NATIONAL INSTITUTE OF TOXICOLOGY
AND FORENSIC SCIENCES

GOBIERNO DE ESPAÑA
MINISTERIO DE JUSTICIA

INT CIENCIAS FORENSES

EPIDEMIOLOGY AND TOXICOLOGY OF SUICIDES IN SPAIN

Report 2019

Recommended citation: *Epidemiology and Toxicology of Suicides in Spain. 2019 Report*. National Institute of Toxicology and Forensic Sciences. Ministry of Justice, 2021.

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

Website:
https://www.mjusticia.gob.es/es/ministerio/organismos-entidades/instituto-nacional

Epidemiology and Toxicology of Suicides in Spain.

National Institute of Toxicology and Forensic Sciences

Report 2019

GOBIERNO DE ESPAÑA | MINISTERIO DE JUSTICIA

Madrid, 2021

Coordination:

María del Carmen Jurado Montoro
Former Head of the Chemicals and Drugs Service of the Seville Department of the INTCF

Content production:

María del Carmen Jurado Montoro
Former Head of the Chemicals and Drugs Service of the Seville Department of the INTCF

María Antonia Martínez González
Head of the Drugs Service of the Madrid Department of the INTCF

Begoña Bravo Serrano
Head of the Chemicals Service of the Madrid Department of the INTCF

Teresa Soriano Ramón
Head of the Chemicals and Drugs Service of the Seville Department of the INTCF

Nuria Sanvicens Díez
Head of the Chemicals and Drugs Service of the Barcelona Department of the INTCF

Luis Manuel Menéndez Quintanal
Head of the Chemicals and Drugs Service of the La Laguna Delegation of the INTCF

Published by:
Ministry of Justice.
General Technical Secretariat

NIPO (PDF): 051-21-046-2
ISSN:

Catalogue of publications of the General State Administration:
https://cpage.mpr.gob.es

Desktop design:
Safekat, S. L.

Index

PROLOGUE

Suicides in Spain continue being the first cause of violent death, with 3,671 deaths in 2019, according to the latest data provided by the National Statistics Institute[1]. The data is shocking in its magnitude, because it is three times higher than the annual number of deaths by traffic accident. It leads all of the public institutions, that are in some way affected by this problem, to reflect on how we can contribute to prevent this public health problem.

An effective suicide prevention requires a multidisciplinary approach (healthcare, psychological, social, cultural...) that will allow the establishment of a multisector national strategy for suicide prevention, within the scope of the national mental health strategy. According to the WHO[2], among the risk factors associated with deaths by suicide are the difficulties in obtaining access to health care, the ease of access to resources that can be used for suicide, media sensationalism and the stigma associated with seeking help for suicidal behaviours or for mental health or psychoactive drug use problems.

Vigilance and restricting access to suicide methods are key elements in its prevention. Quality scientific data, based on sufficiently representative population studies, are required in order to formulate effective policies to restrict access to suicide methods. This is one of the essential objects of this report by the National Institute of Toxicology and Forensic Sciences (INTCF), which aims, through our case studies, to offer epidemiological data on suicides in our country and on the suicide methods or mechanisms, with special reference to the toxicological findings in this type of deaths.

This report presents 1,822 cases of death by suicide that were analysed at the INTCF in 2019. We first present the general epidemiological data to evaluate the influence of age, sex, date of the suicide and autonomous community on the deaths by suicide. A population study was also carried out on the various suicide mechanisms (hanging, poisoning, jumping from height, drowning, firearm, self injury by cutting and others) and on their influence on the different above-mentioned epidemiological variables. Also included is a comparison study of the data obtained in this epidemiological study by the INTCF, with the data reported by the National Statistics Institute (INE) and by the World Health Organisation (WHO). Lastly, and given that the toxicology assessments of all of the cases received are performed by the Chemicals and Drugs Services, a monographic chapter is included with the detailed toxicological assessment of the suicide victims, which highlights, among other aspects, the high prevalence of poly-drug use in this type of deaths.

---

[1] INE 2019. Deaths by cause of death: Available at: https://www.ine.es/jaxiT3/Tabla.htm?t=7947 (last accessed on the 30 September 2021).

[2] World Health Organization 2019. Suicide in the world. Global health estimates. Available at: https://www.who.int/publications/i/item/suicide-in-the-world (last accessed on the 28 September 2021).

In short, it is a study that offers very important population data on the deaths by suicide, which may be of great value if taken into consideration in the suicide prevention policies in our country.

As a director of the INTCF, I would like to thank everyone who contributed to bringing this study into being. Firstly, María del Carmen Jurado Montoro (Former Head of the Chemicals and Drugs Service of the Seville Department of the INTCF and recently retired), true *alma mater* of this report, as she was the coordinator of the study, she processed the data and shaped the final manuscript. Secondly, all of the civil servants, laboratory experts, technical specialists and assistants who participated in the tests related to these cases and, especially, to the Heads of the Chemicals and Drugs Services of the various departments of the INTCF (María Antonia Martínez González, Begoña Bravo Serrano, Teresa Soriano Ramón, Nuria Sanvicens Diez and Luis Manuel Menéndez Quintanal) for their goodwill, continuous collaboration and their work in coordinating and revising the analytical data being presented. I would also like to sincerely thank the Directors of the Departments and of the Delegation of the INTCF for their unconditional support for this initiative. Lastly, the various Institutes of Legal Medicine and Forensic Sciences (IMLCF) of our country, without whose contribution in the collection and sending of the samples and data to the INTCF it would not have been possible to produce this report.

Antonio Alonso Alonso
Director of the National Institute
of Toxicology and Forensic Sciences

INTRODUCTION OBJECTIVES

The objective of this Report is to alert on the problem of suicide. It is based on the case studies received at the National Institute of Toxicology and Forensic Sciences (INTCF).

The report is divided into two chapters:

- The first chapter presents an epidemiological study, where the following aspects of the suicides are reviewed:
  - Firstly, the general epidemiological data are presented to evaluate the influence of age, sex, date of the suicide and autonomous community; but without considering the mechanisms.
  - The various mechanisms used in the suicides are assessed later, to evaluate the influence of the four parameters considered and listed above.
  - Lastly, the data from the cases received at the INTCF are compared with the data reported by the National Statistics Institute (INE) and by the World Health Organisation (WHO).
- The second chapter presents the toxicological results obtained in the analyses performed on the biological samples received from the suicide victims. This chapter is also divided into the following stages:
  - Firstly, a comparison study to establish possible differences in the epidemiological profiles of cases with positive and negative toxicological results.
  - Secondly, a joint assessment is performed on all of the groups of compounds detected, to verify possible differences in the epidemiological parameters considered in the report.
  - A detailed and individualised study is then presented on each of the compound groups included in the report: ethyl alcohol, antidepressants, antiepileptic drugs, antipsychotic drugs, benzodiazepines, drugs of abuse, hypnotic drugs, prescription opioids and “others” compounds not included in these groups.
  - Lastly, we aim to alert on the problem entailed by poly-drug use, and data are presented regarding mono-intoxications and poly-drug use.

Methods

This report was produced with the suicide-related cases sent by the corresponding Institutes of Legal Medicine and Forensic Sciences (IMLCF). All of them are derived from Court cases.

The data from each case were recorded in the LIMS Labware (Laboratory Information Management System) of the INTCF.

The Data Explorer module was used to search the LIMS system and after filtering the cases of a suicide aetiology from Court autopsies, the following parameters were reviewed:

- For the epidemiological study:
  - Sex.
  - Age.
  - Date of the suicide.
  - Autonomous community.
  - Mechanism.
  - Cause of death.
- For the toxicological study:
  - Substances detected.
  - Concentrations.
  - All of the above-mentioned epidemiological variables.

Analysis techniques used

- Enzyme immunoassay.
- Headspace gas chromatography with flame ionization detection (HS-GC-FID).
- High-performance liquid chromatography with diode array detection (HPLCDAD).
- Gas chromatography-mass spectrometry (GC-MS).
- Gas chromatography-tandem mass spectrometry (GC-MSMS).
- Ultraperformance liquid chromatography-tandem mass spectrometry (UPLC-MSMS).
- Liquid Chromatography-High Resolution Mass Spectrometry (LC-HRMS).

All positive results were confirmed using analytical techniques based on mass spectrometry.

Study limitations

The data presented in this report do not contain all of the deaths by suicide that ocurred in Spain in 2019. According to INE data, 3,671 deaths caused by suicide were documented in 2019, therefore the 1,822 cases of suicide received at the INTCF and reviewed in this report represent 49.6% of the total suicides in Spain, which is a significant number.

This limitation is not exclusive to this report, because almost all of the population studies reviewed do not cover 100% of the population, especially when the data to be reviewed depends on the information provided by sources external to the authors of the study. This

is the case of the WHO, which receives the data from national and/or regional agencies, and acknowledges that it is missing data on the methods used in suicides in some countries, especially in low-income countries[3]. Discrepancies were also found in the INE data when compared to IMLCF data; one study recorded 2,930 suicides according to IMLCF data, compared to the 2,485 recorded by the INE[4]. As already stated, in the case of the INTCF, the cases are sent by the IMLCF, but among the total case histories very few cases are received from some of them, as shown in Figure 1.7. This has led to not all of the autonomous communities being included in this report, as will be seen further ahead.

[3] World Health Organization 2014. Preventing suicide. A global imperative. Available at https://www.who.int/publications/i/item/9789241564779 (last accessed on the 30 September 2021).

[4] Giner L, Guija JA. Number of suicides in Spain: Differences between data from the Spanish Statistical Office and the Institutes of Legal Medicine. *Rev Psiquiatr Salud Ment.* 2014; 7(3):139-146.

1. EPIDEMIOLOGICAL STUDY

1.1. General data

In 2019 the INTCF received 1,822 suicide-related cases. All of them were sent by the IML-CF. This number represents 37.2% of all violent deaths, as shown in Figure 1.1. Almost half of the 10,162 post-mortem cases received died of violent causes (48.2%, 4,898 cases).

Figure 1.1. INTCF post-mortem case histories: Prevalence of suicide in violent deaths

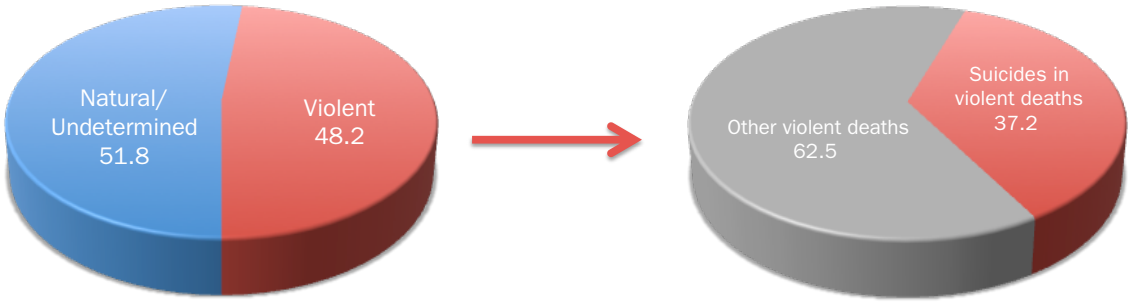
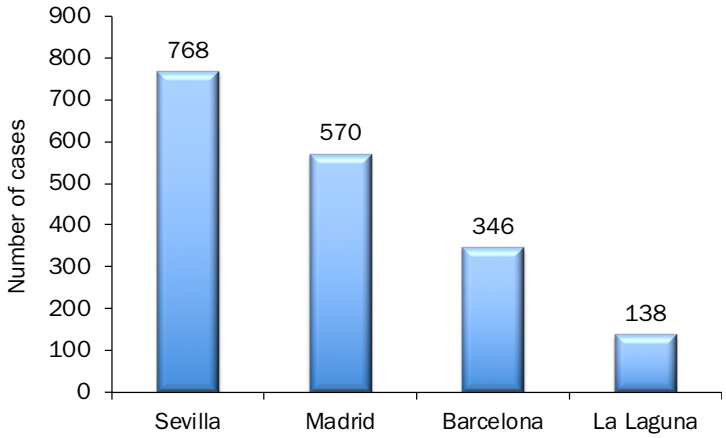


Figure 1.2 shows the number of suicide-related cases received at each of the INTCF departments and at La Laguna Delegation.

Figure 1.2. Number of suicide-related cases received at each of the INTCF departments



1.1.1. Influence of sex, age, date of the suicide and Autonomous Community

Almost three-fourths of the people who committed suicide were men (73.1%), as opposed to 26.9% of women. In one of the cases the sex of the victim was unknown.

Figure 1.3. Distribution by sex (%)

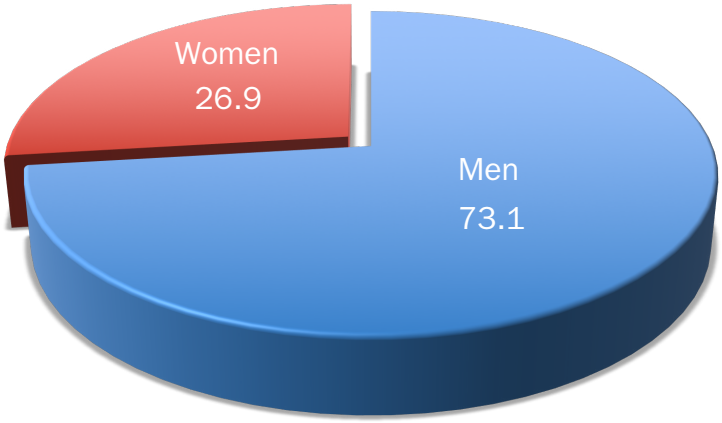


Figure 1.4 shows the influence of age, and there are two different distributions depending on whether the percentage regarding the total of suicide cases received by the INTCF is considered (Figure 1.4A), or the number of cases per 100,000 inhabitants according to the different age ranges (Figure 1.4B). In the first case, the distribution is pyramid-shaped, the highest percentages were found in people in the 40-49 (20.8%) and 50-59 (22.2%) year-old ranges and the lowest in the under-20 years-old (1.8%) and over-90 years-old (1.6%) ranges. The ages of the deceased persons ranged from 11 to 97 years-old.

If we consider the distribution of the age ranges per 100,000 inhabitants, Figure 1.4B shows different profiles. The percentages were very low in the under-20-year-olds (0.4 suicides per 100,000 inhabitants) and increased gradually up to 40 year-old (4.8 suicides per 100,000 inhabitants). After this age, the data remain steady, although with ups and downs, varying between 4.6 suicides per 100,000 inhabitants in 60-69 year-olds and 6.0 in 80-89 year-olds.

No differences were found in the distribution of age ranges in women and men. The only difference was found in the cases with higher prevalence. Most women were in the 50-59-year-old range (24.7%); while in men the range expanded to 40-49 years-old (21.5%), with the same percentage as the 50-59 year-olds (21.3%).

Figure 1.4. Influence of age. A: Percentage distribution of the age ranges regarding the 1,822 suicide cases; B: Distribution of the age ranges per 100,000 inhabitants[5]

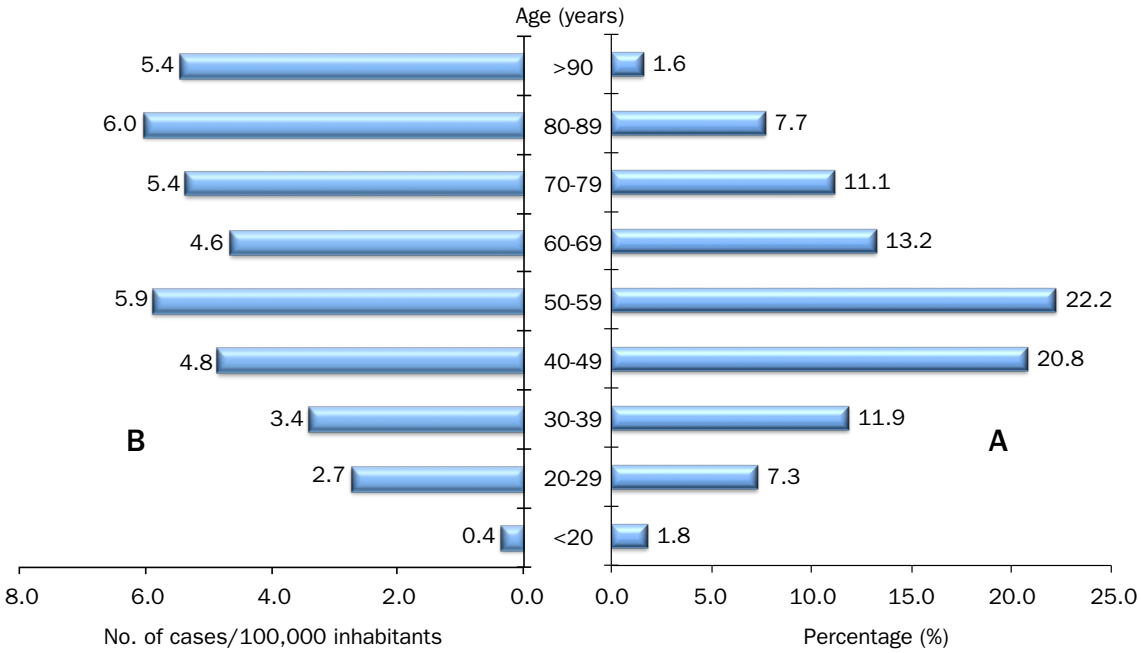
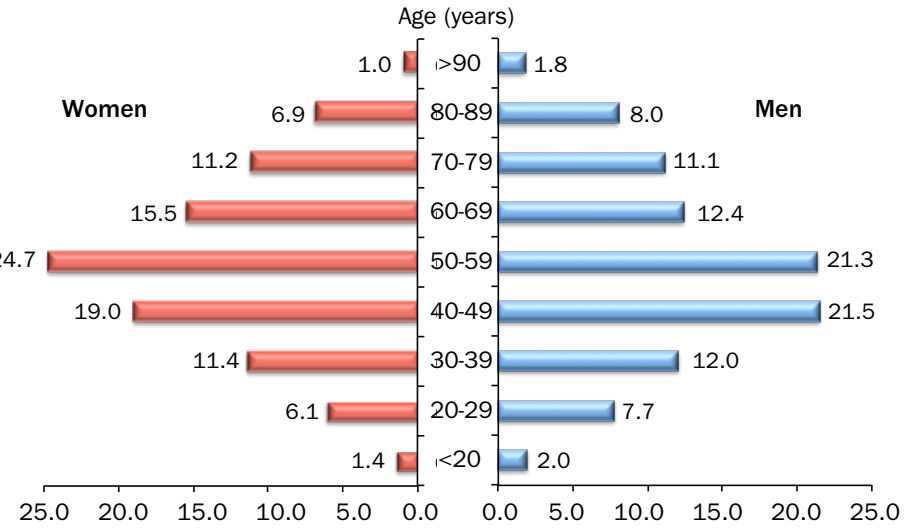


Figure 1.5. Influence of sex on the age of people who commit suicide (%)

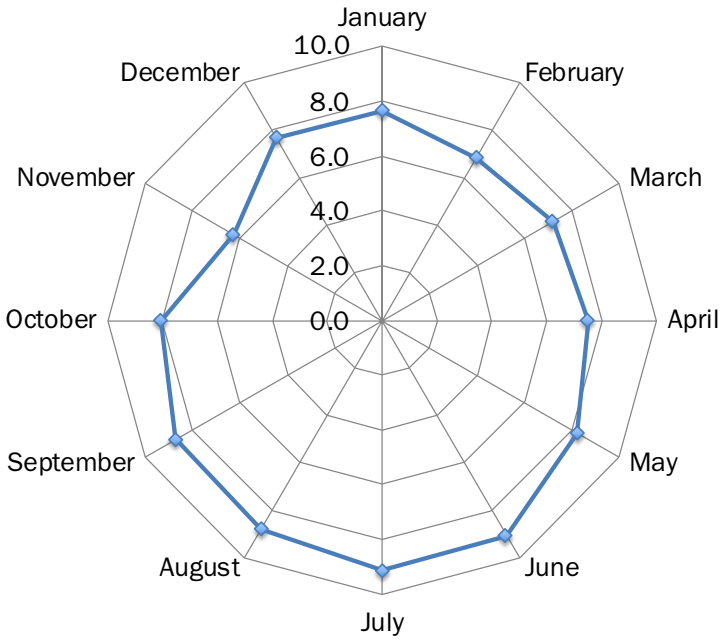


[5] The age is unknown in 43 cases.

No significant differences were found either in the percentage of suicides committed in the different months of the year.

Figure 1.6 shows the evolution of suicides over the twelve months of the year. There is a slight increase in the percentage of suicides from February (6.9%) to June (9.1%), then there is a steady-state until September (8.9%), it goes down until November, when the lowest percentage is recorded (6.3%), and then increases again in December (7.7%).

Figure 1.6. Influence of the date of the suicide[6] (%)



The following Figure shows the number of cases received from each of the autonomous communities (AC).

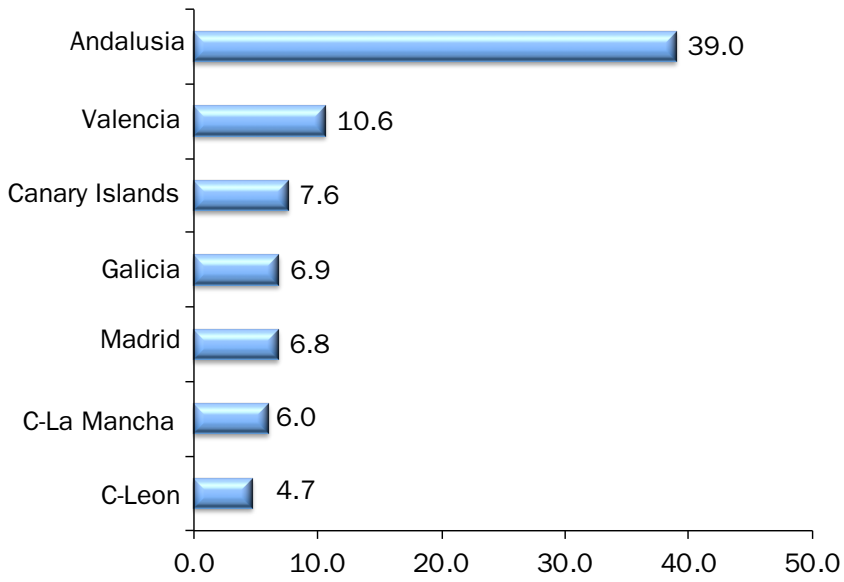
In spite of the low number of cases received from some AC, it was deemed important to include this parameter in the report, because regional trends may help the administrations on their prevention policies.

To avoid including the AC with the highest bias, the suicide data from each AC received at the INTCF were compared with the total data from the INE for 2019. The AC with a representation regarding the total INE data higher than 45% and where the number of suicides received at the INTCF was higher, or very close, to 100, were included in the study. The AC that met these criteria were Andalusia, Valencia, the Canary Islands, Galicia, Madrid, Castilla-La Mancha (C-La Mancha) and Castilla y León (C-Leon). The chosen AC are sufficiently representative, as they comprise 81.6% of all suicides commited in Spain during 2019 (Figure 1.8).

[6] The date of the event is unknown in 90 cases.

Figure 1.7. Number of suicide-related cases received from each of the AC (map adapted from Wikipedia)

Figure 1.8. Percentage of suicides in each of the AC included in the report



39.0% of the suicides received at the INTCF were committed in Andalusia, a much higher percentage than the other AC, which ranged from 10.6% in Valencia to 4.7% in C-Leon.

No differences were found in the sex of the suicide victims in the various AC regarding the global data (Figure 1.9). The results were identical in men and women in C-Leon (4.7% of both men and women committed suicide in this AC). The percentages of men were slightly higher than those of women in Andalusia, 40.1% of men committed suicide in this AC, opposed to 35.9% of women. A similar profile was found in the Canary Islands (7.7% men and 7.1% women) and C-La Mancha (6.2% men and 5.5% women). Opposite results were found in Valencia (10.6% men and 10.8% women) and Galicia (6.8% men and 7.1% women), whereas in the AC of Madrid, the difference between sexes was somewhat higher, 6.0% men opposed to 9.0% of women.

Figure 1.9. Distribution by sex in the suicides committed in the AC under study. Percentage data regarding the global data for men (n = 1.331) and women (n = 490)

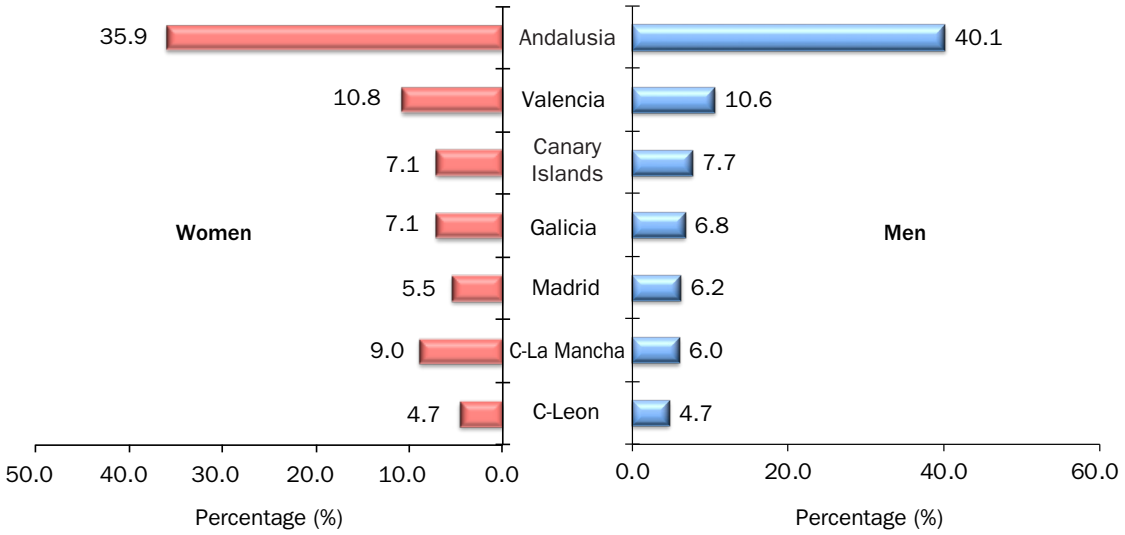
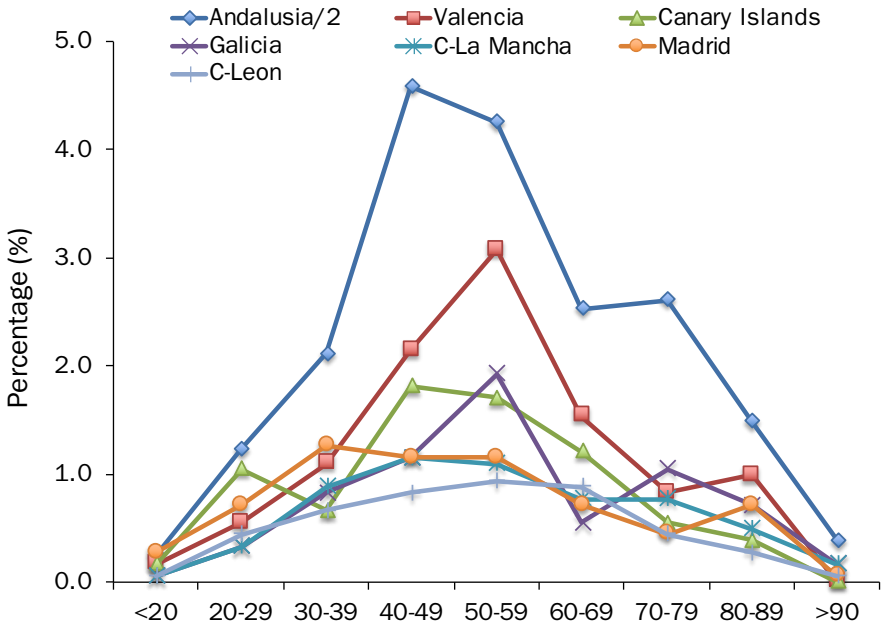


Figure 1.10 shows the influence of age in the various AC. We must point out that the data from Andalusia were divided in half in order to better view the profiles in the other AC, however, Appendix 1 shows the total data. The profiles have a pyramid shape, the same as the global data (Figure 1.4A), the highest percentages were in people from 50-59 years-old (Valencia and Galicia) or in the 40-49-year-old range (Andalusia, the Canary Islands, C-La Mancha and C-Leon). In the AC of Madrid, most of the suicides were committed by people between 30 and 60 years-old. Some AC showed an increase in older people, which in the case of Andalusia and Galicia was in 70-79 year-olds and in Valencia and Madrid in 80-89 year-olds.

