination of ethyl alcohol in biological fluids, among others [16].

The following is a description of the national and international intercomparison exercises in which the Chemistry and Drugs services of the different INTCF Departments participate annually and whose results are essential to externally evaluate the competence of our laboratories in this type of drug of abuse testing.

TABLE 4: PARTICIPATION IN INTERCOMPARISON EXERCISES OF THE CHEMISTRY AND DRUGS SERVICES OF THE DIFFERENT DEPARTMENTS OF THE INTCF

	Barcelona	Madrid	Seville	La Laguna
Program: Blood Alcohol Intercomparison Exercise Organizer: INTCF Seville Frequency: Quarterly Parameters/Samples: Ethyl alcohol and other volatile compounds in blood and plasma	X	X	X	X
Program: Whole Blood Alcohol / Volatiles Survey (AL1) Organizer: College of American Pathologists Frequency: Quarterly Parameters/Samples: Blood ethyl alcohol, volatiles, and ethylene glycol	X	X		
Program: Toxicology Programme Organizer: LGC Standards Frequency: Annual Parameters/samples: Identification and quantification of ethanol in blood			X	
Program: Vitreous Fluid (VF) Organizer: College of American Pathologists Frequency: Semi-annual Parameters/Samples: Ethyl alcohol, potassium, and sodium in vitreous fluid		X		
Program: Forensic Toxicology Criminalistics (FTC) Organizer: College of American Pathologists Frequency: Semi-annual Parameters/samples: Drugs in blood and urine	X	X		
Program: Forensic Blood Toxicology Proficiency Testing (Quartz) Organizer: LGC Frequency: Quarterly Parameters/Samples: Drugs of Abuse and Psychotropic Drugs in Blood		X	X	X
Program: Blood Drug Analysis (CTS-5661) Organizer: Collaborative Testing Services Frequency: Annual Parameters/Samples: Drugs of Abuse and Psychotropic Drugs in Blood		X		

2. INSTITUTE OF LEGAL MEDICINE AND FORENSIC SCIENCES OF CATALONIA

2.1. Analytical techniques and participation in intercomparison exercises

- Enzyme immunoassay.
- Chromatography of gasses with flame ionization detector and headspace analyzer (HS-GC-FID); detection and quantification of ethanol.
- Chromatography of gasses coupled to mass spectrometry (GC-MS); detection and quantification of drugs of abuse and psychotropic drugs.
- Chromatography of liquids in high resolution coupled to the tandem mass spectrometry (HPLC-MSMS); detection and quantification of drugs of abuse and psychotropic medicines.

The intercomparison exercises which the IMLCFC have participated during 2020 have been:

- Intercomparison exercise of ethyl alcohol in the blood (EIAS) organized by the INTCF Seville Department.
- UNODC ICE PROGRAM: an interlaboratory exercise of psychoactive substances in urine (2020-1-BS).

3. BASQUE INSTITUTE OF FORENSIC MEDICINE

3.1. Analytical techniques and participation in intercomparison exercises

- Enzyme immunoassay.
- Chromatography of gasses with flame ionization detector and headspace analyser (HS-GC-FID).
- Chromatography of liquids in high resolution coupled to the tandem mass spectrometry (UPLC-MSMS).

All the reported results about drugs and psychopharmaceuticals have been confirmed with analytical techniques based on mass spectrometry.

The ethanol analytical results have been obtained with a validated method internally by the laboratory where a double column for confirmation is used. Results were always contrasted with Reference Certified Material and the Interlaboratory Exercises in which it is involved.

The analytical results of drugs of abuse have been always obtained with methods contrasted with Reference Certified Material and Interlaboratory Exercises in which it is involved.

The intercomparison exercises in which the IMLCFC has participated during 2020 have been:

- Intercomparison exercise of ethyl alcohol in blood and plasma. Organiser: INTCF Seville. Frequency: four-monthly. Parameters/samples: ethyl alcohol and other volatile compounds in blood and plasma.
- Toxicology Programme. Organiser: LGC Standards. Periodicity: monthly. Parameters/Samples: quantification of COHb, ethanol, and paracetamol in blood.
- Program: Forensic Blood Toxicology Proficiency Testing (Quartz). Organiser: LGC. Frequency: quarterly. Parameters/samples: identification and quantification of drugs of abuse and psychotropic drugs in blood.

4. INSTITUTE OF LEGAL MEDICINE AND FORENSIC SCIENCES OF ARAGÓN

4.1. Analytical techniques used and participation in intercomparison exercises

- Gas chromatography with headspace sampler and flame ionization detection (HS-GC-FID).
- Gas chromatography with mass spectrometry detection (GC-MS).

The intercomparison exercises in which IMLA has participated during 2020 have been:

- The IMLA laboratory participates in the Blood Ethyl Alcohol Intercomparison Exercise organised by the National Institute of Toxicology and Forensic Sciences.

5. INSTITUTE OF LEGAL MEDICINE AND FORENSIC SCIENCES OF MURCIA

5.1. Analytical techniques used and participation in intercomparison exercises

- Gas chromatography with flame ionization detector and headspace autoanalyzer (HS-GC-FID).
- Gas chromatography coupled to mass spectrometry (GC-MS).

The intercomparison exercises in which the IMLCFM has participated during 2020 have been:

- Blood Ethyl Alcohol intercomparison Exercise (EIAS) organised by the Seville Department of the INTCF.

6. ANALYSIS AND STATISTICAL TREATMENT OF DATA

The data received in each request (date of accident, date of death, role, age, sex, type of vehicle, autonomous communities, provinces, requesting body, sending body…, and data of the toxicological studies obtained by the INTCF were registered in the LIMS Labware (Laboratory Information Management System) information management system of the INTCF.

The LIMS queries were performed through various searches using the Data Explorer module. The data were exported to a standardised Microsoft Excel 2016 template.

The data were cross-checked with the data recorded independently by the DGT and a selection of cases was made.

The analytical data received from the different IMLCFs were compiled together in the same standardised Microsoft Excel 2016 template to obtain the final statistical data and graphs.

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Colabora:

GOBIERNO DE ESPAÑA MINISTERIO DE JUSTICIA

INT CIENCIAS FORENSES

National Institute of Toxicology and Forensic Sciences
José Echegaray, 4. 28232 Las Rozas. Madrid.