Figure 1.10. Influence of age in the suicides committed in the AC under study. (The data from Andalusia were divided by two)



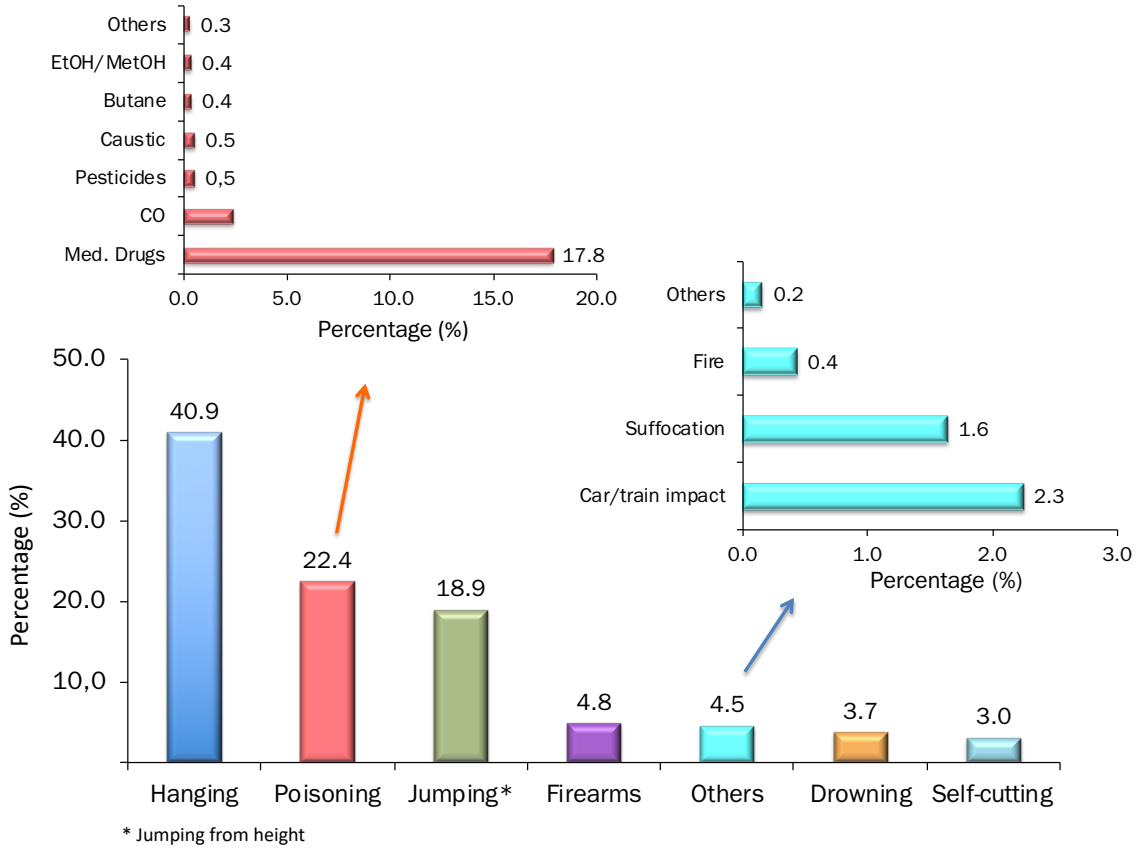
1.2. Suicide mechanisms

Restricting access to the most frequently used means or methods of suicide is a key element for its prevention. It is essential to know the most frequently used methods of suicide in the various groups of society, through extensive population studies, in order to correctly approach restriction policies.

The Figure below shows the percentage distribution of the various mechanisms used in the suicides, according to the INTCF case studies.

Hanging was the most frequently suicide mechanism (40.9%), followed by poisonings (22.4%) and jumping from height (18.9%). Abusive consumption of medications was the main cause of poisoning (17.8%), much higher than the next cause, poisoning by carbon monoxide (CO) (2.4%). The “others” group includes less common suicide mechanisms, such as train or car impact (2.3%), and suffocation (1.6%).

Figure 1.11. Suicide mechanisms[7].
(EtOH: Ethanol; MetOH: Methanol; CO: Carbon monoxide)



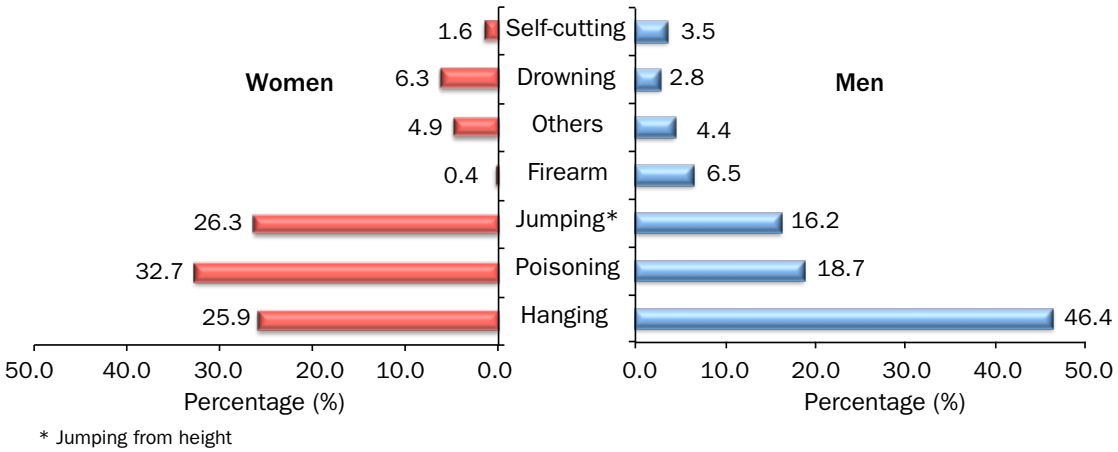
1.2.1. Influence of sex, age, date of the suicide and Autonomous Community

The mechanisms used in the suicides differed between men and women. Most men committed suicide by hanging (46.4%), followed by poisoning (18.7%) and jumping from height (16.2%), whereas the percentages for other mechanisms were lower (3.5-6.5%). In women, on the other hand, the highest percentage was suicide by poisoning (32.7%) followed by jumping from height (26.3%) and hanging (25.9%), and in a lower proportion by other mechanisms, which ranged from 0.4% of suicides by firearm to 6.3% by drowning (Figure 1.12).

Figure 1.12 also highligts the differences between sexes in some mechanisms; such is the case of suicide by firearm and self injury by cutting, which are lower for women (0.4% and 1.6%, respectively) compared to men (6.5% and 3.5%, respectively). The opposite was found in deaths by drowning: over double the number of women (6.3%) than men (2.8%) committed suicide by this method.

[7] The suicide mechanism is unknown in 28 cases.

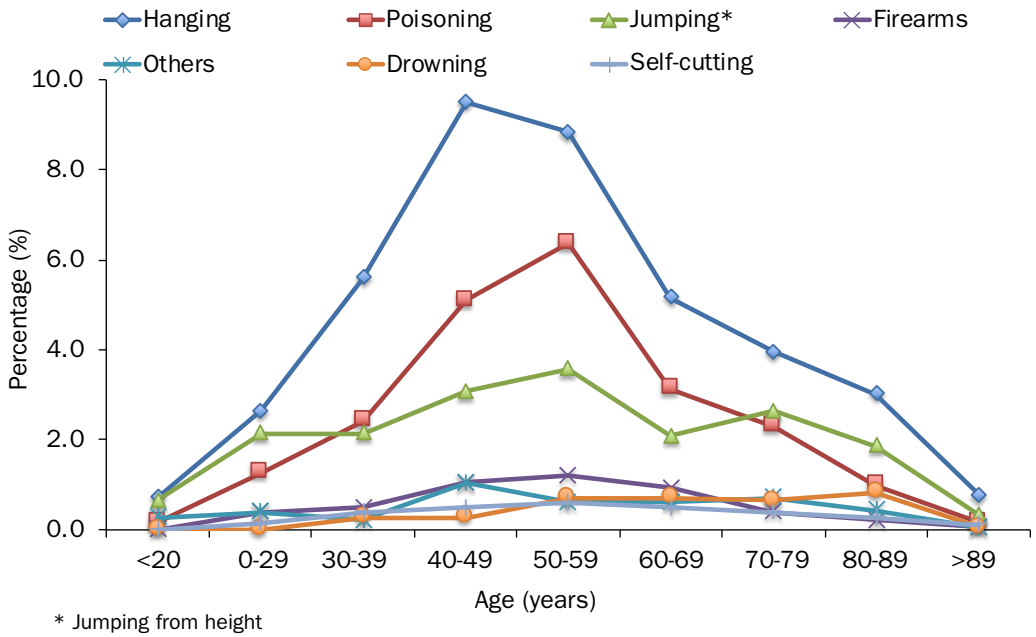
Figure 1.12. Distribution of the suicide mechanisms by sex



* Jumping from height

When evaluating the suicide mechanisms in all age ranges, Figure 1.13 and Appendix 2 show that the profiles are similar. Most suicides happened in the age ranges between 50 to 59 (poisoning, jumping from height, firearm) and 40 to 49 (hanging, others). The only exception was suicides by drowning, where most of the suicide victims were in the 80-89 year-old range.

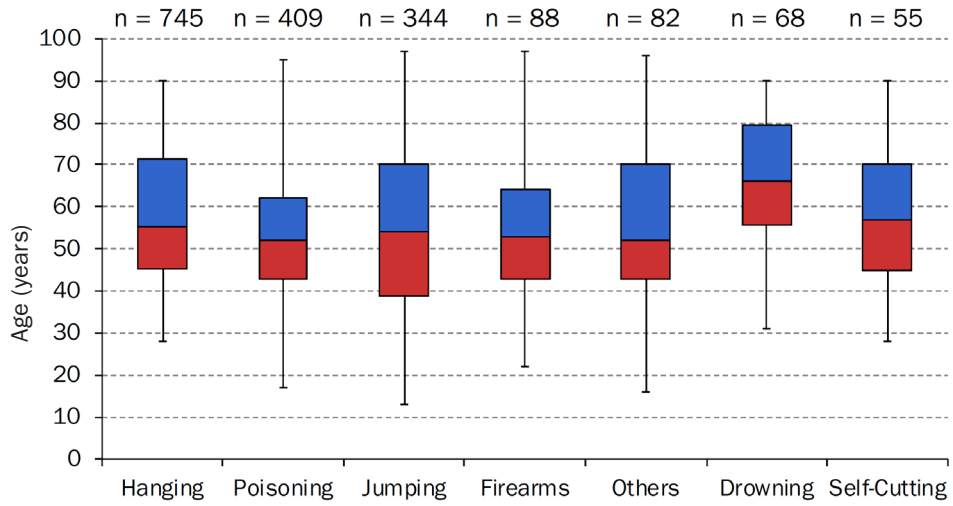
Figure 1.13. Influence of age on the suicide mechanisms



* Jumping from height

Figure 1.14 confirms the above data. The median of age in all mechanisms is within the 50-59 year-old range, except for drowning, which is in the 60-69 year-old range.

Figure 1.14. Statistical study of age in the various suicide mechanisms. Minimum age, percentile 25, median, percentile 75 and maximum age



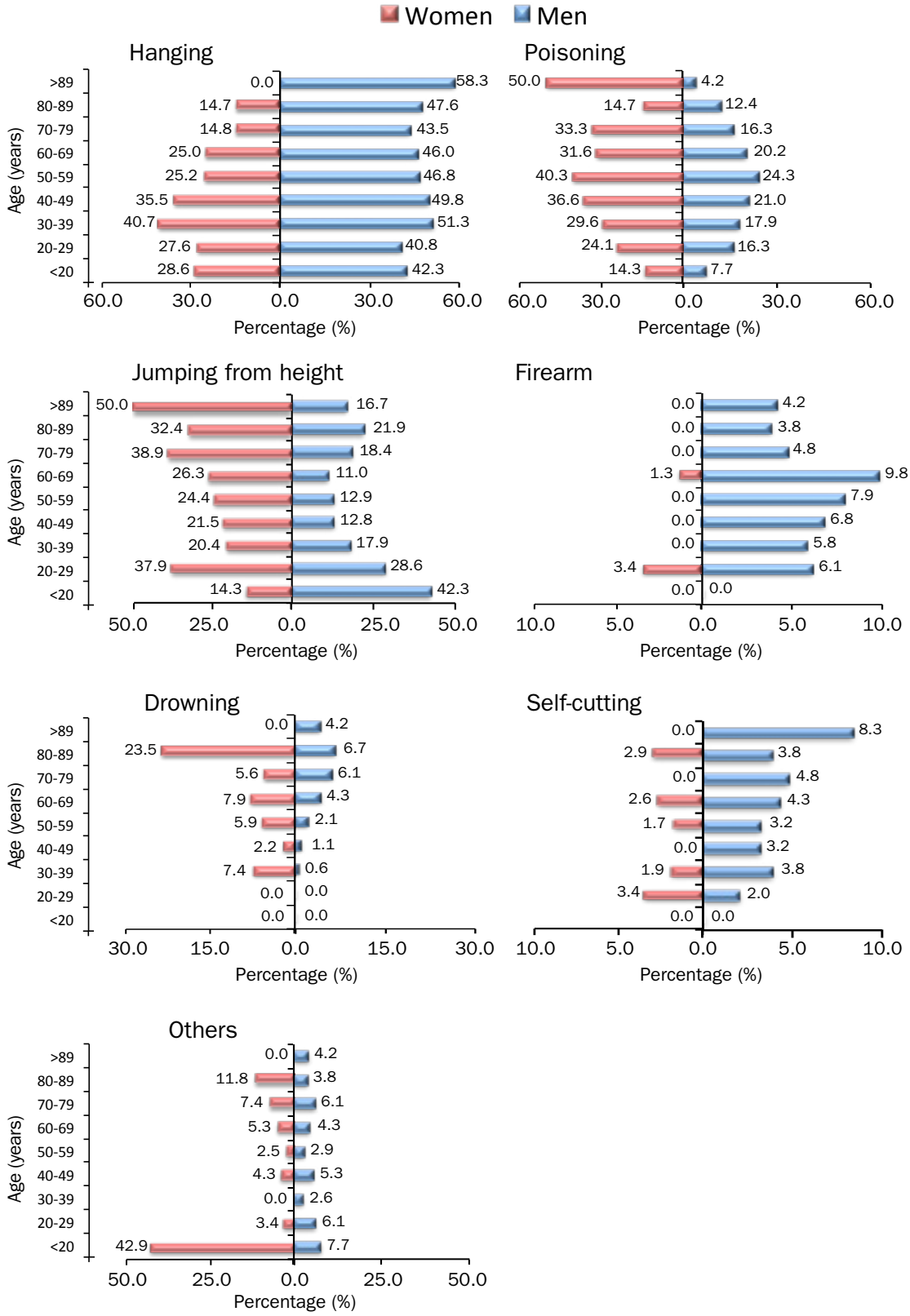
The distribution of the age ranges was also different between the various suicide mechanisms and between men and women. Most men committed suicide by hanging, and without differences in all age ranges, varying from 40.8% for the 20-29 year-old range to 58.3% for the over 89 range. In women, suicide by hanging was approximately half than in men, and the age distribution was not as uniform, with an increase in the 30-39 and 40-49 year-old ranges and a decrease in the 70-79 and 80-89 year-old ranges.

The age profiles in the cases of suicide by poisoning were similar between men and women, although the percentages were higher in the latter. The percentages gradually increased from the youngest to 50-59 years-old (24.3% of men and 40.3% of women) and then decreased in the higher age ranges. The exception was found in women, because 50.0% of women over 90 died by poisoning.

The profiles were the opposite between men and women in suicides by jumping from height. In the case of men, the percentages went down with age, from those under 20 (42.3% jumped) to those over 90 (16.7%). In women the profiles were the opposite, increasing from 14.3% in those under 20 to 50.0% in those over 90.

As previously stated, very few women committed suicide by firearm (2 women) or self injury by cutting (8 women). In the case of men, no one under 20 committed suicide by these mechanisms and the percentages, in the deaths by firearm, increased with age from 20 years-old (6.1%) to 60 years-old (9.8%) to then decreased up to those over 90 (4.2%). Deaths by self injury by cutting in men were less significant: none of the age ranges exceeded 5%, except in those over 90 (8.3%).

Figure 1.15. Influence of age: Percentage distribution of the age ranges in the various suicide mechanisms (in both sexes)

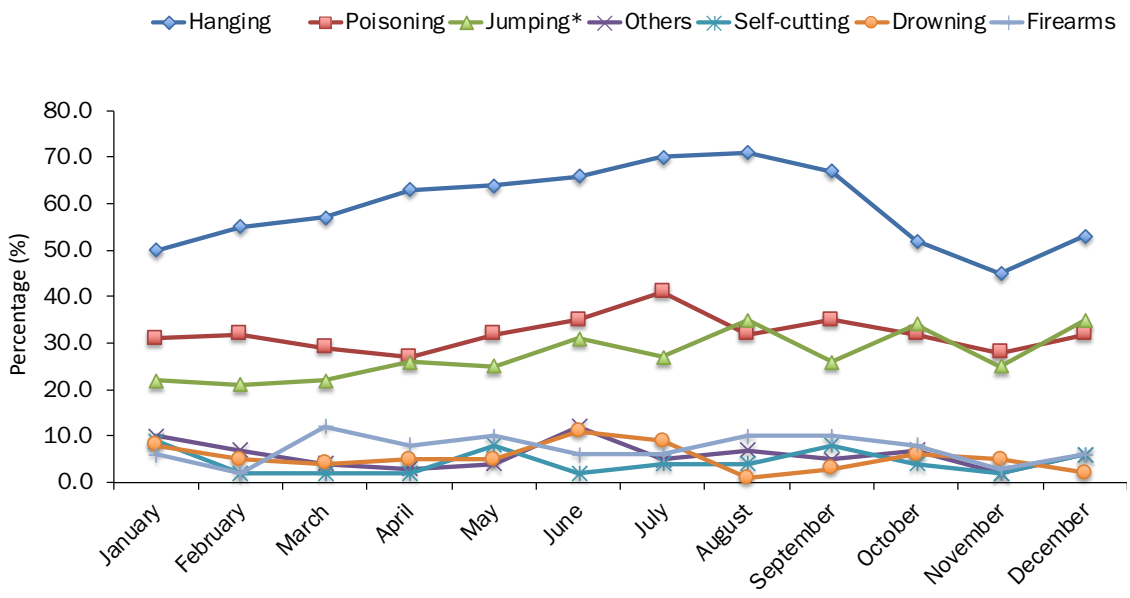


In drowning, it is noticeable that 23.5% of 80-89 year-old women committed suicide by this mechanism, while the percentages in other age ranges, both in men and women, were very low.

In deaths by other suicide mechanisms, the percentage of women under 20 was noticeable at 42.9%, whose mechanism was mostly by impact with a train.

No major differences were found in the profiles of the mechanisms throughout the whole year (Figure 1.16 y Appendix 2). The only exception were deaths by hanging, where a slight increase was found from January (2.7%) to August (3.9%), and then a decrease until November (3.5%) and an increase again in December (2.9%).

Figure 1.16. Influence of the date of the suicide on the suicide mechanisms

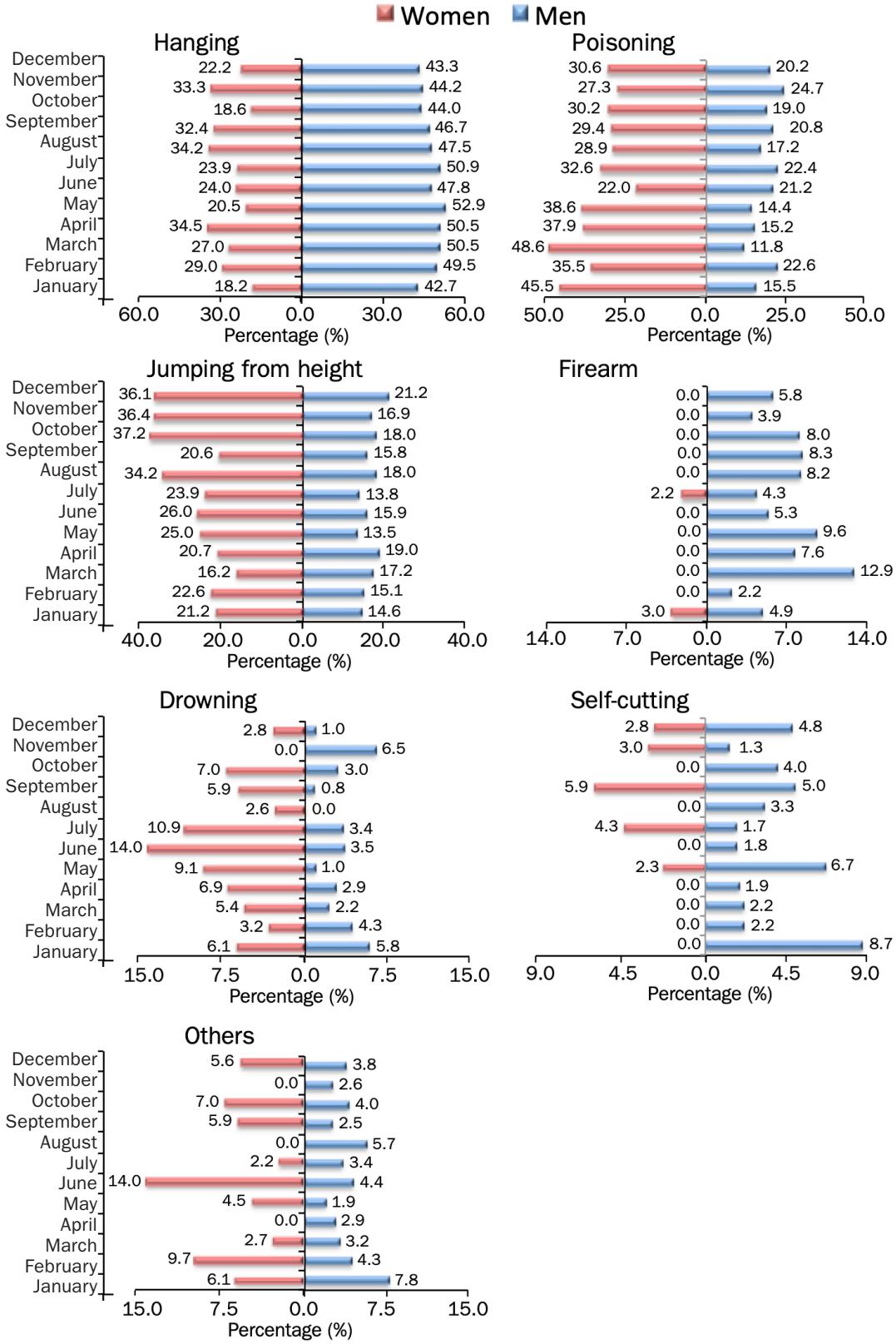


Looking at the influence of the date on the various suicide mechanisms among men and women, the profiles were similar in both sexes for most mechanisms, although the rate was different.

Deaths by hanging were around 50% during the twelve months of the year for men, and almost half (around 25%) for women. In the case of suicides by poisoning, the results were the opposite and, although with variations, in men they were around 25% throughout the year, and in women they were up to 40%.

There were no differences found either in the cases of jumping from height in men, which varied from 13.5% in May to 21.2% in December. On the other hand, in women, also with variations, there was an upward trend throughout the year, from 21.2% in January to 36.1% in December.

Figure 1.17. Influence of the date of the suicide: Percentage distribution of the twelve months of the year for the various suicide mechanisms (in both sexes)

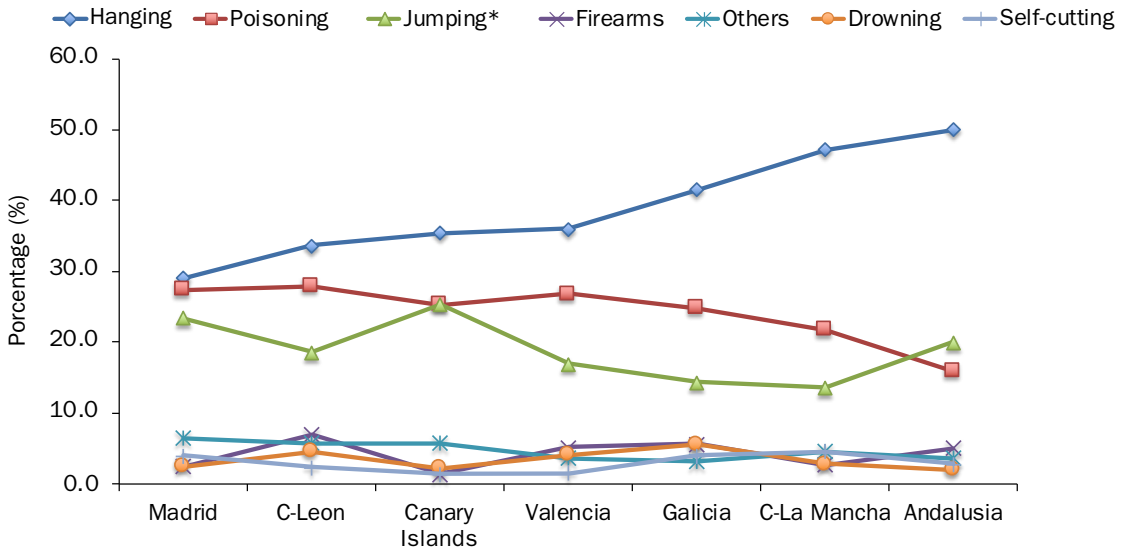


Around 8% of the suicides committed by men in each month were by firearm, although there were months with lower percentages (January, February, June, July and November) and one with higher percentage (March).

The suicides by drowning committed by women were the only mechanism where a clear influence of the season was noticed, with a tendency to increase from January (6.1%) to summer, June and July (14.0% and 10.9% respectively) and then to decrease until December (2.8%).

Several differences were found in the suicide mechanisms used in the seven AC considered in this report (Figure 1.18, Appendix 2), especially in the main mechanisms. Similar percentages were found in all AC in suicides by firearm, self injury by cutting, drowning and "others" mechanisms. The differences between AC were found in the hanging, poisoning and jumping from height mechanisms. Hanging was the predominant mechanism in all AC, the highest data, around 30%, were seen in C-Leon, the Canary Islands and Valencia, somewhat lower in Madrid (29.0%) and higher in Galicia (41.6%), C- La Mancha (47.3%) and Andalusia (50.0%). Suicides by poisoning were similar in Madrid, C-Leon, the Canary Islands and Valencia (25.4%-27.9%) and lower in the AC, that had higher percentages of hangings: Galicia (24.8%), C-La Mancha (21.8%) and Andalusia (15,9%). A similar profile, although with a lower percentage, was found in jumping from height, except in Andalusia, where the percentage was 20%, slightly higher than poisoning.

Figure 1.18. Influence of the suicide mechanisms in the AC



The Community of Madrid had very similar percentages of hangings (29.0%), poisonings (27.4%) and jumping from height (23.4%), and the Canary Islands of jumping from height and poisonings, 25.4% in both cases.

The profiles of the suicide mechanisms were different between the AC considered and also between men and women. Hanging was the main method of suicide in men in all AC, except in C-Leon, where the percentage of men (33.9%) was almost the same as of women (34.8%). The data on suicides by hanging in men in the other AC were similar, ranging from 41.0% in the Canary Islands to 60.5% in C-La Mancha; whereas in women the rate was approximately half (23.5%-30.5%), or even lower, as in Madrid (14.3%) and C-La Mancha (11.5%); it just so happens that this latter AC is the one with the highest percentage of men.

The percentages of deaths by poisoning were higher in women than in men, although in the AC of C-Leon there were similar results, 27.4% of men and 30.4% of women. Most of the women in the Community of Madrid committed suicide by poisoning (54.8%) compared to only 14.7% of men. In the other AC the percentages varied from 13.3% (Andalusia) to 24.0% (Canary Islands) for men and 24.1% (Andalusia) to 41.2% (Valencia) for women.

The deaths by jumping from height were also higher in women than in men, although in two AC the percentages were similar: Canary Islands (25.0% men and 29.4% women) and Galicia (13.5% men and 17.1% women). Unlike in the case of hangings, C- La Mancha showed the highest percentage of jumping from height in women (34.6%) and the lowest in men (7.4%).

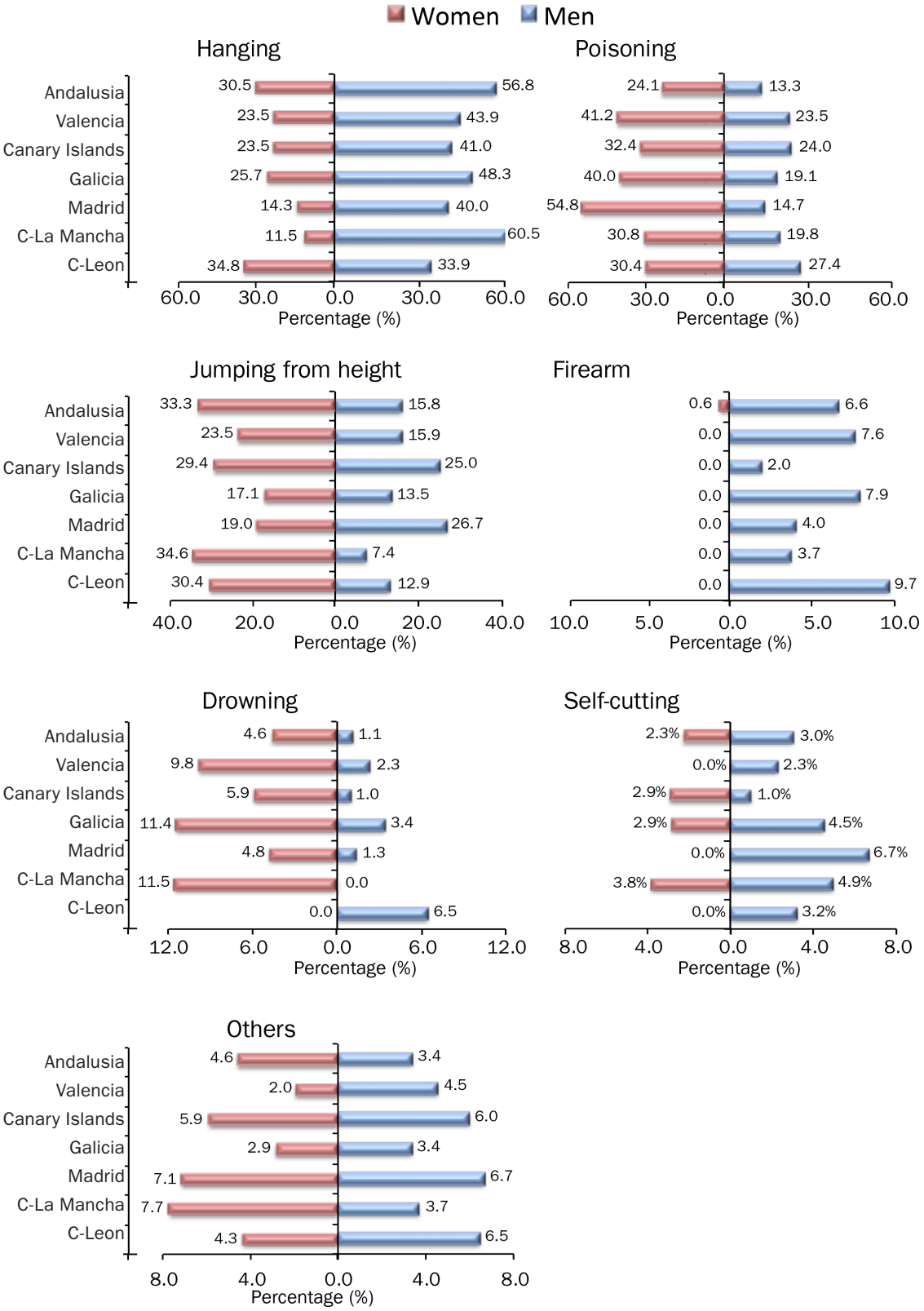
Only one woman committed suicide with firearm in Andalusia, and the data on men differed in the various AC. The highest percentages were found in C-Leon (9.7%), Galicia (7.9%), Valencia (7.6%) and Andalusia (6.6%), and the lowest in the Canary Islands (2.0%), C-La Mancha (3.7%) and Madrid (4.0%).

In the case of drowning, the rate in women was higher than in men, except in C-Leon, where no woman died by drowning, as opposed to 6.5% of men. The opposite was found in C- La Mancha, at 11.5% of women and no men. In the other AC, the results varied from 4.6% in Andalusia to 11.4% in Galicia for women, and for men from 1.0% in the Canary Islands to 3.4% in Galicia.

The number of women who committed suicide by self injury by cutting was also very low, and none was found in C-Leon, Madrid and Valencia. The rate in the other AC was similar (2.3%-3.8%). The percentages were higher in men in all AC except in the Canary Islands, where 1.0% of men committed suicide by this method, compared to 2.9% of women. The percentages in the other AC were not uniform and varied from 2.3% in Valencia to 6.7% in Madrid.

The percentages of suicides by other mechanisms were similar in both sexes in all AC, except in C-Leon (6.5% men and 4.3% women), C-La Mancha (3.7% men and 7.7% women) and Valencia (4.5% men and 2.0% women).

Figure 1.19. Influence of the AC: Percentage distribution of the seven AC considered regarding the various suicide mechanisms (in both sexes)



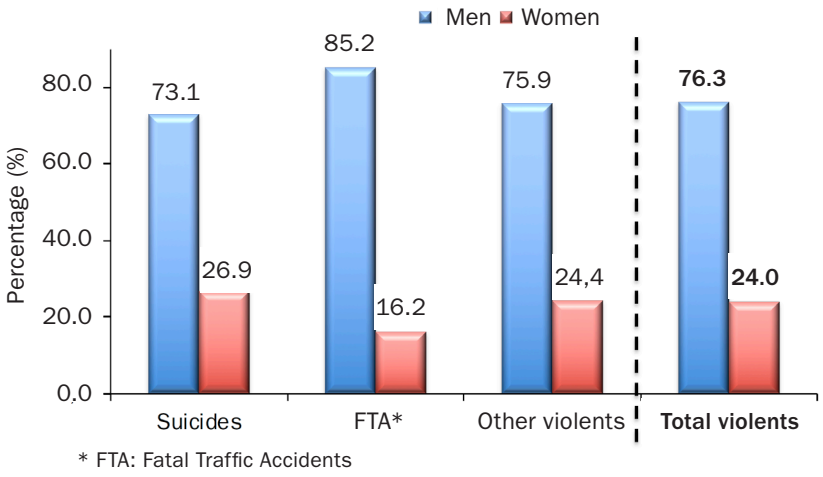
1.3. Comparison study

1.3.1. Comparison of deaths by suicide with deaths from other violent causes

It was considered important to find out possible differences in the epidemiological profiles of various violent deaths. With this interest, the data on the following types of cases were compared to: total of violent deaths, suicides, fatal traffic accidents, and other violent deaths (which include homicides, workplace accidents, deaths by adverse reaction to psychoactive substances and other accidental deaths).

No differences were found in the sex in all of the violent deaths, with the exception of fatal traffic accidents (Figure 1.20). The percentage of men is very similar in suicides (73.1%), other violent deaths (75.9%) and the total of violent deaths (76.3%), and almost triples that of women. In fatal traffic accident, if we consider the total of deaths (drivers and pedestrians), the percentage of men increases to 85.2%, and if we limit it to drivers, the difference between sexes is even higher, 91.8% men and 8.2% women[8].

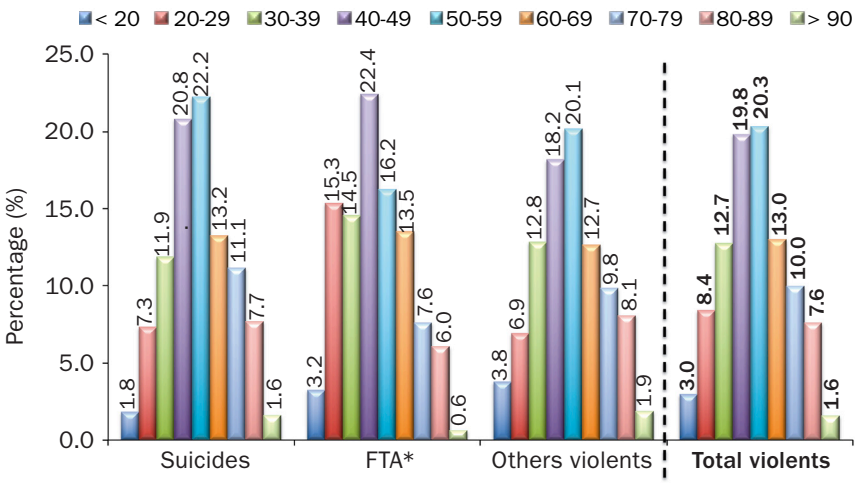
Figure 1.20. Influence of sex on violent deaths



Similar results were obtained when comparing the various age ranges. The profiles were similar in all types of violent deaths, with most of the deceased in the 40-49 and 50-59 years ranges; almost double the rate of other ages. The exception were also fatal traffic accidents, where most of the deceased were in the 40s range (22.4%), followed by the 20-29 to 60-69 ranges (15.3-16.2%).

[8] National Institute of Toxicology and Forensic Sciences 2019. Toxicological findings in road traffic fatalities. Available at: https://www.mjusticia.gob.es/es/ministerio/organismos-entidades/instituto-nacional/documentacion/memorias (last accessed 28 September 2021).

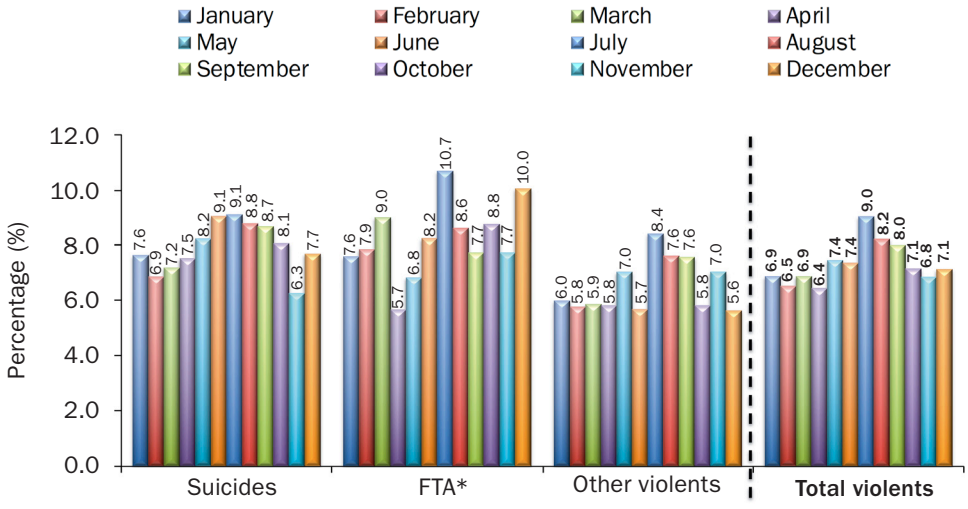
Figure 1.21. Influence of age on violent deaths



* FTA: Fatal Traffic Accidentes

When comparing the date of the deaths, the profiles are different in all types of violent deaths. The only similarity was that the highest rate was found in the month of July, for all types of death (Figure 1.22).

Figure 1.22. Influence of the date of the suicide on violent deaths



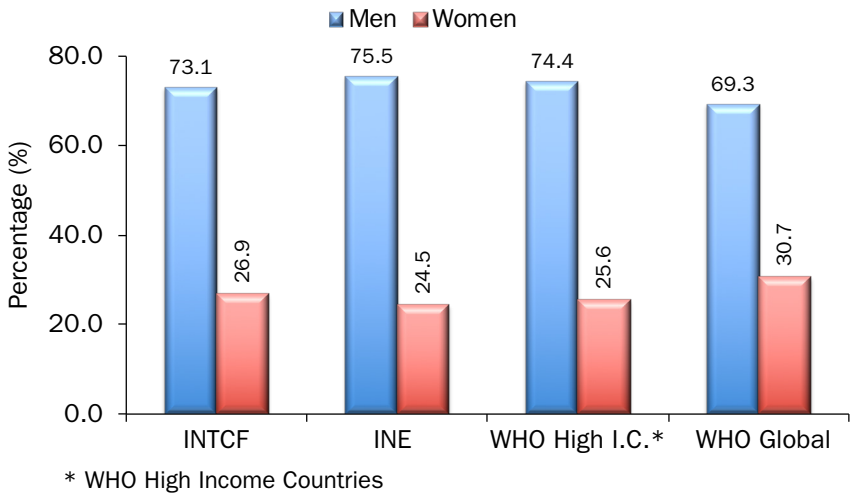
* FTA: Fatal Traffic Accidents

1.3.2. Comparison of the data on suicides from various organisations: National Institute of Toxicology and Forensic Sciences (INTCF), National Statistics Institute (INE[9]), World Health Organisation (WHO[10])

To establish possible differences between the data compiled by various organisations, based on different populations, the data from the INTCF population study were compared with the data reported by the INE and by the WHO, in the latter also differentiating the data of high-income countries (WHO: High IC) (among which is Spain) and the global data (for the whole world). We must point out that the comparison of the date of the suicides could not be performed as this data from the WHO was not available.

When comparing the distribution by sex, Figure 1.23 shows that the profiles are similar in the cases from the INTCF, the INE and the WHO High IC, the men:women ratio varies from 2.7:1 with the INTCF to 3.1:1 with the INE; whereas in the global WHO data the difference between sexes decreases to 2.3:1.

Figure 1.23. Percentage distribution of suicides in men and women, according to the INTCF, the INE and the WHO



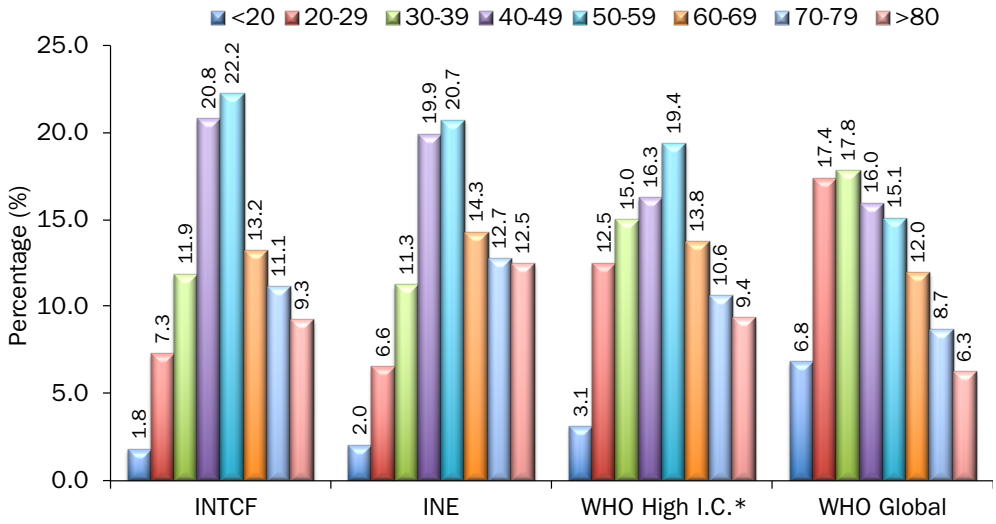
In the age range comparison (Figure 1.24) the profiles were also similar in the data from the INTCF, INE and the WHO High IC, although not as close as in the above case of sexes. Most of the suicide victims were in the 50-59-year-old range (≈ 20% in all three cases) and very close in percentage in the 40-49-year-old range; although the data provided by the

[9] INE 2019. Deaths by suicide. Detailed results. Available at: https://www.ine.es/dynt3/inebase/es/index.htm?padre=7933&capsel=7942 (last accessed on the 30 September 2021).

[10] WHO. Global Health Estimates 2010-2019: Estimated deaths by age, sex, and cause. Available at: https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-leading-causes-of-death (last accessed on the 1 October 2021).

WHO High IC shows that the percentage of people in the 40-49-year-old range is somewhat lower (16.3%). On the other hand, the global data from the WHO shows that most suicides happen in the 20-29-year-old range (17.4%) and 30-39 year-old (17.8%), and progressively decreases with the age. This means that there are large differences in the age of suicide victims, depending on the regions of the world being studied.

Figure 1.24. Percentage distribution of age ranges in the suicide cases, according to the INTCF, the INE and the WHO



* WHO High Income Countries

A detailed comparison of the suicide mechanisms according to data from the three institutions was not possible because, although we have the data from the INE and our INTCF, we do not have the WHO data. The main reason is that many countries, especially the low and medium-income countries, do not provide data on the suicide methods based on WHO data, which means that there is a bias in the information in 72% of cases[11].

Although there are no detailed tables, the WHO informs that in high-income countries, hanging is the most frequent suicide method (50%), followed by firearms (18%). Regarding the latter mechanism, the WHO finds differences depending on whether they are high-income countries in America, where firearm is the predominant suicide method (48%), whereas in the other high-income countries the percentage of suicide by firearm is reduced to 4.5%. Although the data may be biased due to the low number, in the medium and low-income countries most of the suicides are due to poisoning with pesticides.

[11] World Health Organization 2014. Preventing suicide. A global imperative. Available at: https://www.who.int/publications/i/item/9789241564779 (last accessed on the 30 September 2021).

If we compare the data from the WHO with the INTCF data, the results are identical. The predominant mechanism in the INTCF cases was hanging (40.9%) and the percentage of deaths by firearm was 4.8%; both data are very similar to the WHO data for high-income countries that are not on the American continent.

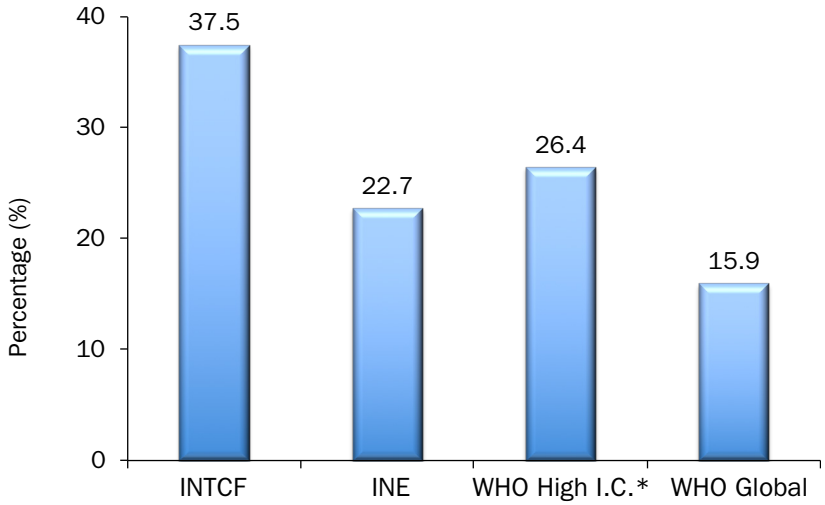
1.3.3. Contribution of suicide to violent deaths: INTCF/INE/WHO

Another method to evaluate the importance and repercussion of deaths by suicide, as a public health problem, is to determine the contribution of the rate of suicide to the total of violent deaths[12].

To this purpose a comparison study was carried out to establish the percentage of suicides in violent deaths, based on the data of the three organisations that we are assessing, and the two epidemiological variables available were also compared: sex and age. As stated above, the data on the date of the suicide and the detailed tables of the suicide methods were not available from the WHO.

Figure 1.25 shows the percentaje of suicides in violent deaths according to data from the INTCF, the INE and the WHO, the latter also differentiating the data in high-income countries (OMS: HIC) and global data (for the whole world). The highest percentage was found in the data from the INTCF (37.5%), followed by the WHO: High IC (26.4%), the INE (22.7%) and only 15.9% of violent deaths were by suicide in the global data of the WHO.

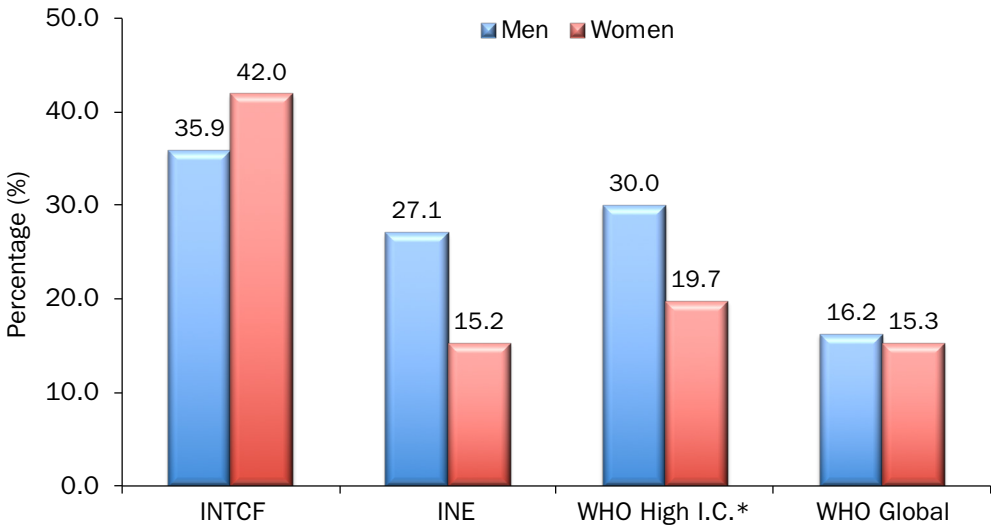
Figure 1.25. Percentage of suicides in deaths from violent causes. Data from the INTCF, INE and WHO



[12] World Health Organization 2014. Preventing suicide. A global imperative. Available at: https://www.who.int/publications/i/item/9789241564779 (last accessed on the 30 September 2021).

When looking at the influence of sex, significant changes were found in the ratio between men and women (Figure 1.26), decreasing from 3.1 to 1.8 in the data from the INE and from 2.9 to 1.5 in the WHO High IC data and from 2.3 to 1.1 in the WHO:Global. The ratio was the opposite in the data from the INTCF (from 2.7 to 0.9) because almost half of the women who died due to violent causes in the INTCF cases committed suicide (42.0%) compared to 35.9% of men.

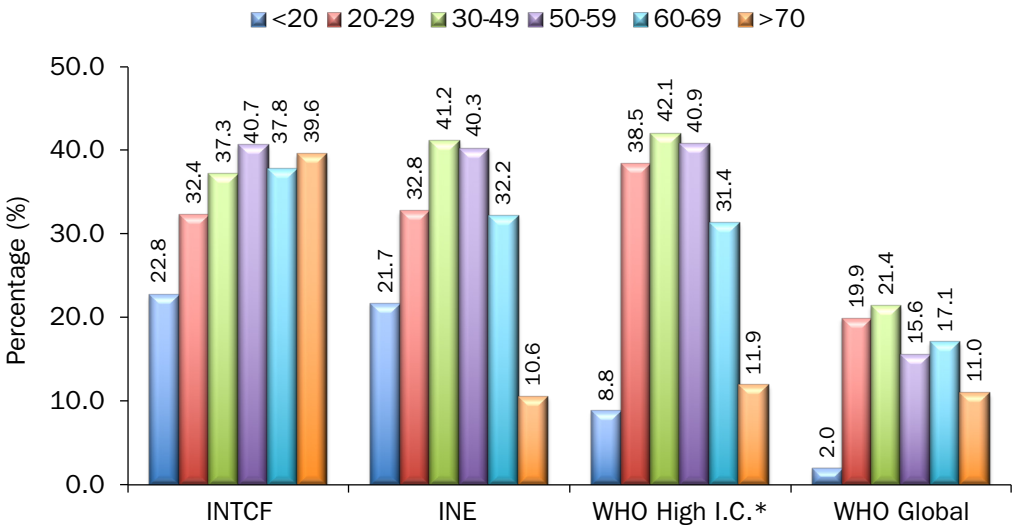
Figure 1.26. Percentage of suicides in deaths from violent causes: Influence of sex



* WHO High Income Countries

Figure 1.27 shows the influence of age. In this case, the INE and WHO: High IC data are also the most similar. In this figure we must also point out, on the one hand, that the percentages of all of the age groups of the WHO global data are almost half of the other groups studied and; on the other hand, the high rate of the higher age group in the INTCF data (39.6%) compared to those from the other organisations, which vary from 10.6% (INE) to 11.9% (WHO: High IC).

Figure 1.27. Percentage of suicides in deaths from violent causes: Influence of age[13]



* WHO High Income Countries

[13] The age ranges were adapted to the data available from the WHO.

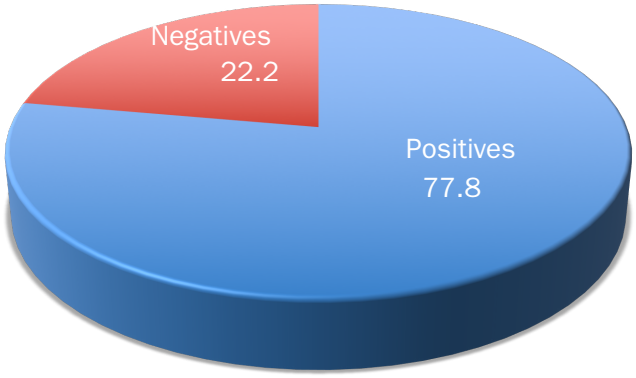
2. TOXICOLOGICAL STUDY

2.1. General data

This second part of the report presents the toxicological findings in the deaths by suicide received at the INTCF in 2019.

The study did not include the cases that died in the hospital after several days of hospitalisation and in which only the substances administered in the hospital treatment were detected; neither did it includes the cases that were found in an advanced stage of decomposition, due to the impossibility to interpret the results obtained. Following these criteria, 107 cases were discarded, and therefore, 1,715 suicides were considered in the assessment of the toxicological findings.

Figure 2.1. Distribution by toxicological result (%)



Most cases (1,334; 77.8%) had a positive toxicological result, whereas in only 22.2% (381 cases) no substance of toxicological interest was found. This data could indicate that 22% of the suicide cases received at the INTCF did not have a medical treatment prescribed, or they were not following it.

2.1.1. Population study comparing the cases with positive and negative toxicological results

Below there is a comparison study to establish possible differences in the epidemiological profiles of the cases with positive and negative toxicological results.

When comparing the distribution by sex, there are differences both if they are assessed regarding the total number of suicides, or regarding the deaths of each sex. In the first case, the positive:negative ratio in men is 2.9:1; while in women the data of positives

doubled: 6.5 women had a positive result for each negative result case (Figure 2.2A). In the second case, the ratios are the same, but Figure 2.2B shows that 86.7% of women who committed suicide had consumed some type of substance, compared to 74.5% of men.

Figure 2.2. Influence of sex. A: Percentage distribution by sex regarding the total suicides (1,715 cases); B: Percentage distribution regarding each of the sexes

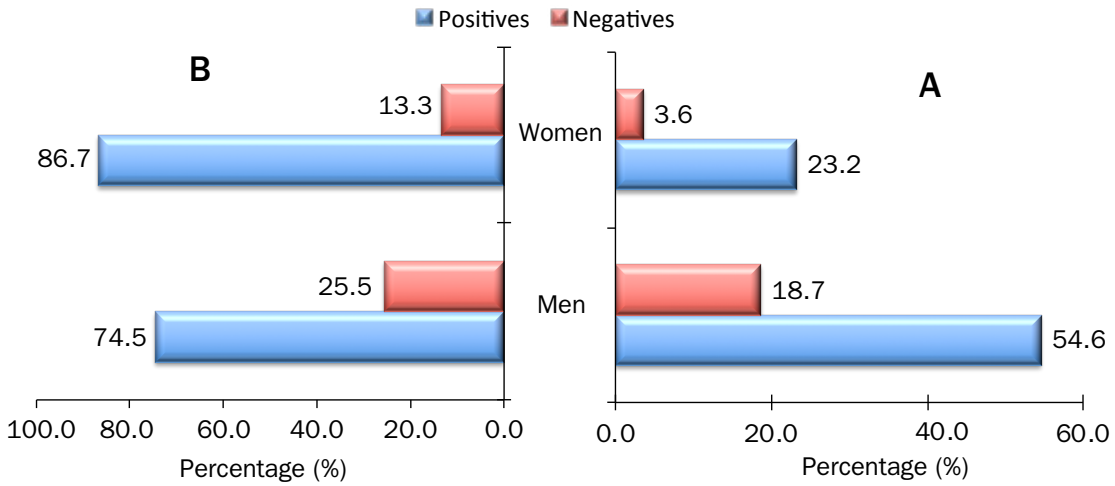
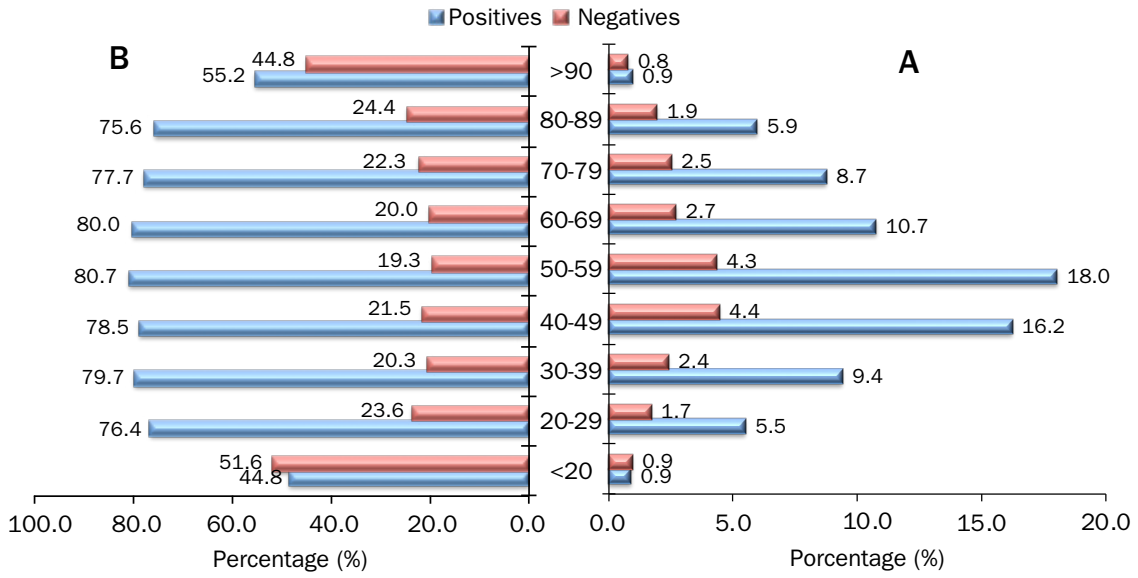


Figure 2.3 shows the influence of age and there are two different distributions depending on whether we consider the percentage regarding the total number of suicides received at the INTCF (Figure 2.3A), or regarding the number of suicides in each age range (Figure 2.3B). In the first case, the distribution is pyramid-shaped, both in the positive and negative cases, the highest percentages were found in people in the 50-59 year-old (18.0% positive and 4.3% negative) and 40-49 year-old ranges (16.2% positive and 4.4% negative) and the lowest in the under-20 year-old and over-90 year-old with almost the same percentages: 0.9% positive in both cases and 0.9% negative in the 20 year-old and 0.8% in the over 90-year-old ranges.

Comparing the toxicological results obtained in each age range with the total deaths in each of the ranges, we found two different profiles in the positive:negative ratios. In most cases, in the 20-29 and 80-89 ranges the ratio is 4:1 (with the positives varying from 80.7% in the 50-59 range and 75.6% in the 80-89 range, and the negative cases varying from 19.3% in the 50-59 range to 24.4% in the 80-89 range), whereas in the under 20s and over 90s the ratio is 1:1 (44.8% positive and 51.6% negative in the under 20s, and 55.2% positive and 44.8% negative in the over 90s).

Figure 2.3. Influence of age. A: Percentage distribution of the age ranges regarding the total suicides (1,715 cases); B: Percentage distribution regarding each of the age ranges



The profiles of the date of suicide are also different depending on whether they are compared with the total number suicides (Figure 2.4.A) or with the number of suicides committed in each of the months of the year (Figure 2.4.B). In the first case no differences were found in the percentages of negative results during the whole year, varying between 1.3% in November and 2.2% in August. On the other hand, the percentage of positive results varies throughout the twelve months of the year, being lower in February and November (4.8% in both months) and higher in the summer months from June to September (6.7%-7.6%). The increases and decreases in the percentage of positives match the months with the higher or lower number of suicides (Figure 1.6).

When comparing the toxicological results obtained each month with the total number of deceased during each month of the year, the profiles of both the negative and positive cases are the same throughout the twelve months of the year. The positives vary between 74.1% in February and 83.1% in September; these months are, obviously, the ones that also have the highest (25.9%, February) and lowest (16.9%) percentage of negatives.

The figure below shows the number of cases with positive toxicological result for each AC and the percentage regarding the total number of cases received from each one.

Following the same criteria specified in the previous chapter, the Autonomous Communities of Andalusia, Valencia, the Canary Islands, Galicia, Madrid, C-La Mancha and C-Leon were chosen for a more detailed study.

Figure 2.4. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of suicides (1,715 cases); B: Percentage distribution regarding each of the months of the year.

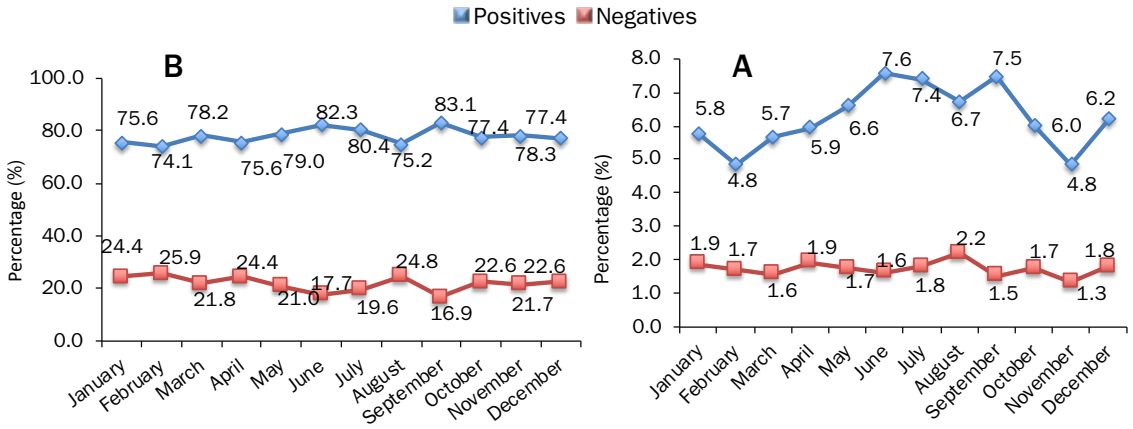
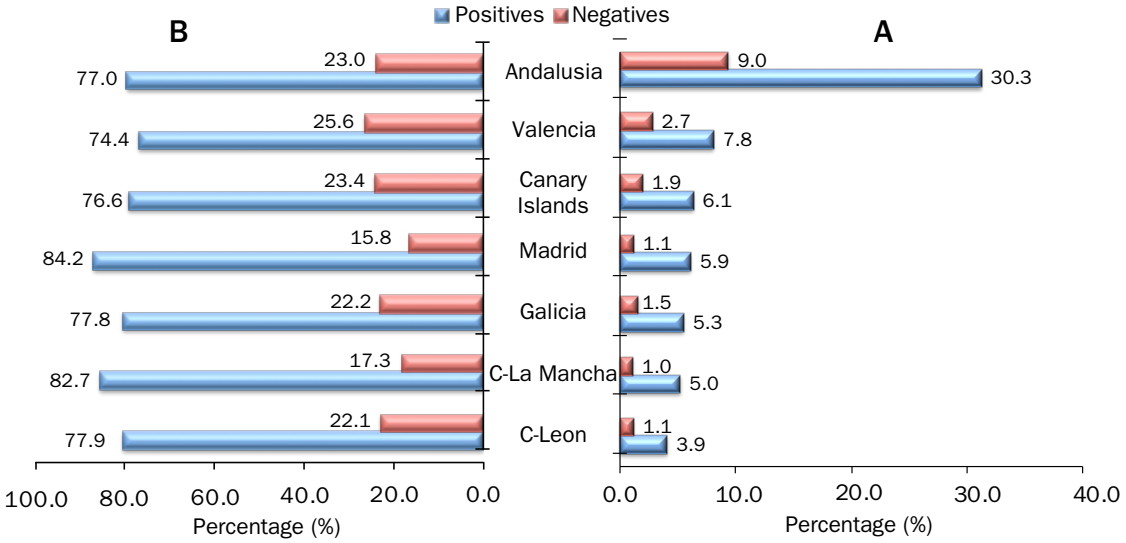


Figure 2.5. Number of positive cases in each AC and percentage regarding the number of cases received from each one

The same as in the previous parameters, the profiles differ depending on whether they are compared with the data of the total number of suicides (Figure 2.6.A) or with the cases received from each of the AC (Figure 2.6B). In the first case, the percentage of positives depends on the number of cases received from each AC; the largest percentage corresponds to Andalusia (710 cases received, 30.3% positive) and the lowest to C-Leon (86 cases received, 3.9% positive); the percentage of negatives follows the same criteria, the highest percentage in Andalusia (9.0%) and the lowest in C-La Mancha (1.0%). The exceptions are Madrid (124 cases received, 1.1% negative) with a percentage of negatives lower than Galicia (125 cases received, 1.5% negative) and C-La Mancha (110 cases received, 1.0% negative) with a percentage of negatives lower than C-Leon (86 cases received, 1.1% negative).

Figure 2.6. Influence of the AC. A: Percentage distribution by number of suicides in each AC regarding the total of suicides (1,715 cases); B: Percentage distribution regarding each of the AC

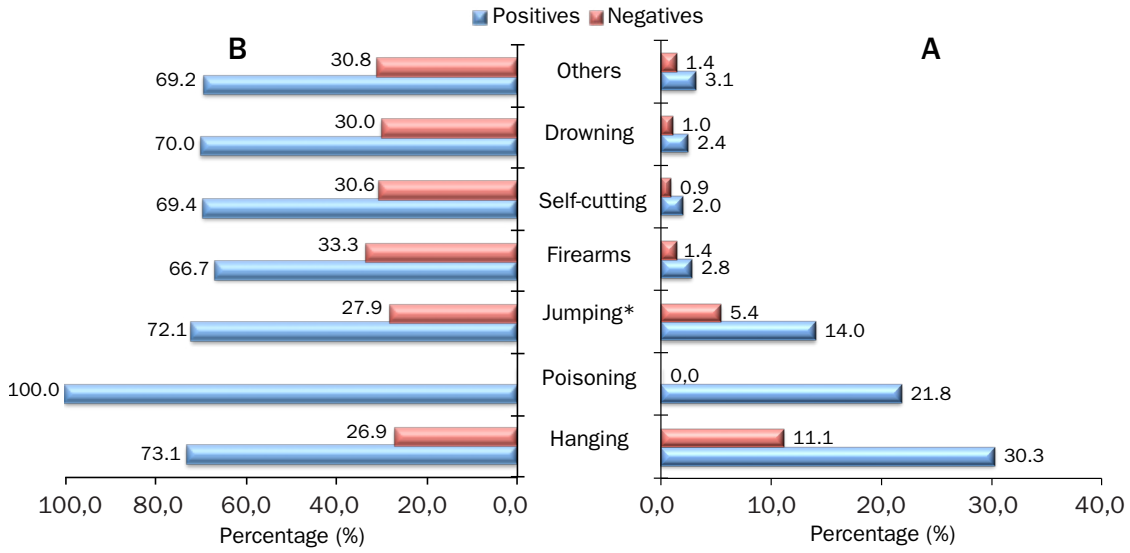


When the toxicological results obtained in each AC are compared with the total number of cases received from each of them, no differences were found. The positive:negative ratio is 3:1 in all AC and varies between Valencia (2.9:1) and Galicia and C-Leon (3.5:1 in both cases); the exception was found in C-La Mancha (4.8 positives for each negative) and Madrid (5.3 positives for each negative).

When the comparison study of the suicide mechanisms was performed, different profiles were also found depending on whether they were compared with the total number of suicides received (Figure 2.7.A) or with the suicides committed using each of the mechanisms (Figure 2.7.B). In the first case, the highest percentage of positives was found in suicides by hanging (30.3%), followed by poisoning (21.8%) and jumping from height (14.0%), while the percentage of positives in the other mechanisms was lower and similar, varying from

2.0% by self injury by cutting to 3.1% by "others". The percentages of negatives followed the same criteria, with the exception of the poisoning cases, where no case was found with a negative result. When comparing the toxicological results regarding the total of suicides committed by each of the mechanisms, the profiles are the same in all cases, except in poisoning, where, as previously stated, all cases received had a positive toxicological result. The positive:negative ratio in the other mechanisms was 2.5:1; ranging from firearm (2.0:1: 66.7% positive and 33.3% negative) to hanging (2.7:1: 73.1% positive and 26.9% negative).

Figure 2.7. Influence of the suicide mechanism. A: Percentage distribution by number of suicides committed by the different mechanisms regarding the total of suicides (1,715 cases); B: Percentage distribution regarding each of the mechanisms



2.2. Substances detected in the cases of suicide

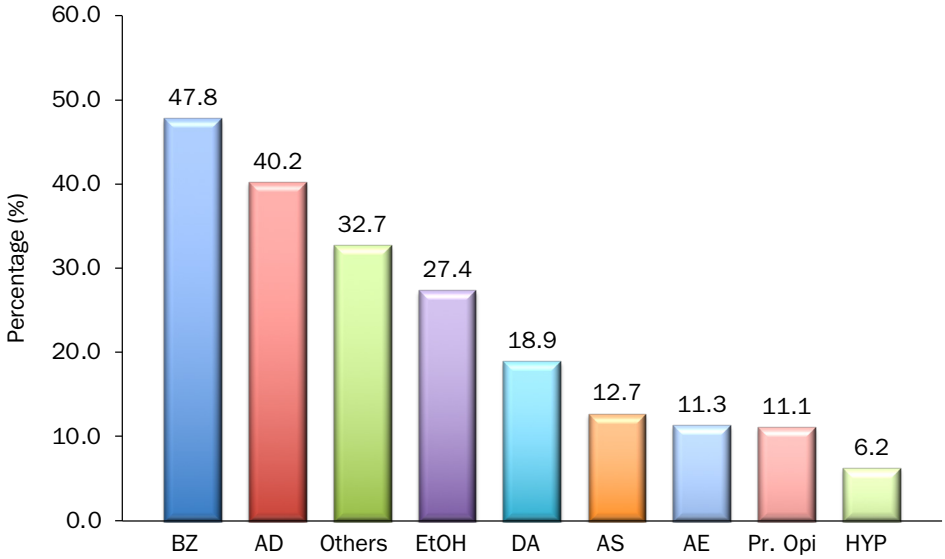
The substances detected were classified in the following groups:

- Ethyl alcohol: EtOH
- Antidepressants: AD
- Antiepileptic drugs: AE
- Antipsychotic drugs: AS
- Benzodiazepines: BZ
- Drugs of abuse: DA

- Hypnotic drugs: HYP
- Prescription opioids: Pr. Opi; which includes: codeine, dextromethorphan, fentanyl, methadone, morphine, oxycodone, pethidine, tapentadol and tramadol.
- Other: This group includes the medications and other compounds (caustic substances, pesticides and related substances, carbon monoxide, cyanide, etc.) not included in the above groups.

The figure below shows the percentage distribution of the various substance groups detected in the cases of suicides received at the INTCF.

Figure 2.8. Distribution of the groups of medications and drugs detected in the suicides, not taking into account possible associations

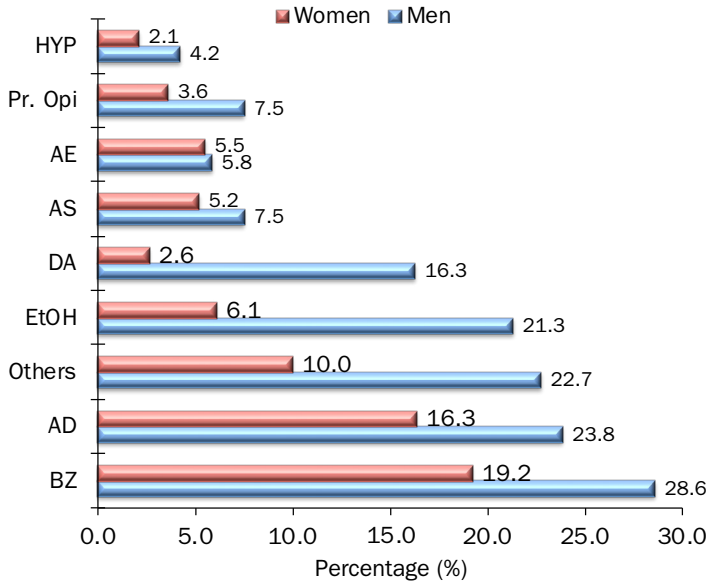


Almost half of the positive cases had consumed benzodiazepines (47.8%), followed by antidepressants (40.2%), the group "others" (32.7%) and EtOH (27.4%). The percentages of the other groups were lower and ranged from 18.9% for drugs of abuse to 6.2% for hypnotic drugs. The sum of the percentages of the various groups of compounds enables us to predict that there was simultaneous consumption of several groups of compounds, as will be explained below.

2.2.1. Influence of sex, age, date of the suicide, Autonomous Community and mechanism

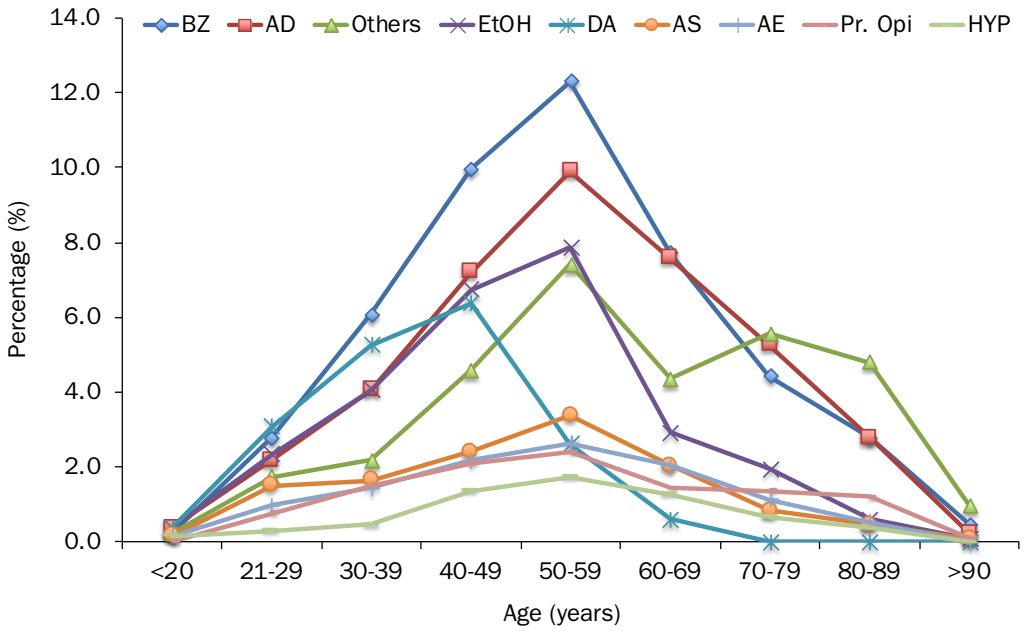
When comparing the distribution by sex (Figure 2.9) differences were only found in two groups of compounds, DA and EOH. In all of the groups studied, the men:women ratio varied from 1.1 for AE to 2.3 of the "others" group. The exception was for EtOH, with a ratio of 3.5 and for DA, where the ratio is up to 6.3.

Figure 2.9. Influence of sex on the groups of compounds detected



The age ranges varied between the <20 and >90-year-olds in most cases, except for DA, where the oldest person was 66 years-old.

Figure 2.10. Influence of age on the groups of compounds detected

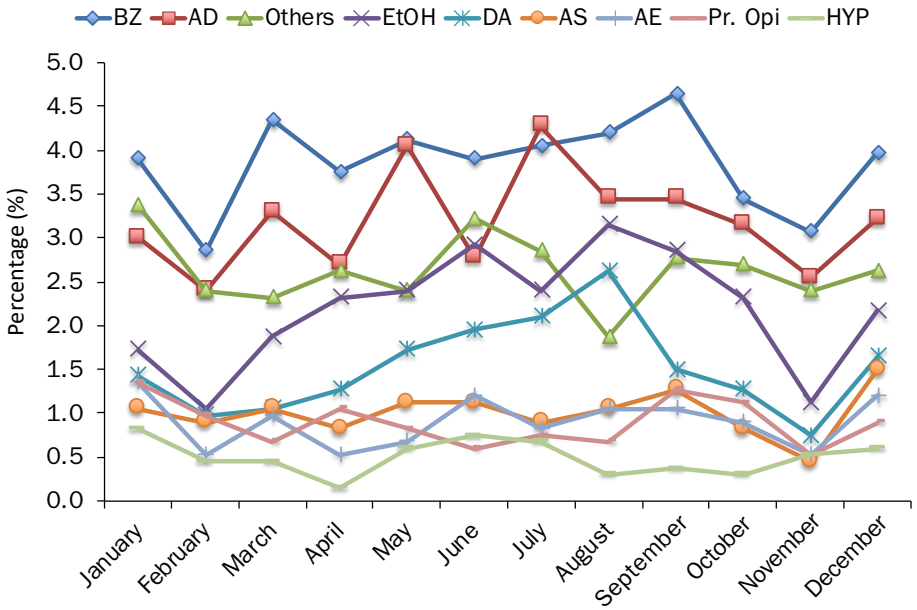


The same as with the sex variable, differences were also found in the DA group in the age distribution. Most groups showed a gradual increase up to 50-59 year-olds, and a later decrease up to 90-year-olds, however, the DA group showed a rapid increase from

the 20-29 year-olds (0.4%) to the maximum at 40-49 year-olds (6.4%) and then a sudden decrease in the 50-59 year-olds (2.6%). In the other groups of compounds, the highest percentages were found in the 50 to 59 years, varying from 12.3% for BZ to 1.7% for HYP.

No major differences were found in the profiles of the mechanisms in the various groups of compounds throughout the twelve months of the year (Figure 2.11 and Appendix 3). The exceptions were found in EtOH and in DA, with similar profiles. The percentages increased from February (1.0% EtOH and DA) to August (3.1% EtOH and 2.6% DA), then they decreased until November (1.1% EtOH and 0.7% DA) and they again increased in December (2.2% EtOH and 1.6% DA).

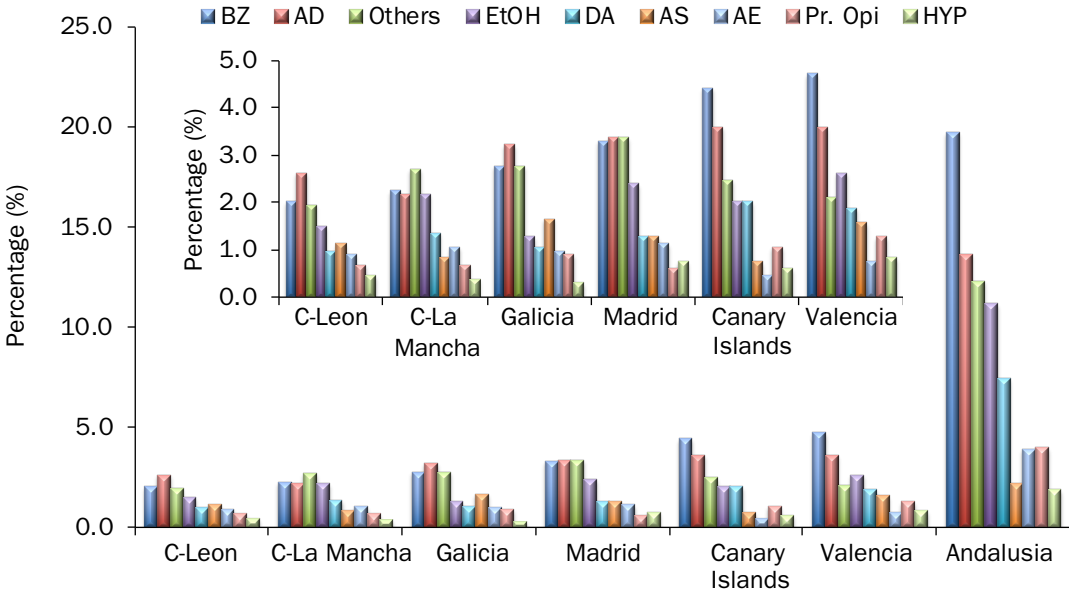
Figure 2.11. Influence of the date of the suicide on the groups of compounds detected



Several differences were found in the groups of compounds detected in the seven AC considered in this report (Figure 2.12 and Appendix 3). In the AC of Andalusia, Valencia and the Canary Islands the percentages of groups detected showed a profile similar to that of the general population (Figure 2.8) (BZ > AD > "others" > EtOH > DA > AS > Pr. Opi > HYP); C-Leon had the same profile, except for AD (2.6%), which were higher than the BZ (2.0%); in Madrid and Galicia no differences were found in the percentages of BZ (3.3% Madrid and 2.8% Galicia), AD (3.4% Madrid and 3.2% Galicia) and "others" (3.4% Madrid and 2.8% Galicia) and in C-La Mancha the percentages of BZ (2.2%), AD (2.2 %), "others" (2.7%) and EtOH (2.2%) were similar.

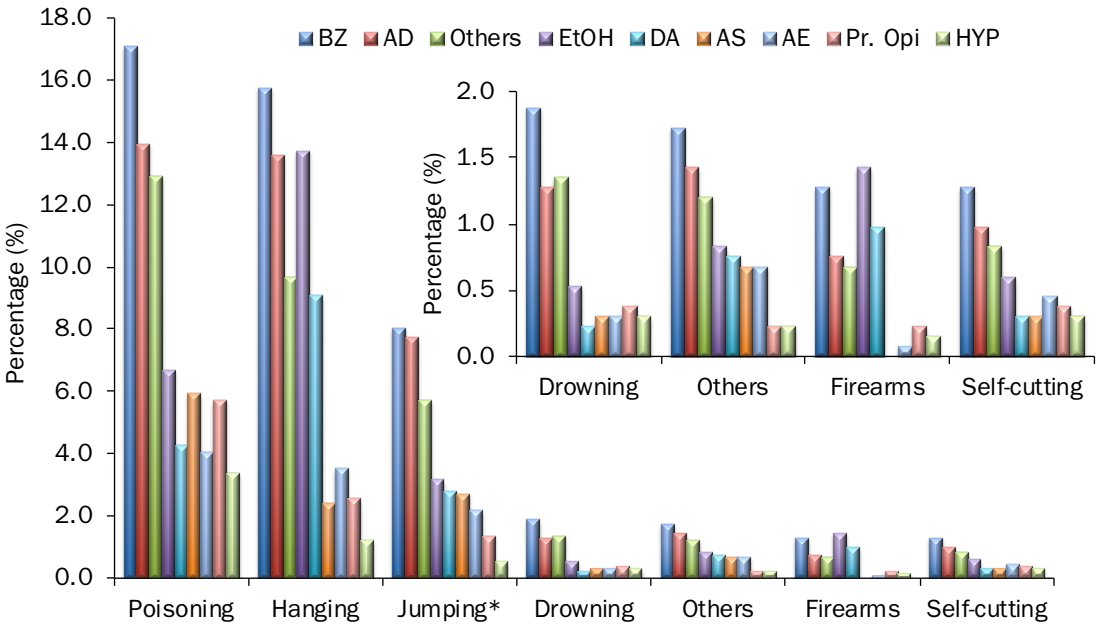
Several differences were found in the groups of compounds detected in the various suicide mechanisms (Figure 2.13 y Appendix 3). In the jumping from height, "others" and self injury by cutting mechanisms, the percentages of groups detected also showed a profile similar to that of the general population (Figure 2.8) (BZ > AD > "others" > EtOH > DA >

Figure 2.12. Influence of the Autonomous Community on the groups of compounds detected



AS > Pr. Opi > HYP); in poisoning the percentages of AS and Pr. Opi were slightly higher to what they should have been according to the profile; in drowning, the percentage of "others" (1.3%) was the same as for AD (1.3%); in hangings there were significant percentages of EtOH (13.7%) and DA (9.1%), as well as in the suicides by firearms (1.4% EtOH and 1.0% DA), no antipsychotic compounds were detected in this mechanism.

Figure 2.13. Influence of the suicide mechanism on the groups of compounds detected (%)



2.3. Substances detected in mono-intoxications and poly-drug use

As shown in Figure 2.8, most of the cases are related to poly-drug use due to the simultaneous consumption not only of compounds of several groups, but also several medications of the same group and, therefore, with the same pharmacological activity. In only 38.7 % of the suicides a single group of compounds was detected, and in even less cases (33.5%) consumption of a single substance was found. The number of combinations of groups of compounds detected in a same case varied between 1 and 7 (average 2.1; median 2.0) and the number of substances consumed simultaneously varied between 1 and 12 (average 2.5; median 2.0).

Figure 2.14 shows, on the one hand, that the simultaneous consumption of several groups of compounds progressively decreases from 38.7 % the cases in which only one group is detected to 4.1%, where 5 or more groups of compounds are found. A similar profile was found in the percentages of substances consumed simultaneously by the same individual. The cases in which only one substance was detected were 33.5%, a percentage that decreased to 11.2% in the cases positive for four substances and the percentage was maintained (11.7 %) in the cases positive for 5 or more substances.

Figure 2.14. Influence of the simultaneous consumption of groups of compounds and of individual compounds (%)

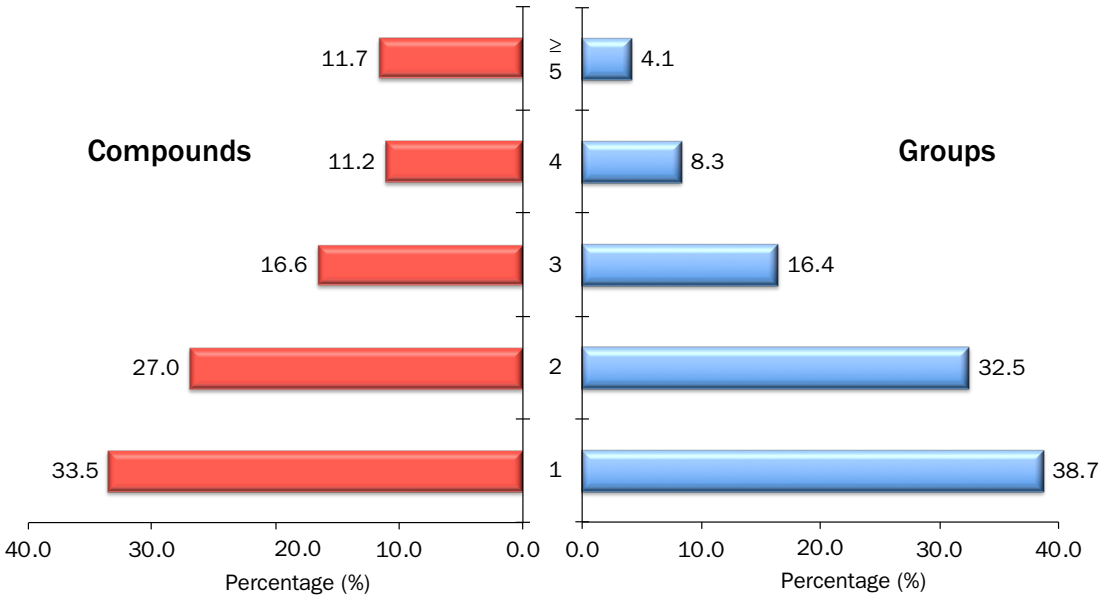
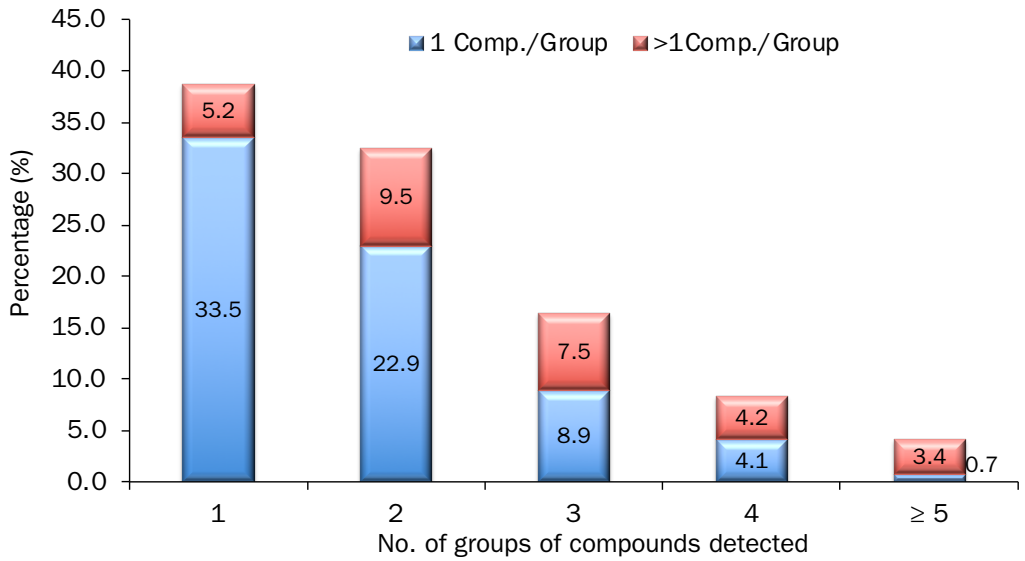


Figure 2.15 shows the aggravated problem entailed by the simultaneous consumption of several substances of the same group. Consumption of a single substance of each group decreased as the number of groups consumed simultaneously increased. In 33.5 % of the suicides where a single group of compounds was detected there was also consumption

of a single substance; whereas this percentage decreased to 0.7% in the cases where 5 or more groups of substances were detected. If we consider the simultaneous consumption of several substances of the same group, there is an increase from 5.2% in the cases in which only a single compound per group was detected, to 9.5% in those where associations of two groups of compounds were detected, and after that point the percentages decreased to 3.4% where associations of 5 or more groups of substances were detected.

Figure 2.15. Percentage distribution of cases where mono-intoxications or poly-drug use of several substances of the same group was detected

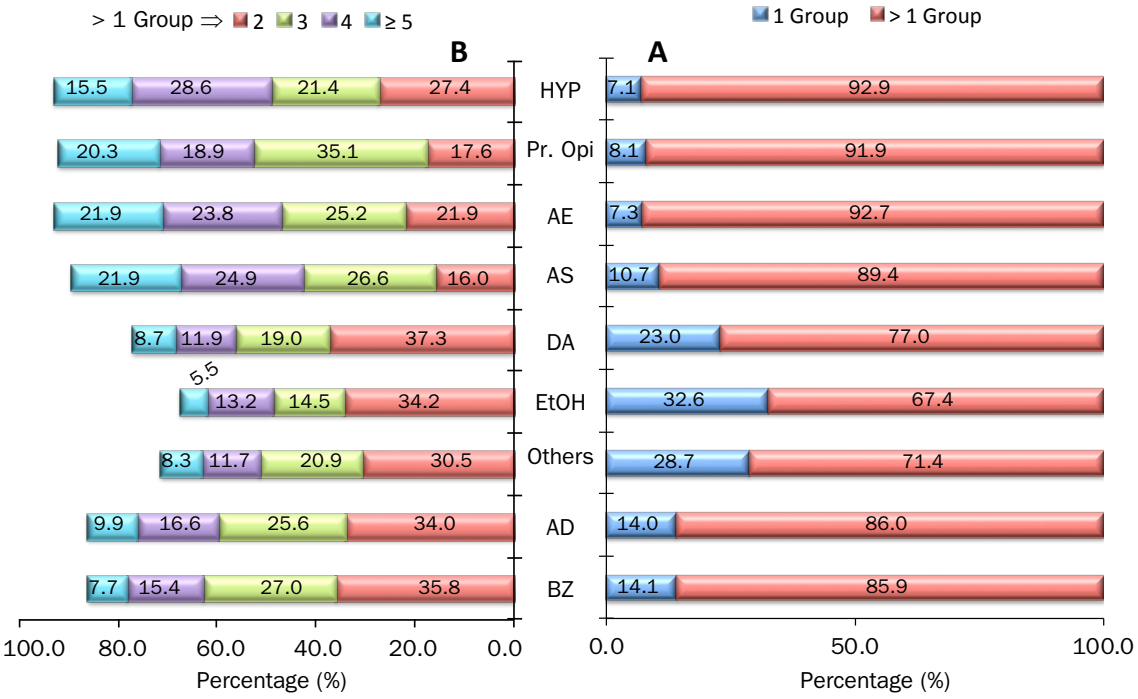


If we consider each of the groups of compounds included in the study, Figure 2.16A shows that, in all the cases, simultaneous consumption of more than one group of compounds was found. The percentages ranged from 92.9% and 92.7% in the HYP to AE groups to 67.4% in the EtOH group.

When breaking down by number of groups of compounds consumed simultaneously (Figure 2.16B), different profiles were observed: in the BZ, AD, "others", EtOH and DA groups, most cases had consumed 2 groups of compounds simultaneously (varying between 37.3% for DA and 30.5% for "others"), followed by those consuming three groups (27.0% for BZ - 14.5% for EtOH), 4 groups (16.6% for AD - 11.7% for "others") and lastly the cases that had consumed 5 or more substances (9.9% for AD-5.5% for EtOH). Different profiles were found in the AS, AE and Pr. Opi groups, most of which had consumed 3 groups of compounds (35.1% Pr. Opi - 25.2% AE) followed by those consuming 4 groups (24.9% for AS - 18.9% for Pr. Opi) and 5 or more groups (21.9% for AS and AE and 20.3% for Pr. Opi) and the lower percentages were found in those who had

consumed 2 groups (21.9% for AE and 16.0% for AS). Most cases in the HYP group had consumed 4 and 2 groups of compounds (28.6% and 27.4%, respectively) followed by the cases with 3 groups of compounds (21.4%) and lastly those who had consumed 5 or more groups of compounds (15.5%).

Figure 2.16. Distribution of the number of groups of compounds detected in each of the groups studied



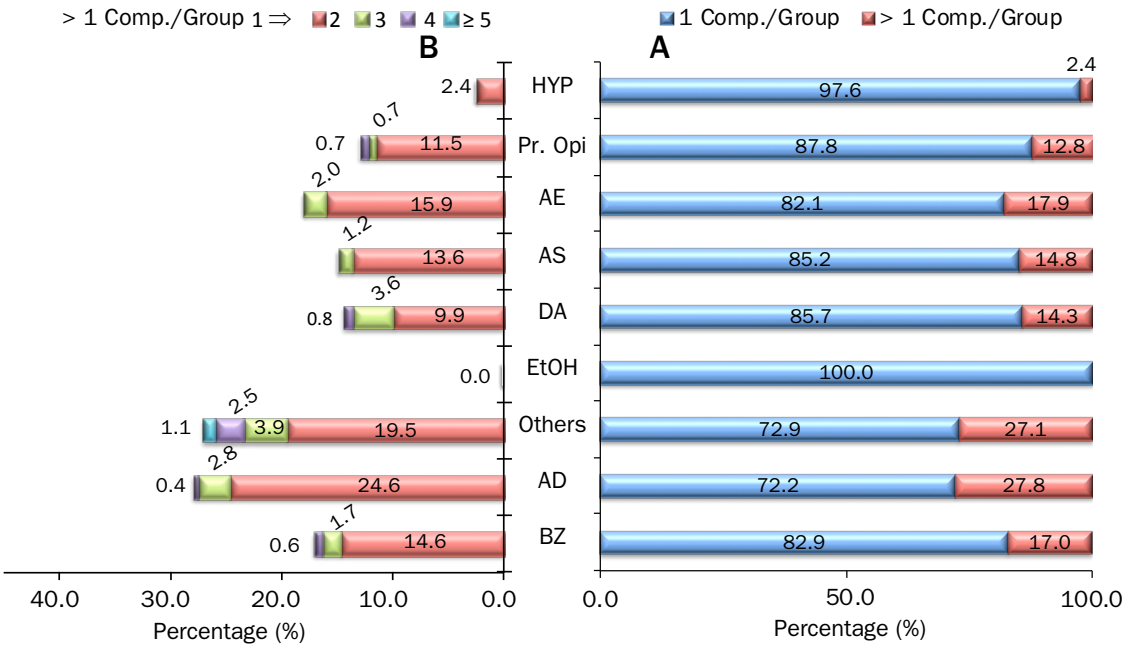
The table below shows the combinations detected in each of the nine groups. The percentages in which only one group of compounds was detected have been highlighted for easier identification. The rate of consumption of a single group of compounds was very low and varied from 0.4% for HYP to 9.4% for the "others" group. As for the combinations, the highest percentages were recorded for BZ and AD, which are also the most frequently detected groups in suicide cases. The distribution of combinations of the other groups also followed the same profile, decreasing as the rate of the various groups was lower. There were two exceptions, EtOH and DA. In the case of EtOH, the percentage of cases in which only ethyl alcohol was detected (8.9%) coincides with the combination with BZ (9.1%) and both are close to the combinations with AD (7.3%) and DA (7.0%). In the case of DA, the combination with EtOH (7.0%) stands out, similar to BZ (7.7%) and confirms the simultaneous consumption of drugs of abuse with ethyl alcohol.

% (Percentage)	Benzodiazepines	Antidepressants	Other	Ethyl alcohol	Drugs of abuse	Antipsychotic drugs	Antiepileptic drugs	Prescription opioids	Hypnotic drugs
Benzodiazepines	6.7	24.7	13.8	9.1	7.7	8.3	6.9	7.9	3.2
Antidepressants	24.7	5.6	12.2	7.3	4.7	7.6	7.3	5.3	2.6
Other	13.8	12.2	9.4	6.1	2.2	3.8	2.9	3.9	2.5
Ethyl alcohol	9.1	7.3	6.1	8.9	7.0	1.9	2.1	1.9	2.2
Drugs of abuse	7.7	4.7	2.2	7.0	4.3	1.8	2.2	2.5	0.9
Antipsychotic drugs	8.3	7.6	3.8	1.9	1.8	1.3	3.6	2.5	1.0
Antiepileptic drugs	6.9	7.3	2.9	2.1	2.2	3.6	0.8	1.7	0.7
Prescription opioids	7.9	5.3	3.9	1.9	2.5	2.5	1.7	0.9	0.9
Hypnotic drugs	3.2	2.6	2.5	2.2	0.9	1.0	0.7	0.9	0.4

As previously explained, in addition to the simultaneous consumption of several groups of medications an additional problem is the simultaneous consumption of several substances of the same group.

Figure 2.17A shows the percentages of cases where consumption of a single or several compounds per group was detected and. In this case the profiles are opposite to those found in Figure 2.43, because in most groups only one compound was detected, ranging from 100% for EtOH (a logical result, as the group is comprised of a single compound) to 72.2% for AD. After breaking down the number of compounds in each group, consumed

Figure 2.17. Distribution of the percentages of mono-intoxications and poly-drug use of substances of the same group



simultaneously (Figure 2.17B), in most cases 2 compounds were detected, ranging from 24.6% for AD to 2.4% for HYP. The rate of simultaneous consumption of 3 or more compounds of the same group was considerably lower.

Below is a more in-depth study of each of the groups of compounds.

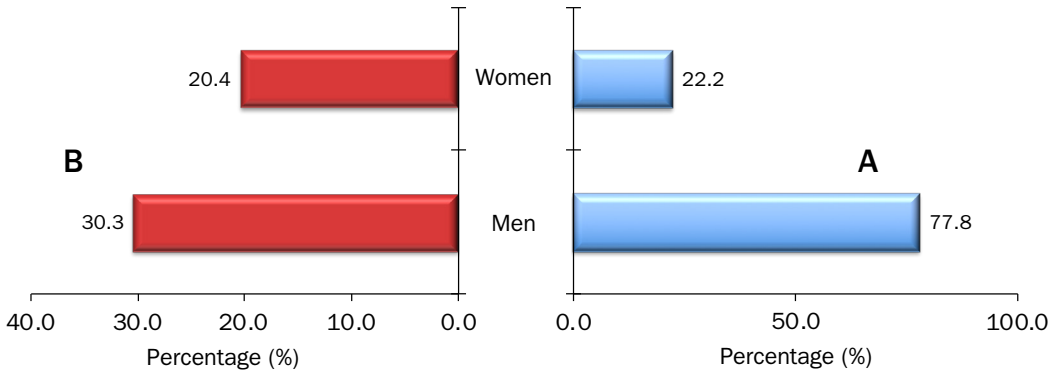
2.4. Ethyl alcohol (EtOH)

365 of the cases of the suicides received at the INTCF in 2019 had consumed ethyl alcohol, which represents a 21.3% of all suicides, and 27.4% of the cases with positive results.

2.4.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for ethyl alcohol

If we consider the sex of the cases positive for EtOH, 77.8% were men and 22.2% were women (Figure 2.18A). The same profile was obtained when comparing the total of positive cases in each of the sexes, 30.3% of men with positive result had consumed EtOH, compared to 20.4% of women (Figure 2.18B).

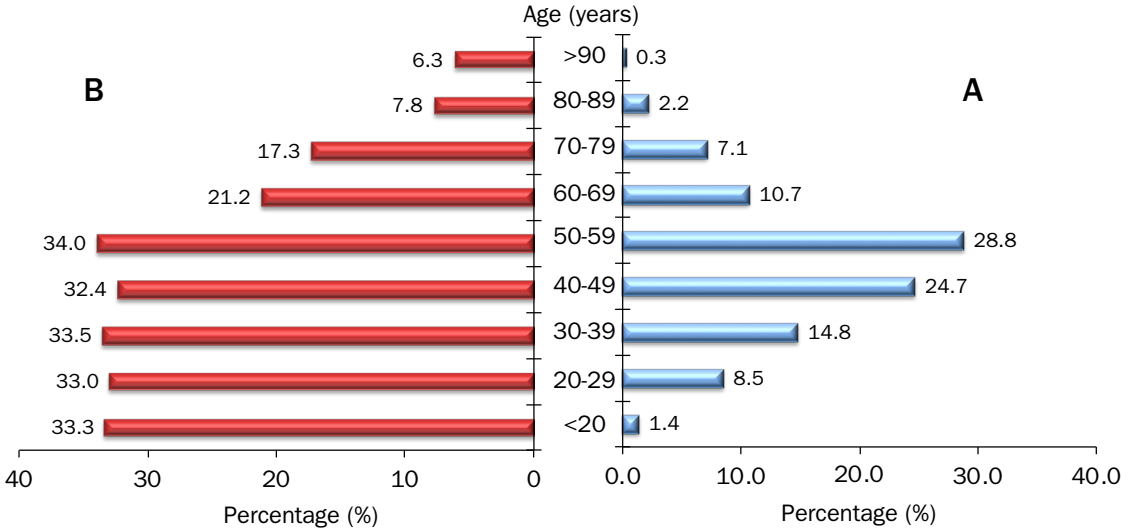
Figure 2.18. Influence of sex. A: Percentage distribution of the cases positive for EtOH in both sexes; B: Percentage distribution of positives for EtOH regarding the total of positive cases in each of the sexes



In order to study the influence of age, different profiles were obtained depending on whether only the EtOH positive cases were studied, or if the comparison was performed with the cases with positive result in each of the age ranges considered. In the first case, we obtained the pyramid-shaped profile increasing from the under-20s at 1.4% to ages from 50 to 59 (28.8%), and then decreasing up to the over-90s (0.3%) (Figure 2.19A). In

the second case (Figure 2.19B), the percentages were similar between the under-20s up to 50-59 years-old (varying from 32.4% in the 40-49 year-old range to 34.0% in the 50-59 year olds) and after 60 years old the percentages decreased progressively with age, to 6.3% in people over 90 years old.

Figure 2.19. Influence of age. A: Percentage distribution of the age ranges in the cases positive for EtOH (365 cases); B: Percentage distribution regarding each of the age ranges



If we consider the evolution of positive cases over the twelve months of the year, the profiles were similar both when compared with the total of EtOH positive cases (the percentages ranged from 3.8% in February to 11.5% in August) (Figure 2.20A), and when compared with the number of cases with positive result of each month, although in this case the percentages were not so homogenoeous (Figure 2.20B).

In the AC, 40.8% of the EtOH positive results were found in Andalusia, much higher than the percentage of the other AC, which varied from 9.6% in Valencia to 4.7% in Galicia (Figure 2.21A). As in the previous cases, the profiles differed when they were compared with the total of positive cases from each AC. In this case, the percentages were similar in all AC (ranging from 25.7% in the Canary Islands to 33.7% in C-La Mancha); the exception was found in Galicia, with only 18.7%.

Most of the EtOH positives committed suicide by hanging (50.1%), followed by poisoning (24.4%) and jumping from height (11.5%), and in a lower proportion by other mechanisms, varying from 1.9% (drowning) to 5.2% (firearm) (Figure 2.22A). When comparing the percentage of EtOH positives with the number of positives for each mechanism, the percentages in the cases of hanging (48.9%) and firearm (55.9%) stand out, while

the percentages in the other mechanisms were lower and similar (varying from 14.6% in drowning to 20.4% in "others") (Figure 2.22B).

Figure 2.20. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for EtOH (365 cases); B: Percentage distribution regarding each of the months of the year

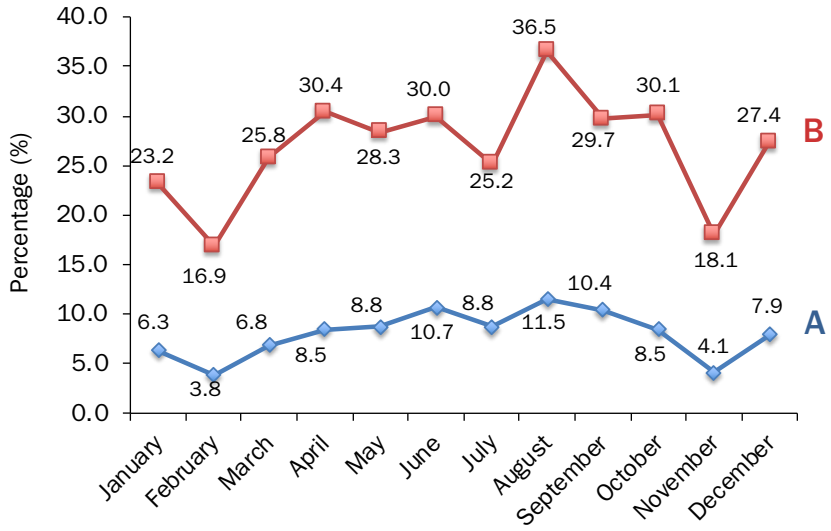


Figure 2.21. Influence of the AC. A: Percentage distribution of the number of cases positive for EtOH in each AC; B: Percentage distribution of positives for EtOH regarding the total of positive cases in each AC

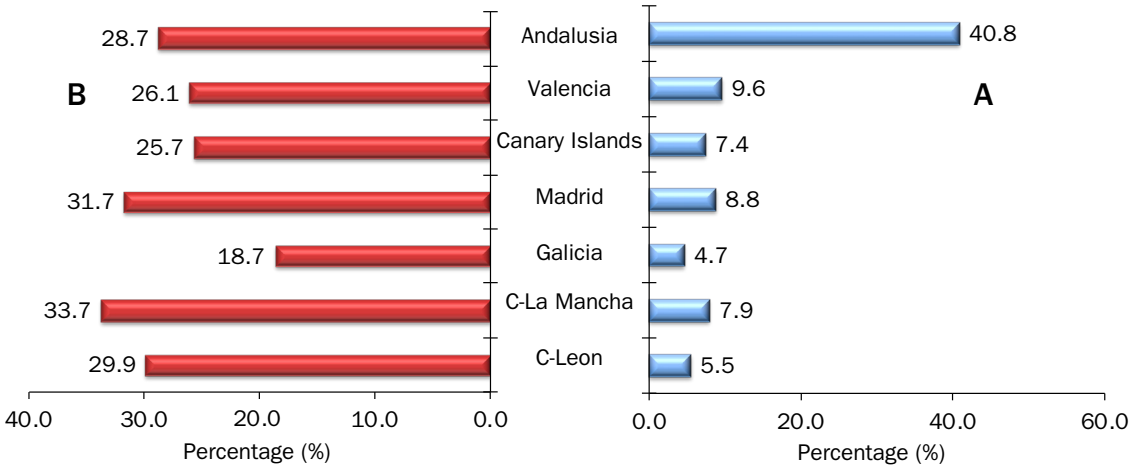
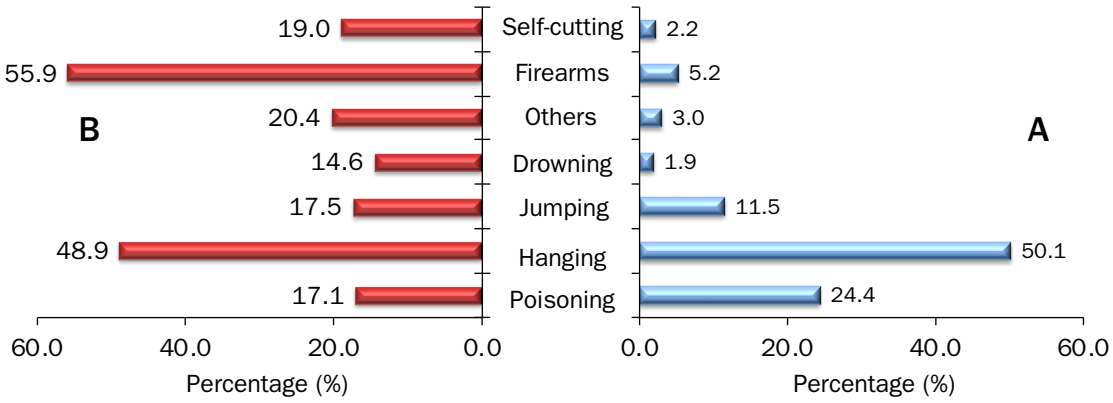


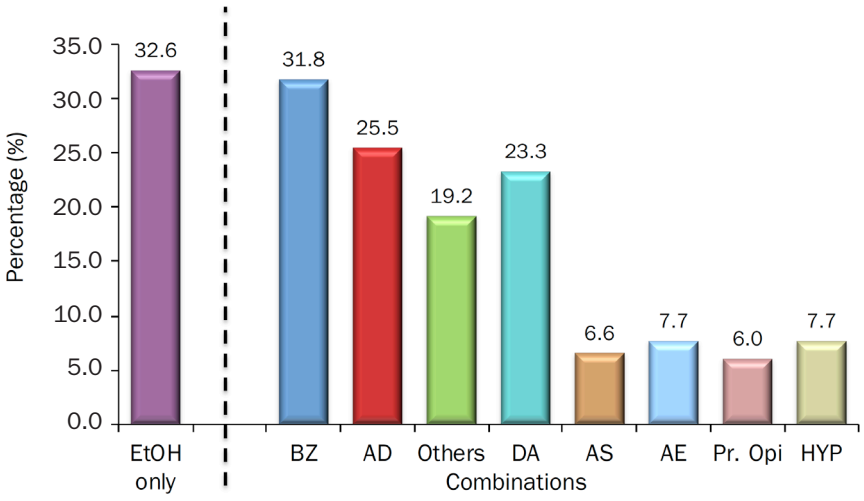
Figure 2.22. Influence of the suicide mechanism. A: Percentage distribution of cases positive for EtOH in each of the suicide mechanisms; B: Percentage distribution of positives for EtOH regarding the total of positive cases in each of the mechanisms



2.4.2. Mono-intoxications versus poly-drug use

Figure 2.23 shows the percentage distribution of the combination of groups of substances detected along with EtOH.

Figure 2.23. Percentage distribution of the combinations of substances detected along with EtOH

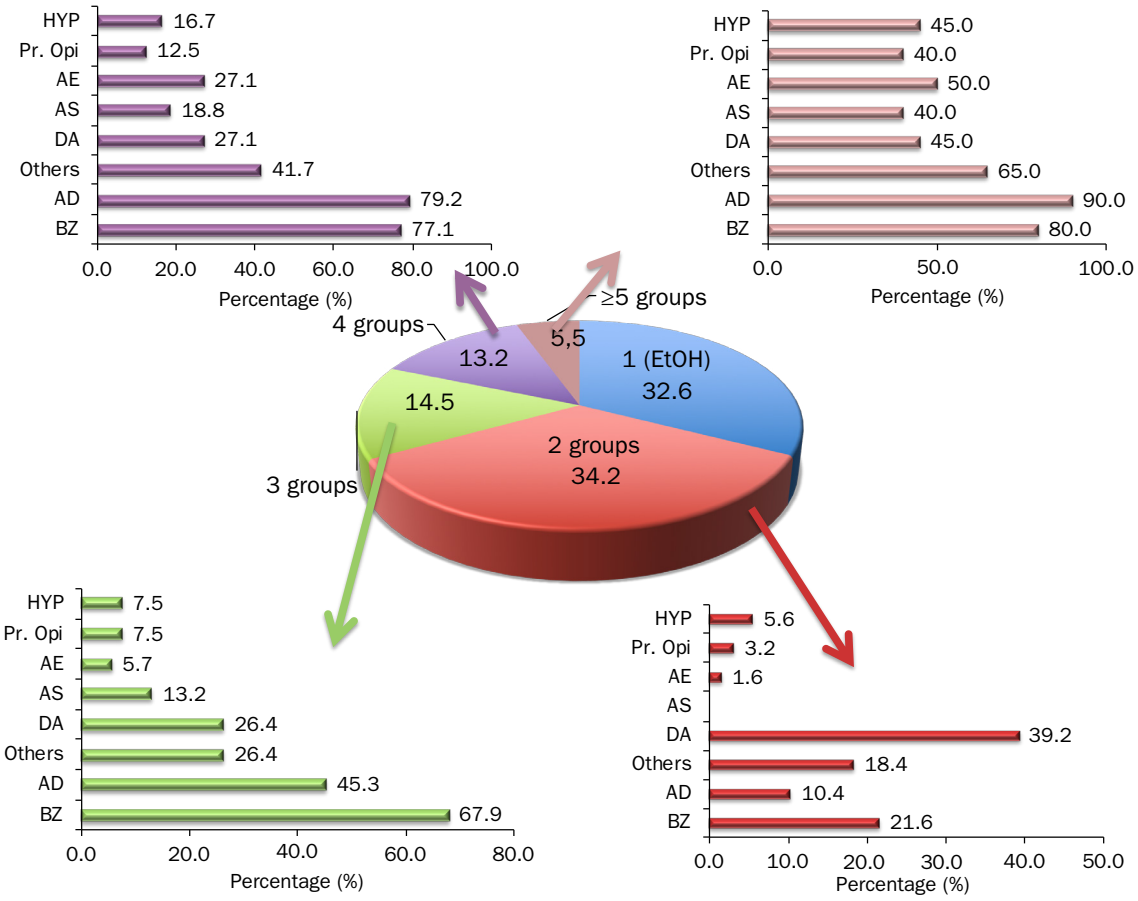


As mentioned and previously demonstrated, this study has brought to light that most of the people who committed suicide had consumed several groups of substances simultaneously, although in the case of EtOH, the higher percentage was found in the cases

of mono-consumption of EtOH (32.6%), quite similar to the combination with BZ (31.8%). Similar percentages were found in the cases of combinations with AD (25.5%), DA (23.3%) and the group "others" (19.2%). The combinations with the other groups of substances were lower and similar, ranging from 6.0% (Pr. Opi) to 7.7% (AE and HYP).

Figure 2.24 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.24. Combinations of EtOH with other groups of substances (%)



The table below shows a statistical study of the concentrations of EtOH in each of the demographic variables assessed. The table specifies the total number of cases in which EtOH was detected and the statistical study of the concentrations, that includes the range of concentrations (minimum and maximum concentrations), average and median concentrations, and percentiles 25 and 75.

	Concentrations in blood (g/l)					
	No. of cases	Range	Average	Median	Percentile 25	Percentile 75
TOTAL DATA	365	0.2–5.0	1.4	1.3	0.6	2.0
SEX						
Male	284	0.2–5.0	1.4	1.3	0.7	2.0
Female	81	0.2–3.6	1.3	1.4	0.6	1.9
AGE (years)						
<20	5	0.3–2.0	0.9	0.8	0.7	0.9
20-29	31	0.3–3.6	1.5	1.3	0.8	2.1
30-39	54	0.2–2.8	1.2	1.1	0.6	1.8
40-49	90	0.2–3.8	1.4	1.3	0.7	2.0
50-59	106	0.2–5.0	1.5	1.5	0.9	2.1
60-69	39	0.2–3.0	1.2	0.9	0.5	1.9
70-79	26	0.2–4.8	1.3	1.3	0.5	2.0
80-89	8	0.3–1.5	0.7	0.6	0.5	0.9
>90	1	1.5	1.5	1.5	1.5	1.5
DATE OF SUICIDE						
January	24	0.2–5.0	1.7	1.6	1.1	2.1
February	14	0.3–3.3	1.4	1.1	0.6	2.0
March	25	0.2–2.9	1.4	1.4	0.6	1.9
April	31	0.2–2.8	1.5	1.6	0.7	2.1
May	32	0.3–4.8	1.6	1.3	0.8	2.3
June	39	0.3–3.0	1.4	1.3	0.6	2.1
July	32	0.3–2.9	1.3	1.3	0.9	1.7
August	42	0.2–3.3	1.3	1.2	0.7	1.9
September	38	0.2–3.8	1.3	0.9	0.6	1.8
October	31	0.3–3.4	1.3	1.4	0.8	1.7
November	15	0.2–3.5	1.0	0.8	0.3	1.1
December	29	0.2–3.1	1.2	1.2	0.5	1.7
AUTONOMOUS COMMUNITY						
Andalusia	150	0.2–5.0	1.4	1.4	0.7	2.0
Valencia	35	0.2–3.3	1.3	1.1	0.4	2.2
Canary Islands	27	0.2–4.4	1.6	1.4	0.8	2.1
Madrid	32	0.2–3.4	1.4	1.4	0.4	2.1
Galicia	17	0.2–2.6	1.1	1.0	0.8	1.5
C- La Mancha	29	0.3–2.9	1.4	1.5	0.9	1.8
C-Leon	20	0.2–4.8	1.1	0.7	0.4	1.2
MECHANISM						
Hanging	183	0.2–3.7	1.4	1.3	0.8	2.0
Poisoning	89	0.2–4.8	1.1	0.8	0.5	1.6
Jumping from height	42	0.3–3.8	1.6	1.6	0.7	2.3
Firearm	19	0.2–3.3	1.6	1.9	0.9	2.2
Self injury by cutting	8	0.6–5.0	2.0	1.7	0.7	2.7
Drowning	7	0.2–3.0	1.6	1.8	1.1	2.0
Other	11	0.3–2.1	1.2	1.0	0.6	1.8

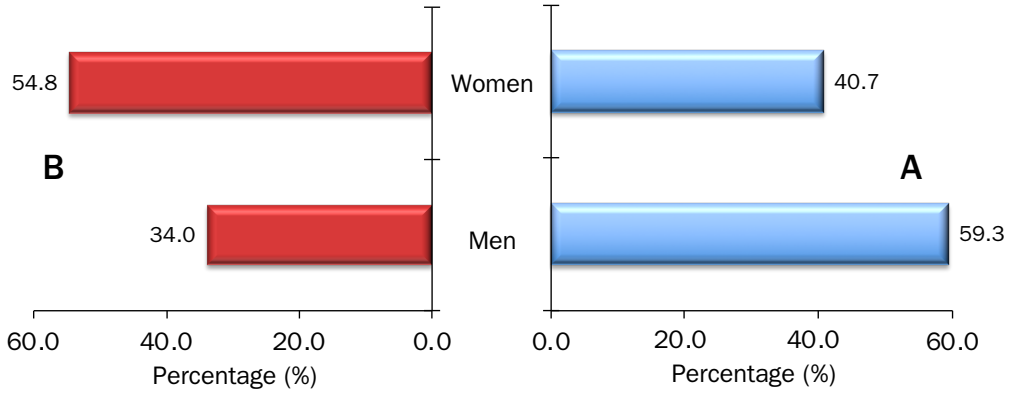
2.5. Antidepressants (AD)

536 of the suicides received at the INTCF in 2019 had consumed antidepressants, which represent 31.3% of all suicides, and 40.2% of the cases with positive results.

2.5.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for antidepressants

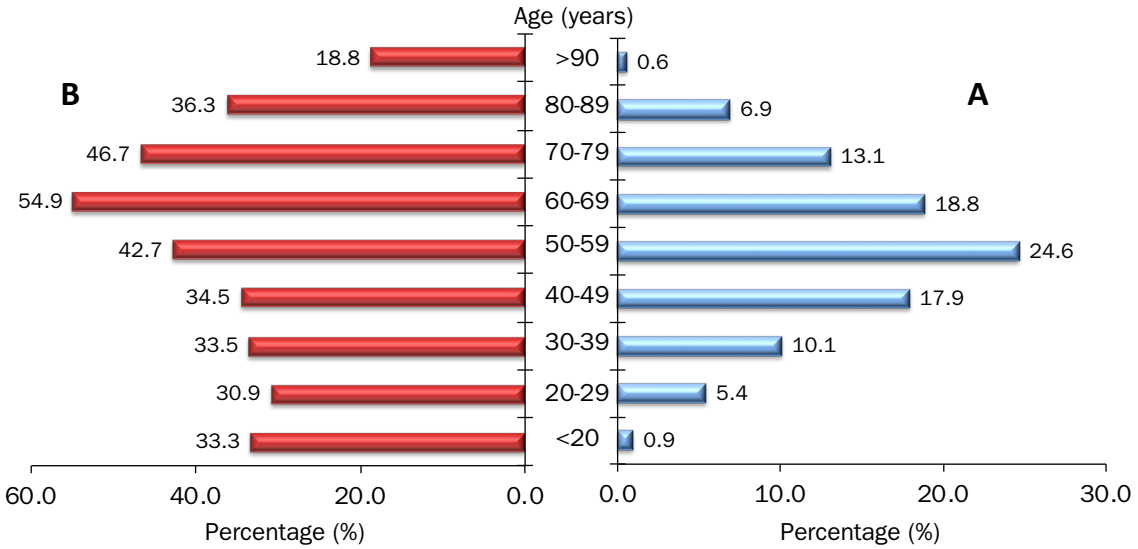
If we consider the sex of the AD positive cases, 59.3% were men and 40.7% women (Figure 2.25A). Opposite results were obtained when comparing with the total number of positive cases in each of the sexes: 54.8% of women with positive result had consumed AD, compared to 34.0% in men (Figure 2.25B).

Figure 2.25. Influence of sex. A: Percentage distribution of the cases positive for AD in both sexes; B: Percentage distribution of positives for AD regarding the total of positive cases in each of the sexes



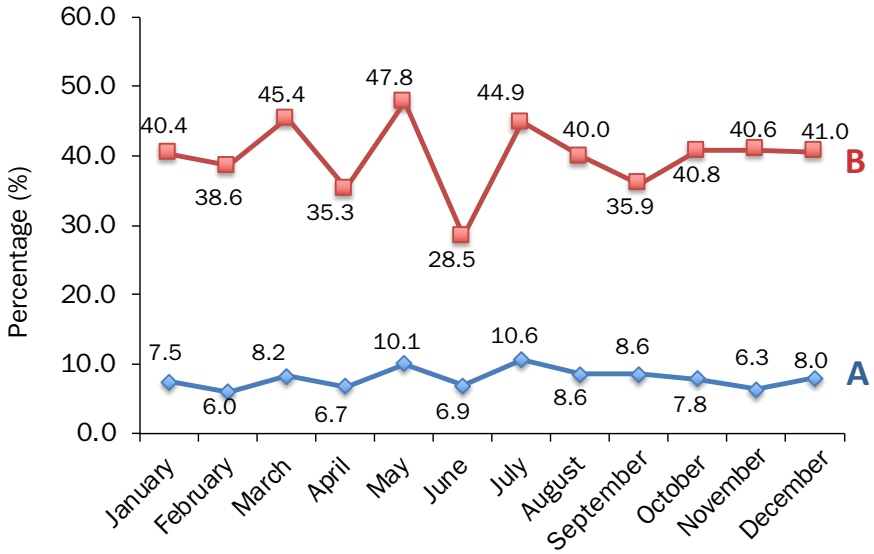
In order to study the influence of age, different profiles were obtained depending on whether only the AD positive cases were studied, or if the comparison study was performed with the cases with positive result in each of the age ranges considered. In the first case, we obtained the pyramid-shaped profile increasing from the under-20s at 0.9% to ages from 50 to 59 (24.6%), and then decreasing up to the over-90s (0.6%) (Figure 2.26A). In the second case (Figure 2.26B), the percentages were similar in the under-20s up to 40-49 years-old (ranging from 30.9% in the 20-29 year-old to 34.5% in the 40-49 year olds); an increase was then seen in the 50-59 year-olds (42.7%) and 60-69 year-olds (54.9%), and after 70-79 years old the percentages decreased progressively with age, to 18.8% in people over 90 years old.

Figure 2.26. Influence of age. A: Percentage distribution of the age ranges in the cases positive for AD (536 cases); B: Percentage distribution regarding each of the age ranges



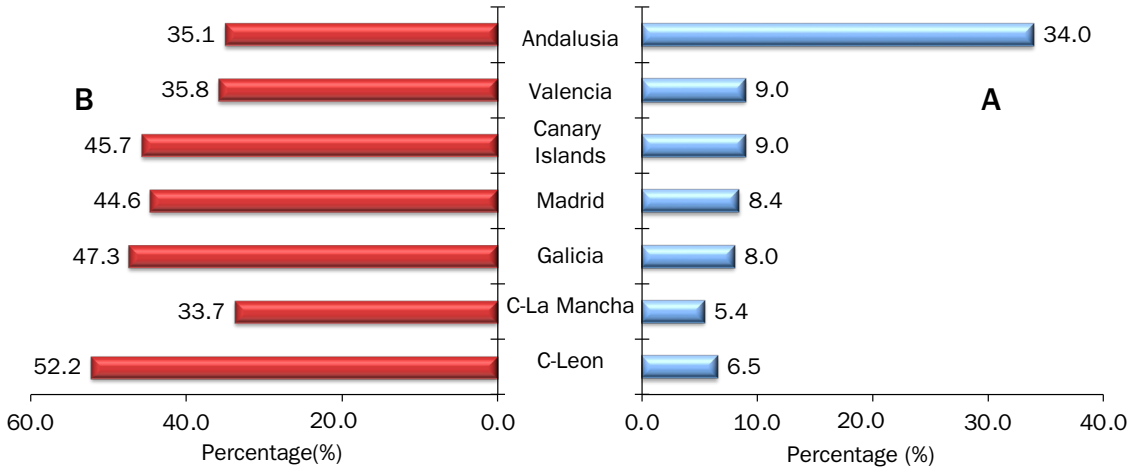
If we consider the evolution of positive cases over the twelve months of the year, the profiles were similar when compared with the total of AD positive cases (the percentages ranged from 6.0% in February to 10.6% in July) (Figure 2.27A) and when compared with the number of cases with positive result of each month, although in this case a decrease was found in June (Figure 2.27B).

Figure 2.27. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for AD (536 cases); B: Percentage distribution regarding each of the months of the year



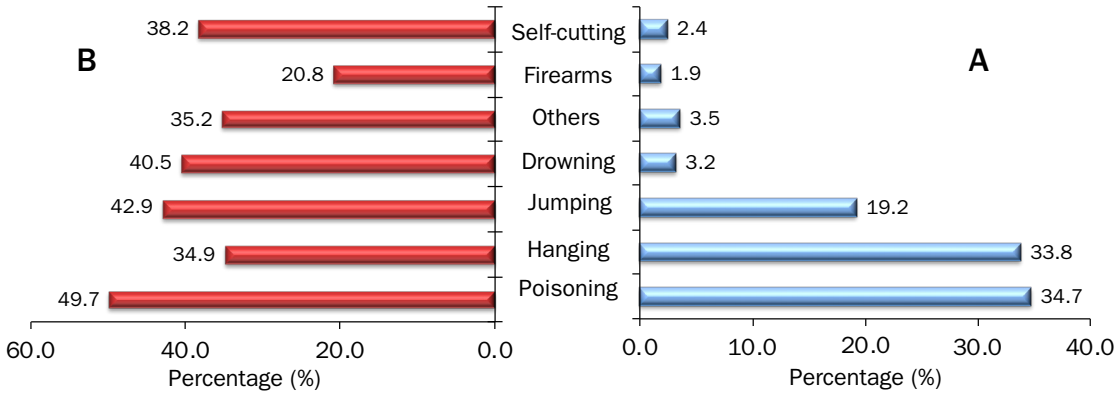
In the AC, 34.0% of the results positive for AD were found in Andalusia, much higher than the percentage of the other ACs, which varied from 9.0% in Valencia and the Canary Islands to 5.4% in C- La Mancha (Figure 2.28A). As in the previous cases, the profiles differed when they were compared with the total of positive cases from each AC (Figure 2.28B). In this case, the percentages were similar in the Canary Islands, Madrid and Galicia (45.7%, 44.6% and 47.3%, respectively), and somewhat lower but also similar in Andalusia, Valencia and C-La Mancha (35.1%, 35.8% and 33.7%, respectively). The highest percentage was found in C-Leon (52.2%).

Figure 2.28. Influence of the AC. A: Percentage distribution of the number of cases positive for AD in each AC; B: Percentage distribution of positives for AD regarding the total of positive cases in each AC



Most of the AD positives cases committed suicide by poisoning (34.7%) and hanging (33.8%), followed by jumping from height (19.2%) and in a lower proportion by the other mechanisms, ranging from 1.9% (firearm) to 3.5% (by "others" mechanisms) (Figure 2.29A). Comparing the percentage of positives for AD with the number of positives for each mechanism, the percentages were similar in all mechanisms (ranging from 34.9% for hanging to 42.9% for jumping from height); the exception was found in suicide by firearms (20.8%) and poisoning (49.7%) (Figure 2.29B).

Figure 2.29. Influence of the suicide mechanism. A: Percentage distribution of cases positive for AD in each of the suicide mechanisms; B: Percentage distribution of positives for AD regarding the total of positive cases in each of mechanisms

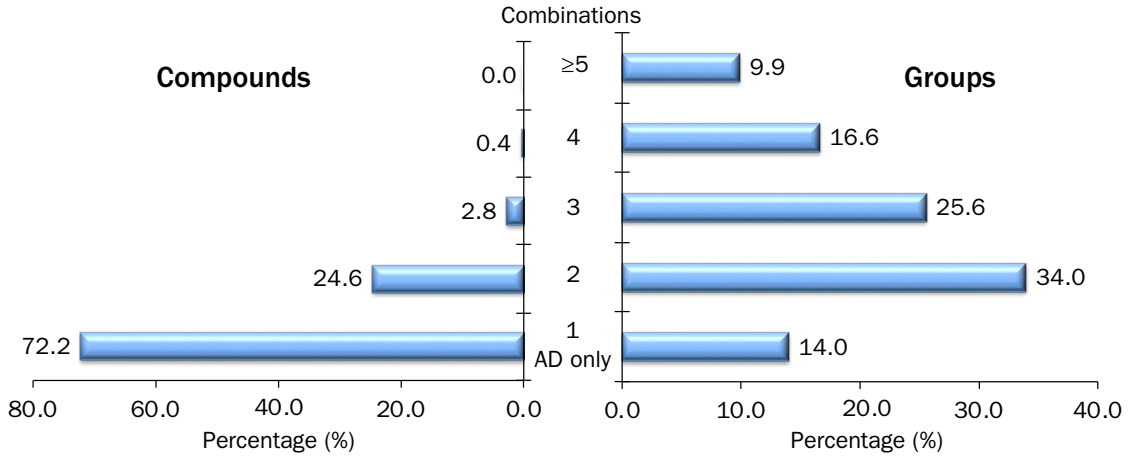


2.5.2. Mono-intoxications versus poly-drug use

This study has brought to light that most of the people who committed suicide had consumed simultaneously not only several groups of compounds, but even several medications of the same group and, therefore, with the same pharmacological activity.

Figure 2.30A shows that only AD was detected in just 14.0%; whereas in the other cases, combinations of AD with other groups of compounds were detected, and the percentages decreased from the combinations of 2 groups of compounds (34.0%) to 5 groups or more (9.9%).

Figure 2.30. Percentage distribution of simultaneous consumption of other groups of compounds along with AD (Groups) and of several AD simultaneously (Compounds)



If we consider the number of AD compounds consumed simultaneously by the same individual (Figure 2.30B), most of them had consumed a single antidepressant (72.2%) followed by 2 and 3 AD (24.6% and 2.8%, respectively); while only two cases (0.4%) showed simultaneous consumption of four AD.

Figure 2.31 shows the percentage distribution of the combination of groups of substances detected along with AD. The highest percentages were found with BZ (61.6%) and the group "others" (30.4%), and the lowest with HYP (6.5%). The combinations with the other groups of substances were similar, ranging from 11.8% (DA) to 19.0% (AS).

Figure 2.31. Percentage distribution of the combinations of substances detected along with AD

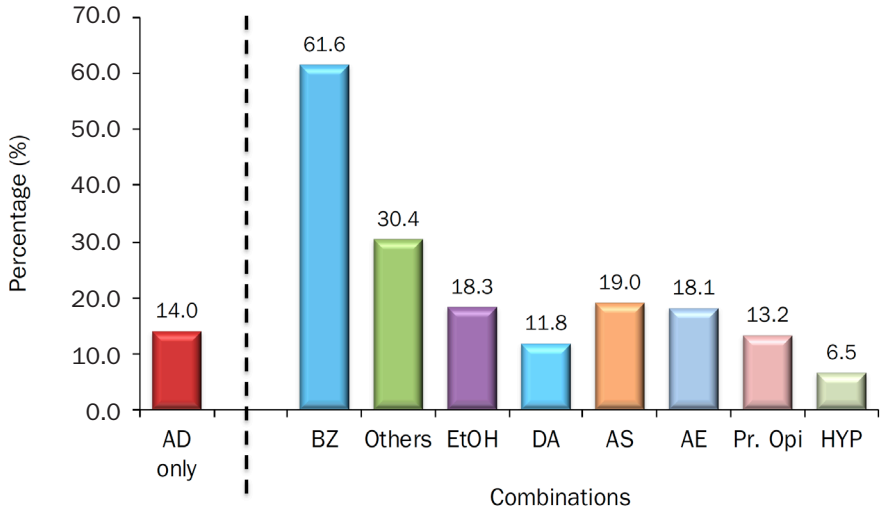


Figure 2.32 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.33 shows the percentage distribution of each of the AD that were detected in the suicides regarding the total of AD (536). For this study, the cases positive for venlafaxine and desvenlafaxine were counted together, as the latter, in addition to being a medication, is an active metabolite for venlafaxine. The same happened with citralopram and escitalopram, for the same reason. The AD compounds most frequently found were: mirtazapine (26.7%), venlafaxine/desvenlafaxine (22.9%), citalopram/escitalopram (19.6%), trazodone (15.5%), sertraline (11.6%) and amitriptyline (7.1%). Positive results for fluoxetine (2.2%), duloxetine (1.3%), clomipramine (1.1%), bupropion (0.7%), paroxetine (0.6%), fluvoxamine (0.4%) were also found, and only one case (0.2%) was positive for maprotiline and mianserin.

Figure 2.32. Combinations of AD with other groups of substances (%)

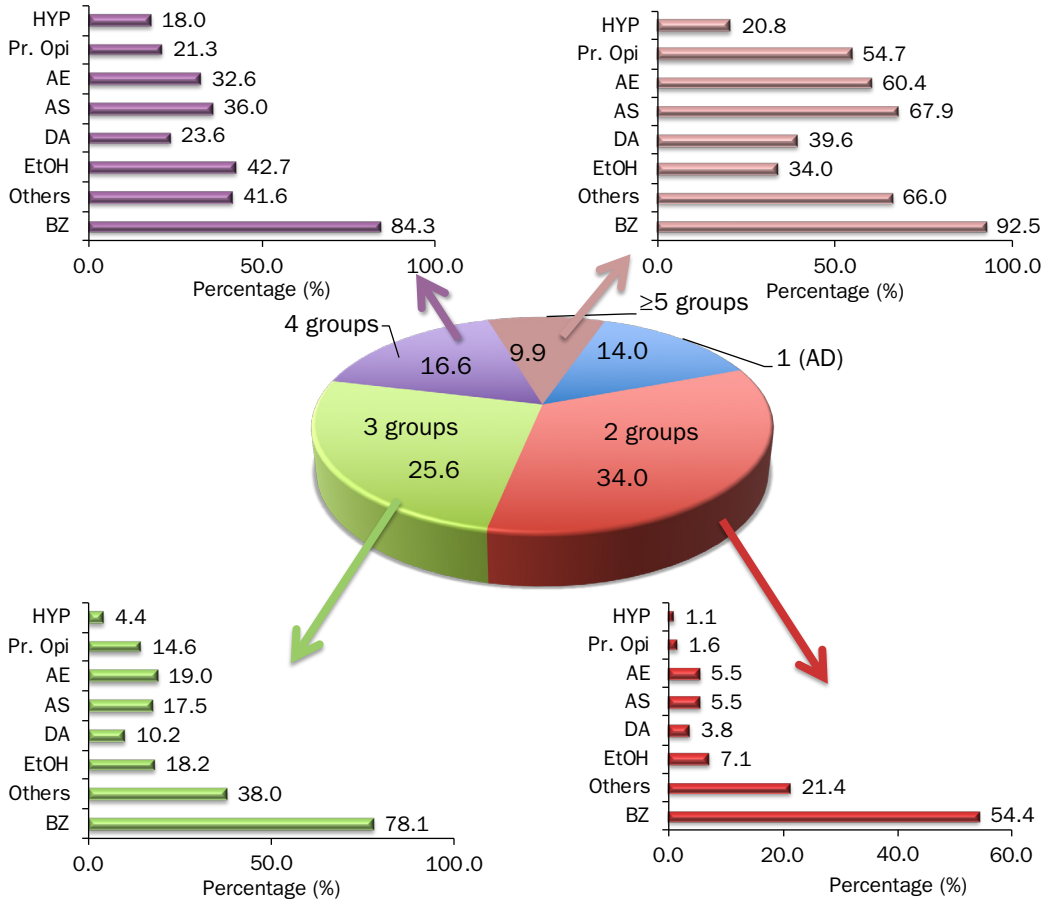
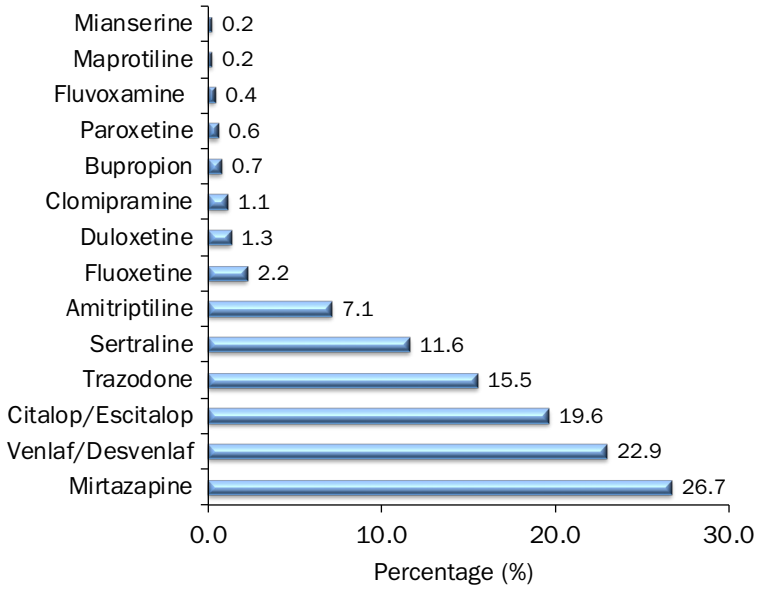


Figure 2.33. Distribution of the antidepressant compounds detected, not considering possible associations



The table below shows a statistical study of the concentrations of the main AD compounds. The table specifies the total number of cases in which each compound is detected and the statistical study of the concentrations, that includes the range of concentrations detected (minimum and maximum concentrations), average and median concentrations, and percentiles 25 and 75.

	Concentrations in blood (mg/l)					
	No. of cases	Range	Average	Median	Percentile 25	Percentile 75
ANTIDEPRESSANTS						
Mirtazapine	143	0.01-27.00	0.56	0.08	0.04	0.22
Venlafaxine	93	0.01-52.00	2.77	0.43	0.20	1.00
Desvenlafaxine	48	0.09-13.00	1.19	0.55	0.27	1.12
Citalopram	99	0.01-2.10	0.36	0.20	0.49	2.10
Escitalopram	7	0.04-0.29	0.14	0.10	0.07	0.22
Trazodone	83	0.01-21.00	1.73	0.34	0.15	1.30
Sertraline	61	0.01-3.30	0.20	0.09	0.04	0.20
Amitriptyline	38	0.02-2.00	0.27	0.13	0.06	0.21

2.6. Antiepileptic drugs (AE)

151 of the suicides received at the INTCF in 2019 had consumed antiepileptic drugs, which represent 8.8% of all suicides, and 11.3% of the cases with positive results.

2.6.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for antiepileptic drugs

If we consider the sex of the AE positive cases, the percentages are similar: 51.7% were men and 48.3% women (Figure 2.34A); however, when the comparison was made with the total of positive cases for each of the sexes, the percentage of women (18.3%) exceeded the percentage of men (8.3%) (Figure 2.34B).

In order to study the influence of age, different profiles were obtained depending on whether only the AE positive cases were studied, or if the comparison study was performed with the cases with positive result in each of the age ranges considered. In the first case, we obtained the pyramid-shaped profile increasing from the under-20s at 1.3% to ages from 50 to 59 (23.2%), and then decreasing up to ages comprised between 80 and 89 (4.6%), and none of the people over 90 had consumed AE (Figure 2.35A). In the second case (Figure 2.35B), the percentages were similar between the under-20s up to 70-79 years-old

(ranging from 10.0% in the 70-79 year-old range to 14.7% in the 60-year olds); the percentage of people aged between 80 and 89 was somewhat lower (6.9%).

Figure 2.34. Influence of sex. A: Percentage distribution of the cases positive for AE in both sexes; B: Percentage distribution of positives for AE regarding the total of positive cases in each of the sexes

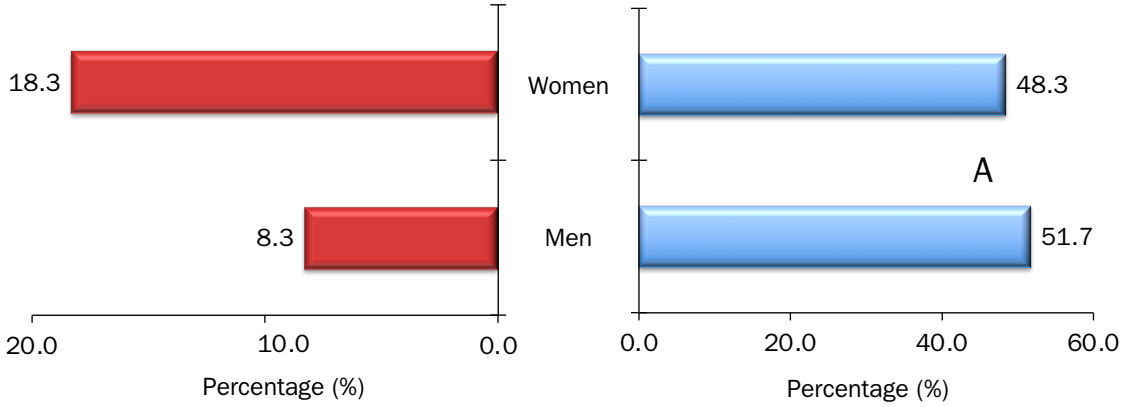
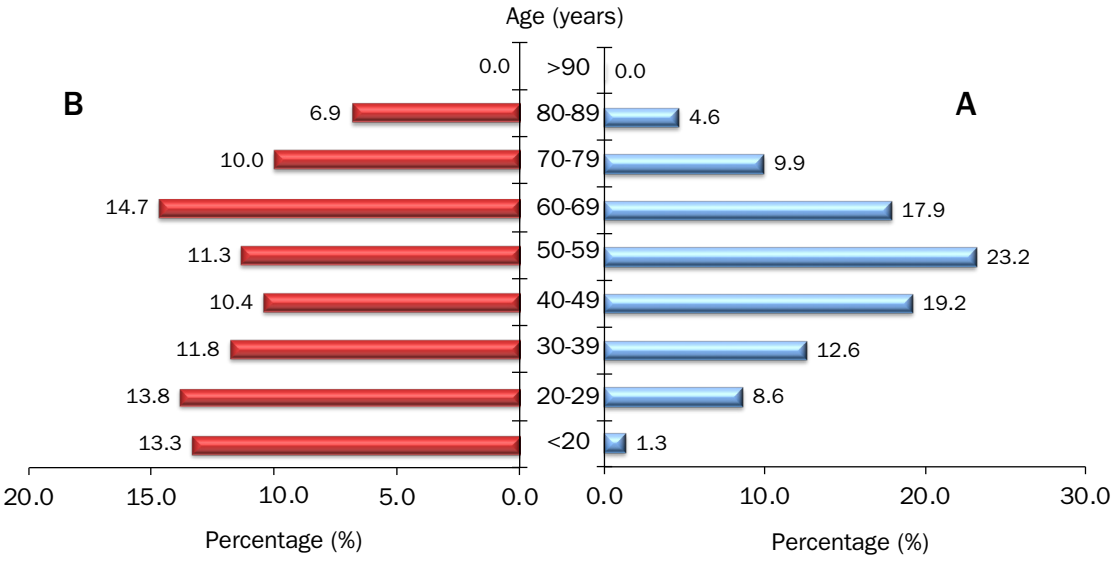
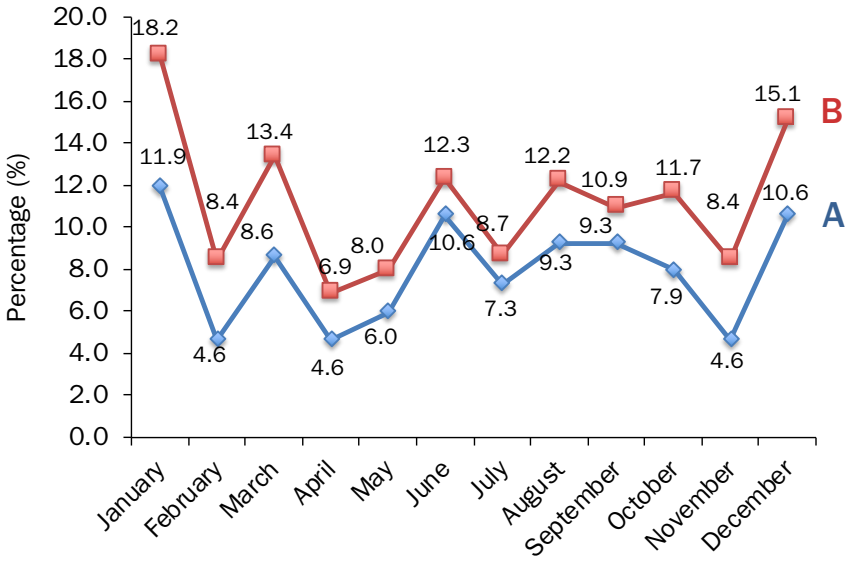


Figure 2.35. Influence of age. A: Percentage distribution of the age ranges in the cases positive for AE (151 cases); B: Percentage distribution regarding each of the age ranges



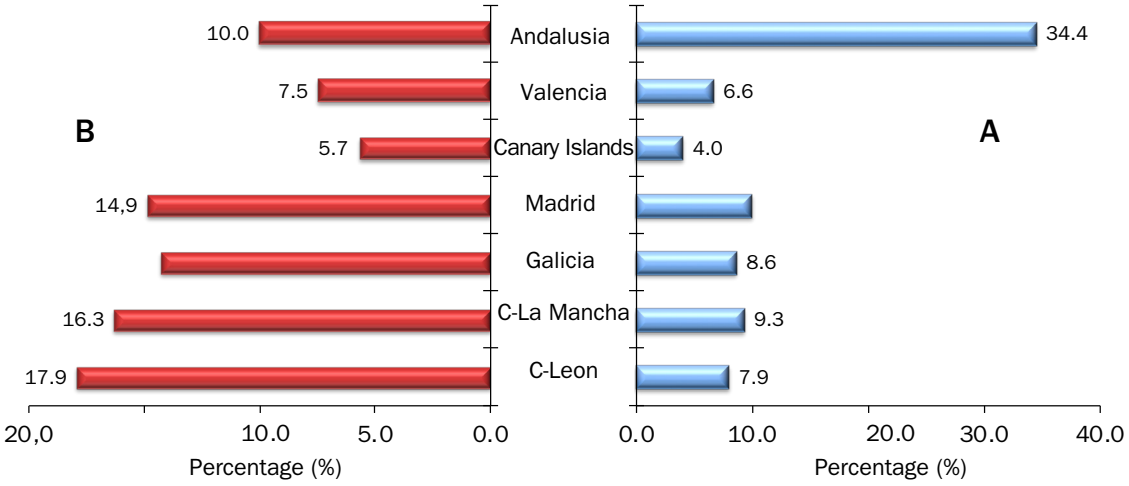
If we consider the evolution of positive cases over the twelve months of the year, the profiles were parallel when compared both with the total of cases positive for AE (Figure 2.36A) and with the number of cases with positive result of each month (Figure 2.36B). In both cases, there were variations in the percentages of positive results over the twelve months.

Figure 2.36. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for AE (151 cases); B: Percentage distribution regarding each of the months of the year



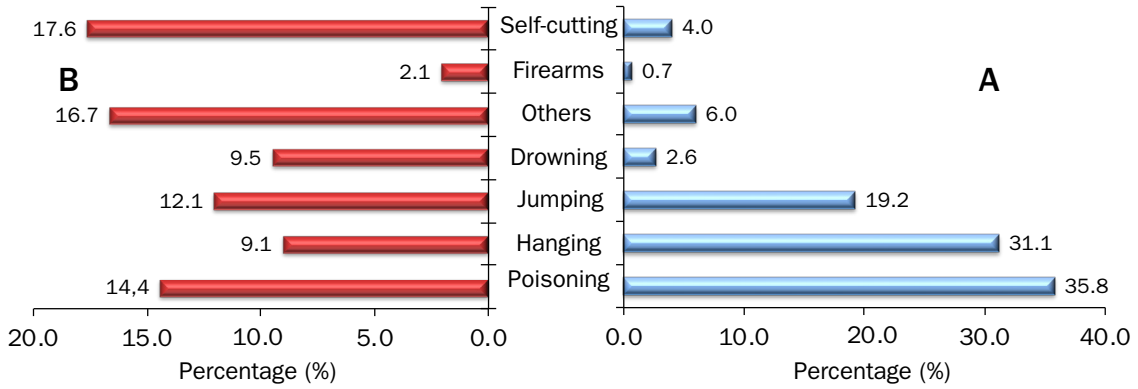
With respect to the AC, 34.4% of the results positive for AE were found in Andalusia, much higher than the percentage of the other AC, which varied from 4.0% in the Canary Islands to 9.9% in Madrid (Figure 2.37A). The profiles differed when they were compared with the total of positive cases from each AC (Figure 2.37B). In this case, the percentages were similar in Madrid, Galicia, C-La Mancha and C-Leon (14.9%, 14.3%, 16.3% and 17.9%, respectively), and somewhat lower in Andalusia (10.0%), Valencia (7.5%) and the Canary Islands (5.7%).

Figure 2.37. Influence of the AC. A: Percentage distribution of the number of cases positive for AD in each AC; B: Percentage distribution of positives for AD regarding the total of positive cases in each AC



Most of the AE positives committed suicide by poisoning (35.8%) and hanging (31.1%), followed by jumping from height (19.2%) and in a lower proportion by the other mechanisms, varying from 0.7% (firearm) to 6.0% (by "others" mechanisms) (Figure 2.38A). Comparing the percentages of AE positives with the number of positives per each mechanism, the percentages differed among all of the mechanisms, ranging from 2.1% for firearm to 17.6% for self injury by cutting (Figure 2.38B).

Figure 2.38. Influence of the suicide mechanism. A: Percentage distribution of cases positive for AE in each of the suicide mechanisms; B: Percentage distribution of positives for AE regarding the total of positive cases in each of mechanisms



2.6.2. Mono-intoxications versus poly-drug use

In only 7.3% of the AE positive cases only these compounds were detected; in the other cases, combinations of AE with other groups of compounds were detected, and the percentages were similar in all cases, ranging from 21.9% in the combinations of 2 groups of compounds and 5 or more groups of compounds, to 25.2% in the combinations of 3 groups (Figure 2.39A).

If we consider the number of AE compounds consumed simultaneously by the same individual (Figure 2.39B), most of them had consumed a single antiepileptic drug (82.1%), followed by two and three AE (15.9% and 2.0%, respectively).

Figure 2.40 shows the percentage distribution of the combination of groups of substances detected along with the AE. The highest percentages were found with BZ (60.9%) and AD (64.2%), somewhat lower the combinations with AS (31.8%) "others" (25.8%), DA (19.2%), EtOH (18.5%), Pr. Opi (15.2%), and the lowest percentage was found in the combination with HYP (6,6%).

Figure 2.39. Percentage distribution of simultaneous consumption of other groups of compounds along with AE (groups) and of several AE simultaneously (compounds)

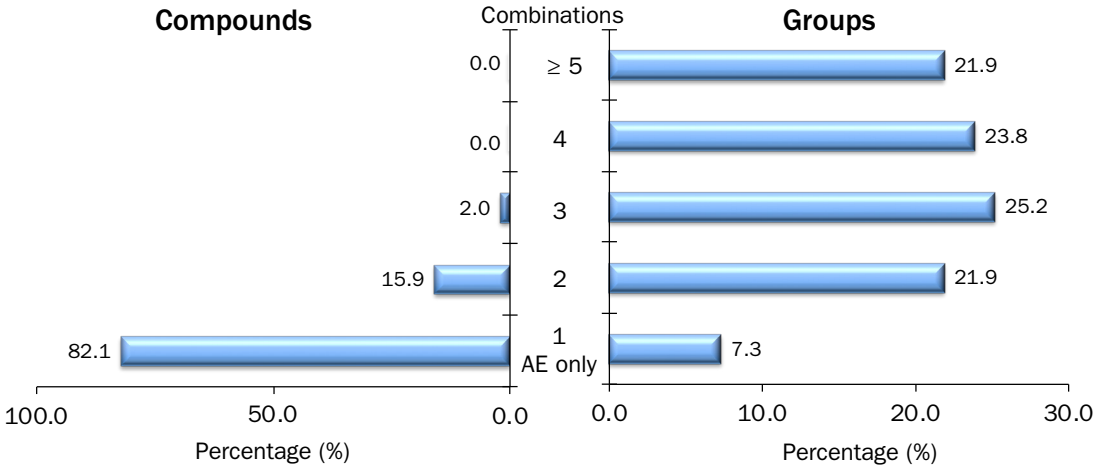


Figure 2.40. Percentage distribution of the combinations of substances detected along with AE

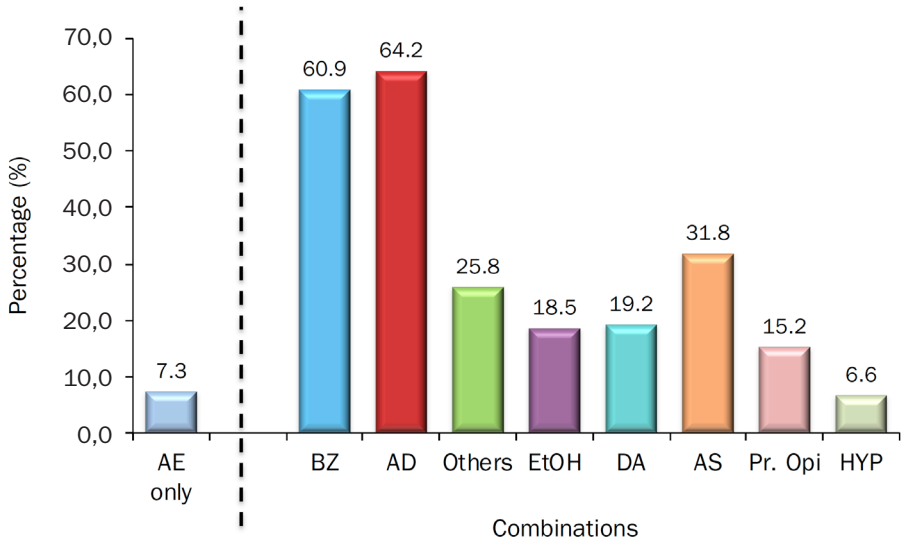


Figure 2.41 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.42 shows the percentage distribution of each of the AE that were detected in the suicides regarding the total of AE (151). In this case, the cases positive for primidone and phenobarbital were counted together, as the latter, in addition to being a medication, is an active metabolite for primidone. The same goes for carbamazepine and oxcarbamazepine, for the same reason. The AE compounds most frequently found were: lamotrigine (21.2%), pregabalin y gabapentin (both at 19.2%), topiramate (17.2%), carbamazepine/oxcarbamazepine (13.9%). The percentages of the other AE are lower than 10%.

Figure 2.41. Combinations of AE with other groups of substances (%)

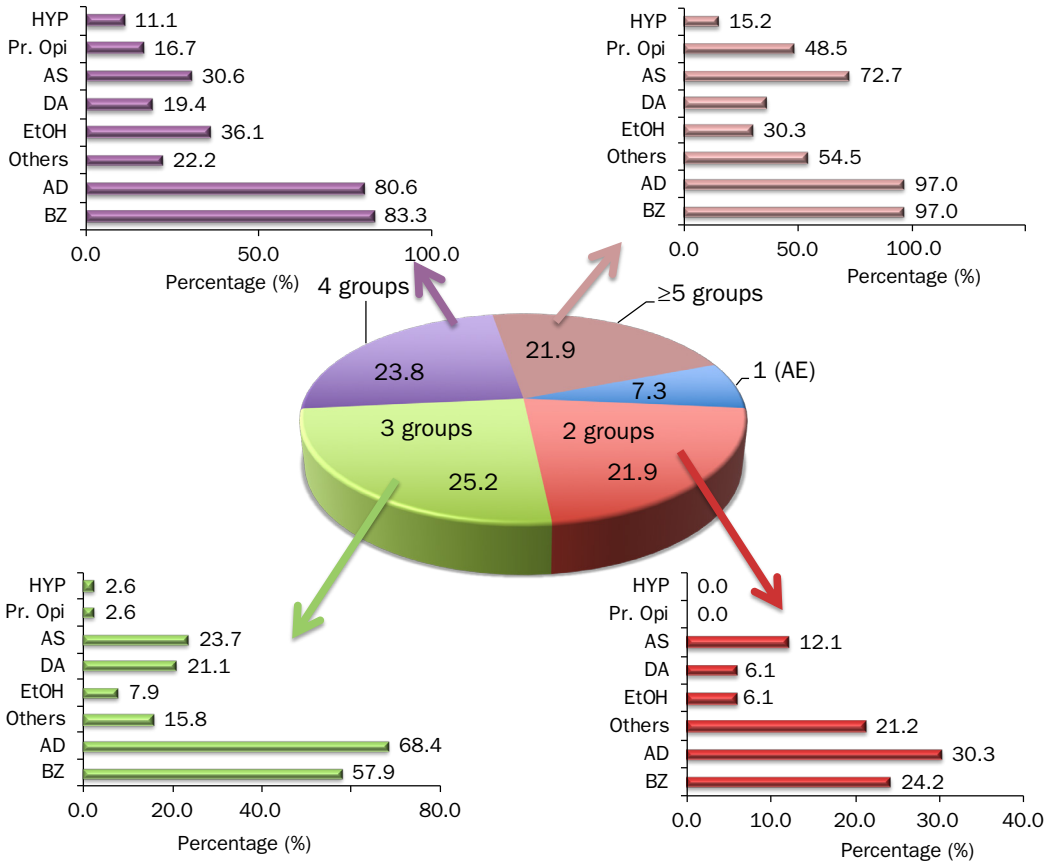
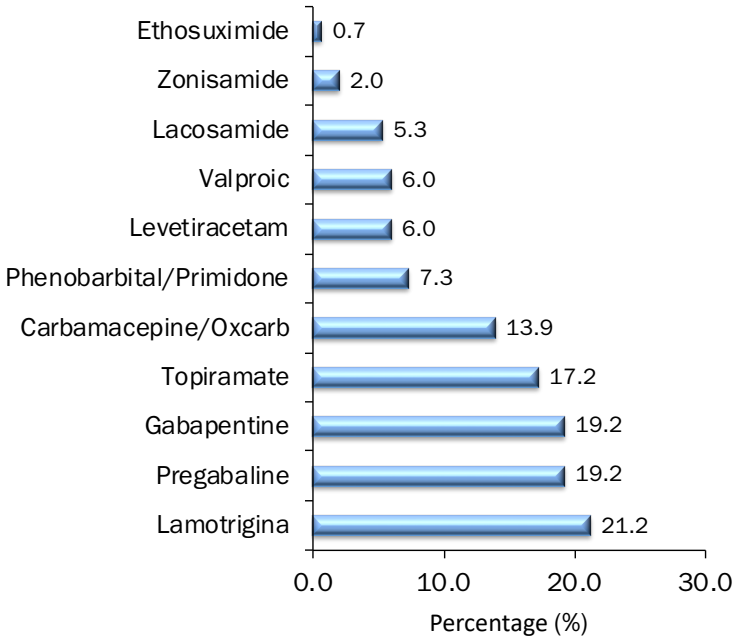


Figure 2.42. Distribution of the AE compounds detected, not considering possible associations



The table below shows a statistical study of the concentrations of the main AE compounds. The table specifies the total number of cases in which each compound is detected and the statistical study of the concentrations, that includes the range of concentrations detected (minimum and maximum concentrations), average and median concentrations, and percentiles 25 and 75.

	Concentrations in blood (mg/l)					
	No. of cases	Range	Average	Median	Percentile 25	Percentile 75
ANTIEPILEPTIC DRUGS						
Lamotrigine	32	0.1–40.0	4.02	1.35	0.6	2.8
Pregabalin	29	0.6–149.4	21.8	7.7	3.3	19.3
Gabapentin	29	0.1–52.0	8.5	4.3	1.7	9.7
Topiramate	26	0.9–50.0	8.3	3.3	1.5	7.5
Carbamazepine	5	0.3–39.0	18.7	11.0	6.0	37.0
Oxcarbamazepine	17	0.1–23.6	9.1	9.0	0.4	14.5
Phenobarbital	7	0.5–27.4	7.3	3.7	2.0	9.2
Primidone	5	1.1–7.8	4.5	4.5	2.8	6.2

2.7. Antipsychotic drugs (AS)

169 of the suicides received at the INTCF in 2019 had consumed antipsychotic drugs, which represent 9.9% of all suicides, and 12.7% of the cases with positive results.

2.7.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for antipsychotic drugs

If we consider the sex of the AS positive cases, the percentage of men (59.2%) is somewhat higher than women (40.8%) (Figure 2.43A); however, when the comparison was performed with the total of positive cases for each of the sexes, the percentage of women (17.3%) exceeded the percentage of men (10.7%) (Figure 2.43B).

In order to study the influence of age, different profiles were obtained depending on whether only the AS positive cases were studied, or if the comparison was performed with the cases with positive result in each of the age ranges considered. In the first case, we obtained the pyramid-shaped profile increasing from the under-20s (1.2%) to ages from 50 to 59 (26.6%), and then decreasing up to the over-90s (0.6%) (Figure 2.44A). In the second case (Figure 2.44B), the percentages were similar between the under-20s up to 60-69 years-old (ranging from 11.5% in the 40-49 year-old range to 14.7% in the 60-69 year

olds); the exception were people in the 20-29 age range, with the highest percentage (21.3%). The percentage of positives for AS among the 70-79 year-olds and over-90s were lower (from 5.9% in the 80-89 age range to 7.3% in the 70-79 age range).

Figure 2.43. Influence of sex. A: Percentage distribution of the cases positive for AS in both sexes; B: Percentage distribution of positives for AS regarding the total of positive cases in each of the sexes

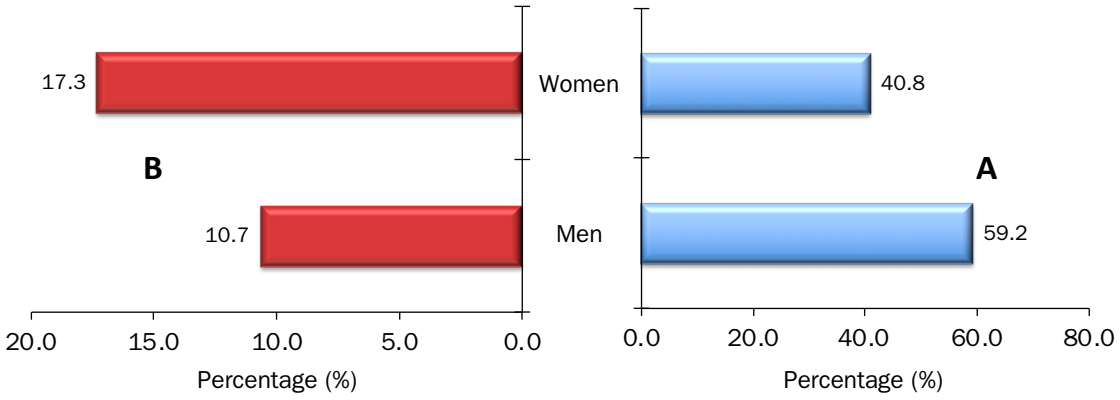
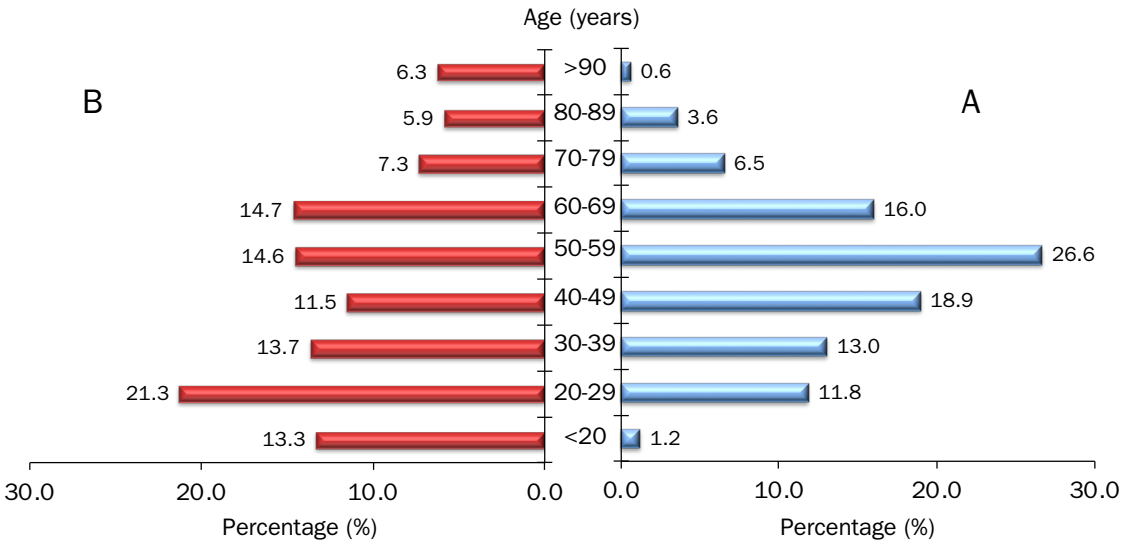


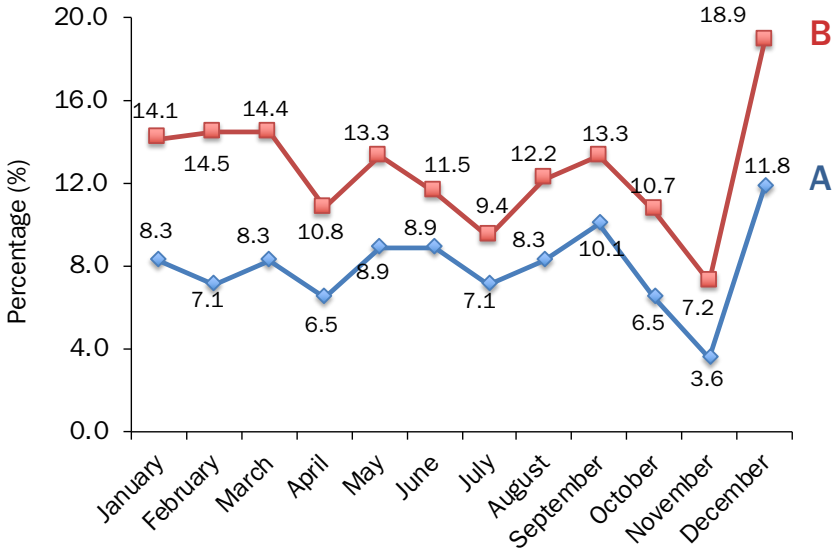
Figure 2.44. Influence of age. A: Percentage distribution of the age ranges in the cases positive for AS (169 cases); B: Percentage distribution regarding each of the age ranges



If we consider the evolution of positive cases over the twelve months of the year, the profiles were parallel when compared with the total of AS positive cases (Figure 2.45A) and when compared with the number of cases with positive result of each month

(Figure 2.45B). In both cases similar percentages were found, from January to September; after this, a decrease was found until November, to then rise again to reach the maximum percentage in December.

Figure 2.45. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for AS (169 cases); B: Percentage distribution regarding each of the months of the year



In the case of the AC, there were not so many differences in the percentages of AS, compared to the other groups of compounds. In this case, most of them were also found in Andalusia (17.2%), but it was similar to the percentages of Galicia (13.0%) and Valencia (12.4%) and somewhat lower were the percentages of Madrid (10.1%), C-Leon (8.9%), C-La Mancha (6.5%), and lastly, the Canary Islands (5.9%) (Figure 2.46A). When the comparison was performed with the total of positive cases of each AC, the results varied, the highest percentages were found in Galicia (24.2%) and C-Leon (22.4%), and the lowest in the Canary Islands (9.5%) and Andalusia (5.6%) (Figure 2.46B).

Most of the AS positives committed suicide by poisoning (46.7%), followed by jumping from height (21.3%), hanging (18.9%), and in a lower proportion by other mechanisms, ranging from 5.3% ("others") to 2.4% (self injury by cutting and drowning). None of the people who committed suicide by firearms had consumed AS (Figure 2.47A). Comparing the percentage of positives for AS with the number of positives per each mechanism, the data were similar in jumping from height (15.0%) and "others" (16.7%), somewhat lower by self injury by cutting (11.8%), drowning (9.5%) and hanging (6.2%), and higher by poisonings (21.1%) (Figure 2.47B).

Figure 2.46. Influence of the AC. A: Percentage distribution of the number of cases positive for AS in each AC; B: Percentage distribution of positives for AS regarding the total of positive cases in each AC

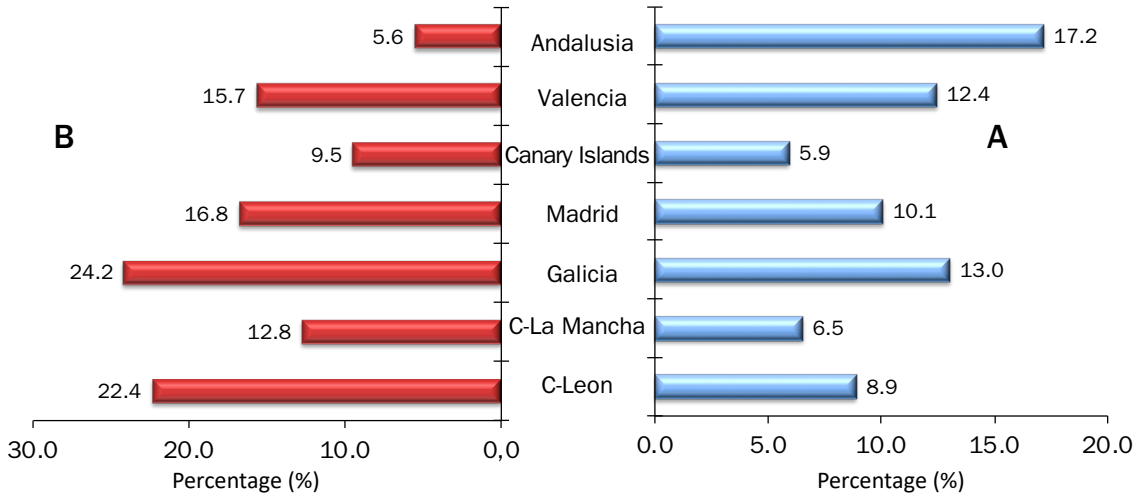
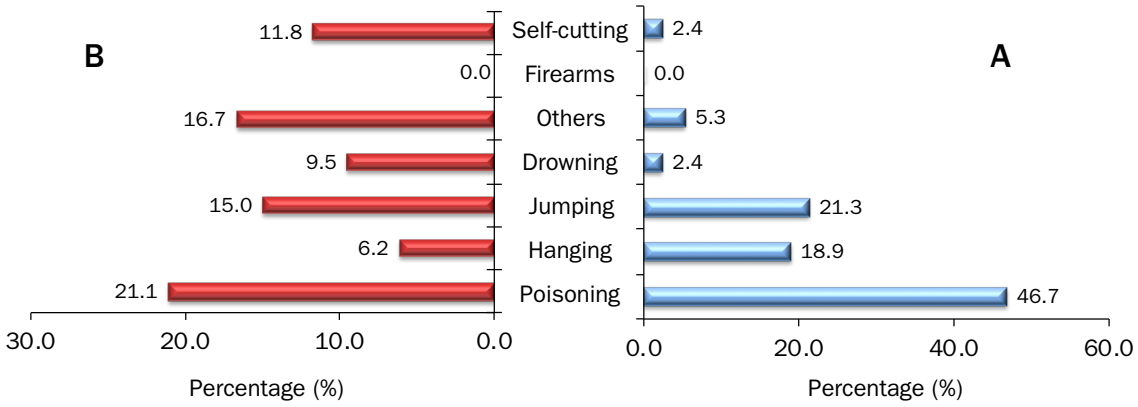


Figure 2.47. Influence of the suicide mechanism. A: Percentage distribution of cases positive for AS in each of the suicide mechanisms; B: Percentage distribution of positives for AS regarding the total of positive cases in each of mechanisms



2.7.2. Mono-intoxications versus poly-drug use

Figure 2.48A shows that AS only was detected in just 10.7%; whereas in the other cases, combinations of AS with other groups of compounds were found, and the percentages increased in the combinations of 2 groups (16.0%) and 3 groups of compounds (26.6%), and remained stable in the combinations of 4 groups (24.9%) and 5 groups and more (21.9%).

If we consider the number of AS compounds consumed simultaneously by the same individual (Figure 2.48B), most of them had consumed a single AS (85.2%), followed by those who had consumed 2 and 3 medications simultaneously (13.6% and 1.2%, respectively).

Figure 2.48. Percentage distribution of simultaneous consumption of other groups of compounds along with AS (groups) and of several AS simultaneously (compounds)

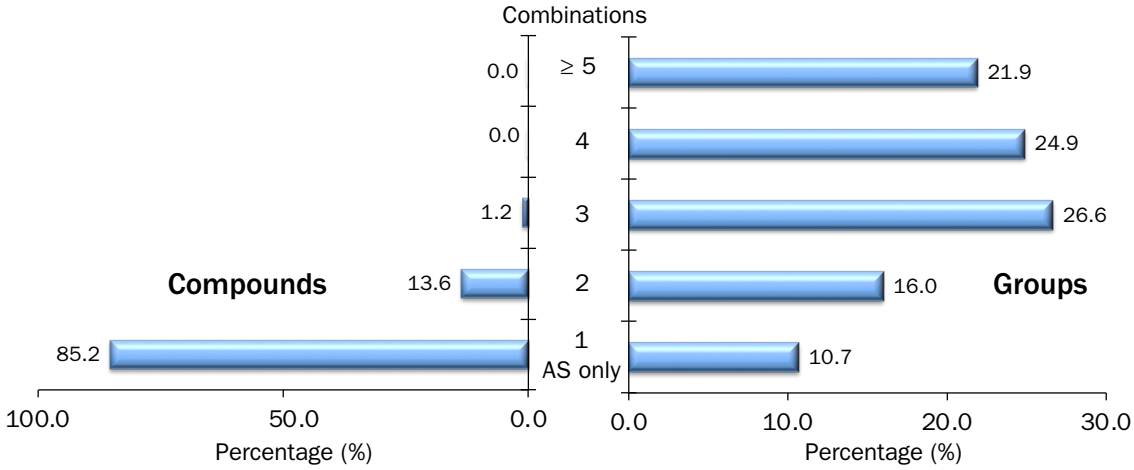


Figure 2.49 shows the percentage distribution of the combination of groups of substances detected along with the AS. The highest percentages were with BZ (66.3%) and AD (60.4%), followed by the group "others" (30.2%), and AE (28.4%). The combinations with the other groups of substances were similar, ranging from 19.5% (Pr. Opi) to 7.7% (HYP).

Figure 2.49. Percentage distribution of the combinations of substances detected along with AS

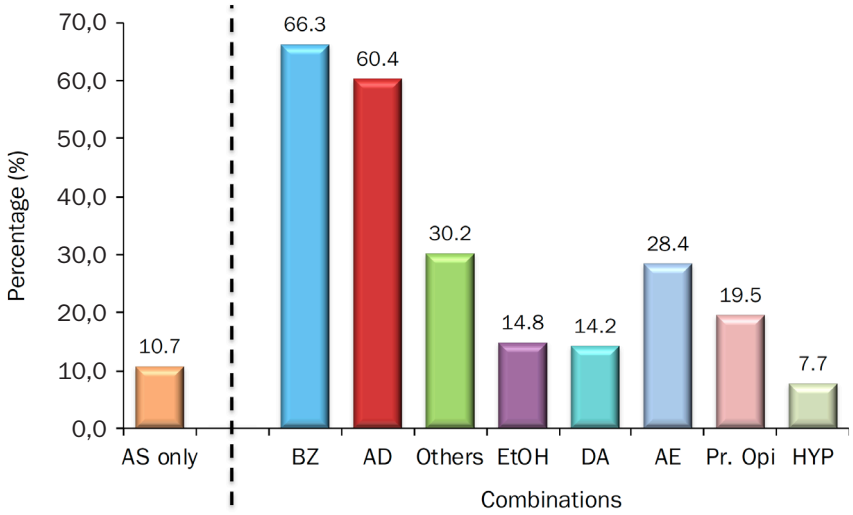


Figure 2.50 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.50. Combinations of AS with other groups of substances (%)

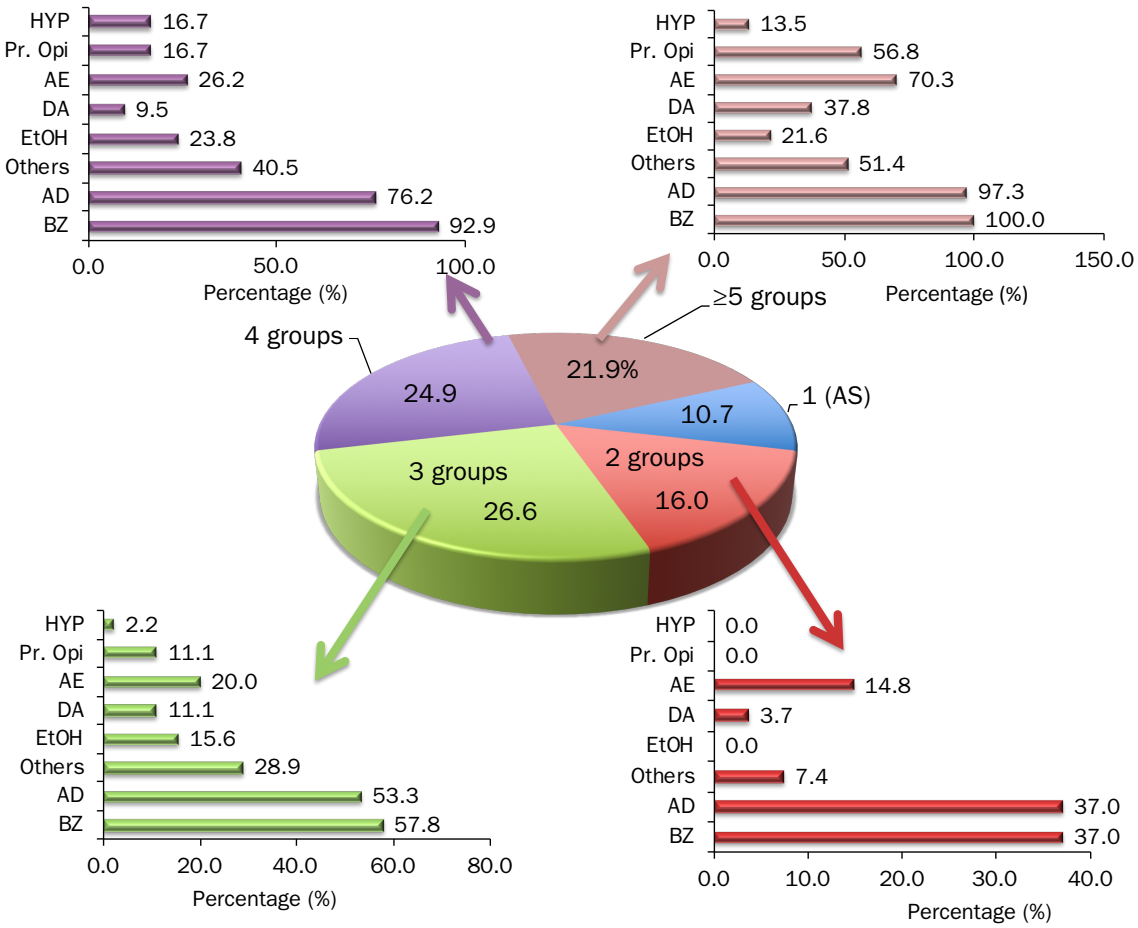
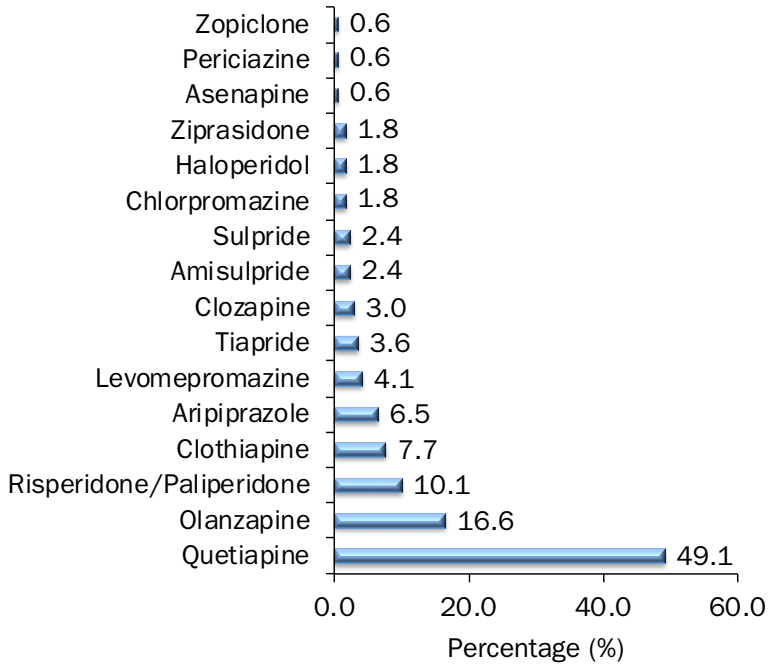


Figure 2.51 shows the percentage distribution of each of the AS detected in the suicides regarding the total of AS compounds. In this study, the cases positive for risperidone and paliperidone were counted together, as both compounds are active ingredients for medications but, in turn, paliperidone (9-hydroxy-risperidone) is risperidone's main metabolite. The medications found in the highest percentages were: quetiapine (49.1%), much higher than olanzapine (16.6%) and risperidone/paliperidone (10.1%), while the percentages of the other AS were below 10%, ranging from 7.7% (clothiapine) to 0.6%, since only one case was detected positive for asenapine, periciazine and zopiclone.

Figure 2.51. Distribution of the AS compounds detected, not considering possible associations



The table below shows a statistical study of the concentrations of the main AS compounds. The table specifies the total number of cases in which each compound is detected and the statistical study of the concentrations, that includes the range of concentrations detected (minimum and maximum concentrations), average and median concentrations, and percentiles 25 and 75.

	Concentrations in blood (mg/l)					
	No. of cases	Range	Average	Median	Percentile 25	Percentile 75
ANTIPSYCHOTIC DRUGS						
Quetiapine	83	0.01–28.2	2.0	0.4	0.1	2.0
Olanzapine	28	0.01–5.1	0.4	0.06	0.04	0.14
Clotiapine	13	0.01–0.2	0.07	0.05	0.01	0.1
Paliperidone	12	0.01–0.1	0.05	0.05	0.01	0.07
Aripiprazole	11	0.03–0.3	0.2	0.2	0.1	0.2

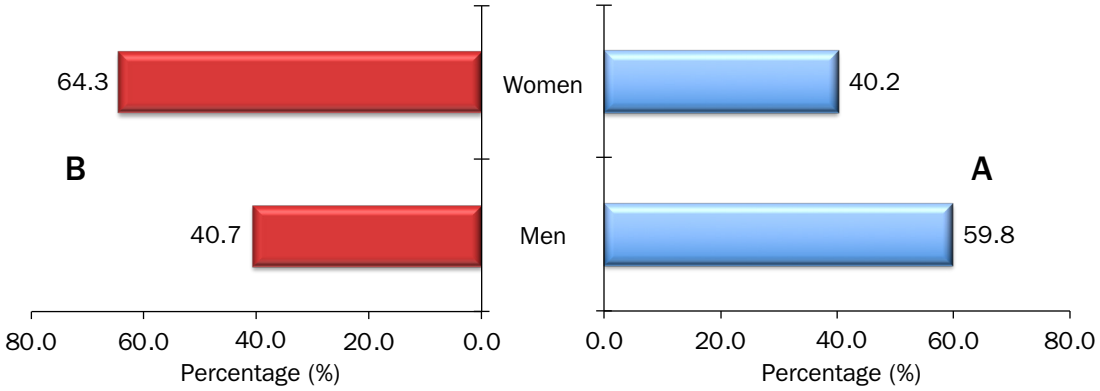
2.8. Benzodiazepines (BZ)

637 of the suicides received at the INTCF in 2019 had consumed benzodiazepines, which represent 37.1% of all suicides, and 47.8% of the cases with positive results.

2.8.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for benzodiazepines

If we consider the sex of the BZ positive cases, 59.8% were men and 40.2% women (Figure 2.52A). Opposite results were obtained when comparing with the total of positive cases in each of the sexes: 64.3% of women with positive result had consumed BZ, compared to 40.7% in men (Figure 2.52B).

Figure 2.52. Influence of sex. A: Percentage distribution of the cases positive for BZ in both sexes; B: Percentage distribution of positives for BZ regarding the total of positive cases in each of the sexes



In order to study the influence of age, different profiles were obtained depending on whether only the BZ positive cases were studied, or if the comparison was performed with the cases with positive result in each of the age ranges considered. In the first case, we obtained the pyramid-shaped profile increasing from the under-20s at 0.5% to ages from 50 to 59 (25.7%), and then decreasing up to the over-90s (0.9%) (Figure 2.53A). In the second case, the lowest percentage was found in the under-20s, only 20% had a positive result for BZ. In the other age ranges, the percentages were similar, but with some differences. The percentage of positives in the 20-29 and 70-79 to higher than 90 years old was around 40% (36.3% in ages 80 to 89 and 39.4% in the 20-29 range). The percentage of positives in the ages from 30 to 70 years old was around 50% (47.8% in ages 40-49 and 56% of those in the 60-69 years old) (Figure 2.53B).

If we consider the evolution of positive cases over the twelve months of the year, no differences were found in the percentages when compared with the total of BZ positive cases (the percentages ranged from 6.0% in February to 9.7% in September) (Figure 2.54A), and when compared with the number of cases with positive result of each month, although in this case the percentages were not so homogeneous (Figure 2.54B).

Figure 2.53. Influence of age. A: Percentage distribution of the age ranges in the cases positive for BZ (637 cases); B: Percentage distribution regarding each of the ages ranges

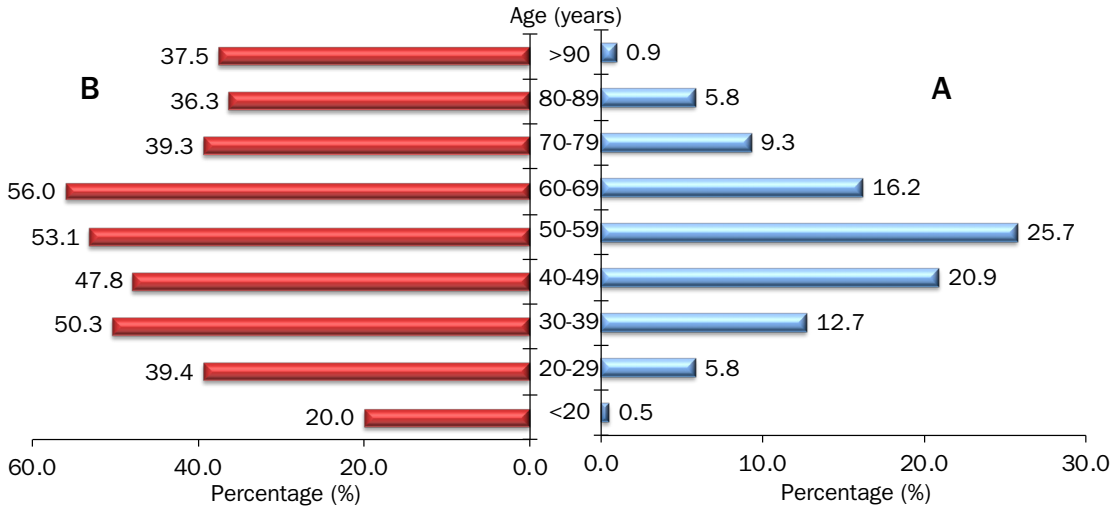
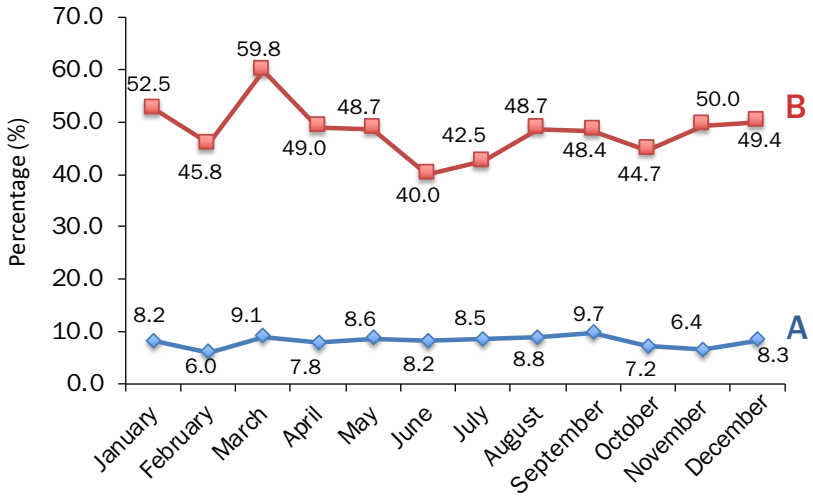
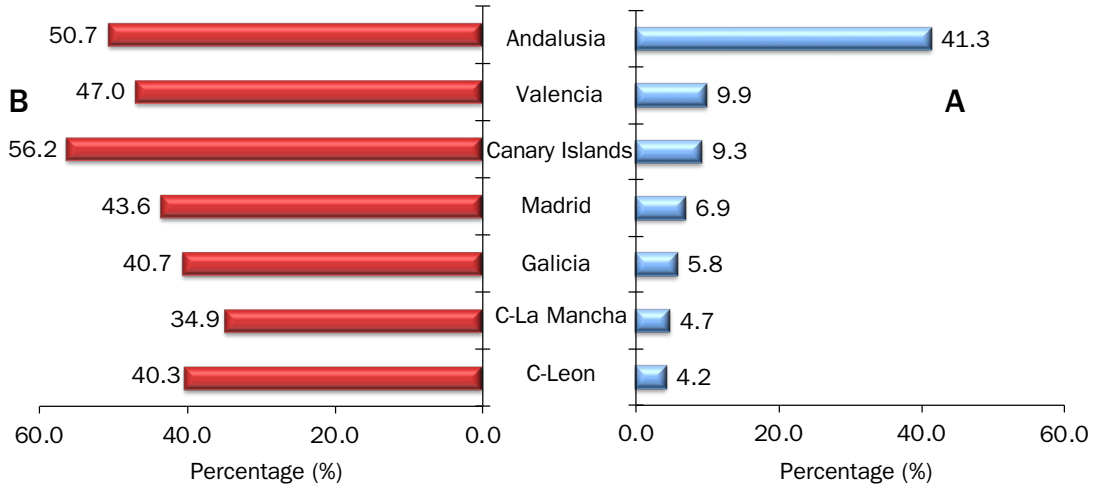


Figure 2.54. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for BZ (637 cases); B: Percentage distribution regarding each of the months of the year



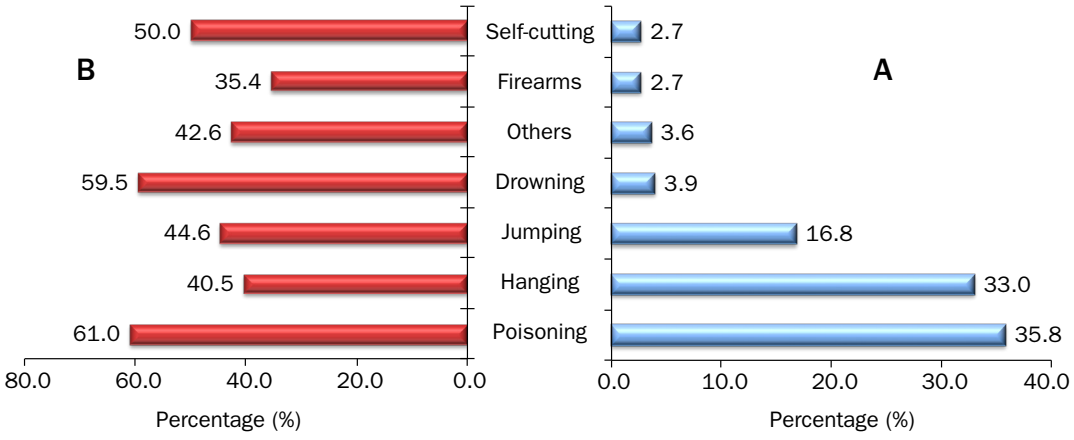
In the AC, 41.3% of the BZ positive results were found in Andalusia, much higher than the percentage of the other AC, which ranged from 9.9% in Valencia to 4.2% in C-Leon (Figure 2.55A). As in the previous cases, the profiles differed when they were compared with the total of positive cases from each AC. In this case, the highest percentage was found in the Canary Islands, where 56.2% of the people who committed suicide had consumed BZ, followed by Andalusia (50.7%), Valencia (47.0%), Madrid (43.6%), Galicia (40.7%), C-Leon (40.3%) and C-La Mancha (34.9%) (Figure 2.55B).

Figure 2.55. Influence of the AC. A: Percentage distribution of the number of cases positive for BZ in each AC; B: Percentage distribution of positives for BZ regarding the total of positive cases in each AC



Most of the BZ positives committed suicide by poisoning (35.8%), followed by hanging (33.0%) and jumping from height (16.8%), and in a lower proportion by other mechanisms, ranging from 3.9% (drowning) to 2.7% (self injury by cutting and firearms) (Figure 2.56A). When comparing the percentage of BZ positives with the number of positives per each mechanism, the data did not differ as much: the highest percentages were found in poisoning (61.0%) and drowning (59.5%), and the lowest in suicide by firearm (35.4%). The other mechanisms ranged from 40.5% (hanging) to 50.0% (self injury by cutting) (Figure 2.56B).

Figure 2.56. Influence of the suicide mechanism. A: Percentage distribution of cases positive for BZ in each of the suicide mechanisms; B: Percentage distribution of positives for BZ regarding the total of positive cases in each of the mechanisms



2.8.2. Mono-intoxications versus poly-drug use

Figure 2.57A shows that BZ only was detected in just 14.1%; whereas in the other cases, combinations of BZ with other groups of compounds were found, and the percentages decreased from the combinations of 2 groups of compounds (35.8%) to 5 groups or more (7.7%).

If we consider the number of BZ compounds consumed simultaneously by the same individual (Figure 2.57B), most of them had consumed a single BZ (82.9%) followed by 2 and 3 benzodiazepine medications (14.6% and 1.7%, respectively); while only 4 cases (0.6%) showed simultaneous consumption of four BZ.

Figure 2.57. Percentage distribution of simultaneous consumption of other groups of compounds along with BZ (groups) and of several BZ simultaneously (compounds)

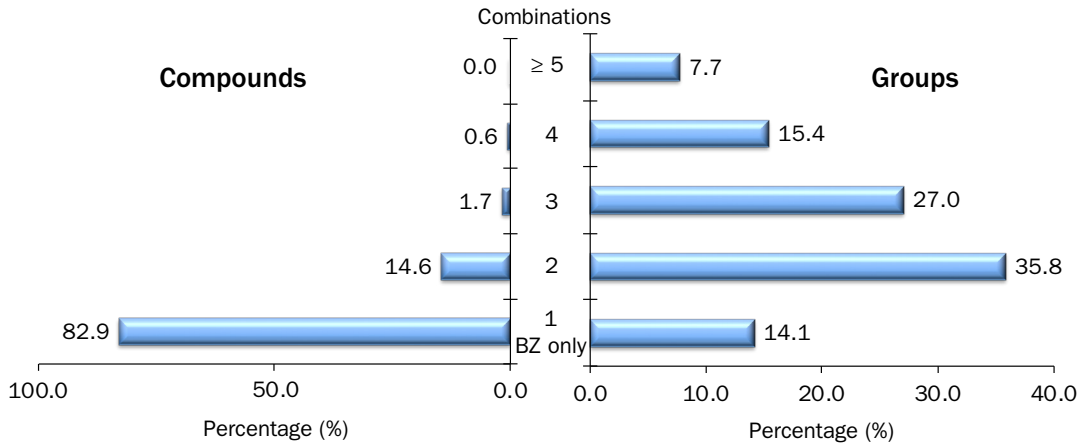


Figure 2.58 shows the percentage distribution of the combination of groups of substances detected along with BZ. The highest percentages were found with AD (51.8%) and the group "others" (28.9%), and the lowest with HYP (6.8%). The combinations with the other groups of substances were similar, ranging from 19.2% (EtOH) to 14.4% (AE).

Figure 2.59 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.60 shows the percentage distribution of each of the BZ that were detected in the suicides regarding the total of benzodiazepine compounds. For this study, the cases positive for diazepam and nordiazepam were counted together, as the latter is the active metabolite of several BZ, such as: diazepam, clorazepate, chlordiazepoxide, halazepam and prazepam. Therefore, the presence of diazepam indicates its consumption, but a positive result for nordiazepam does not exclude that the person also consumed diazepam or another BZ of which it is also a metabolite. This is the same case with lorazepam and lormetazepam, which were also counted together, because both compounds are

Figura 2.58. Percentage distribution of the combinations of substances detected along with BZ

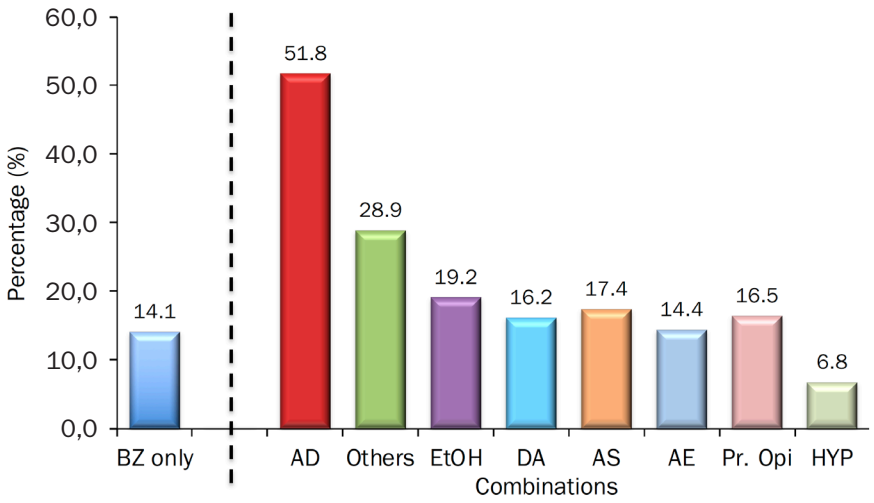
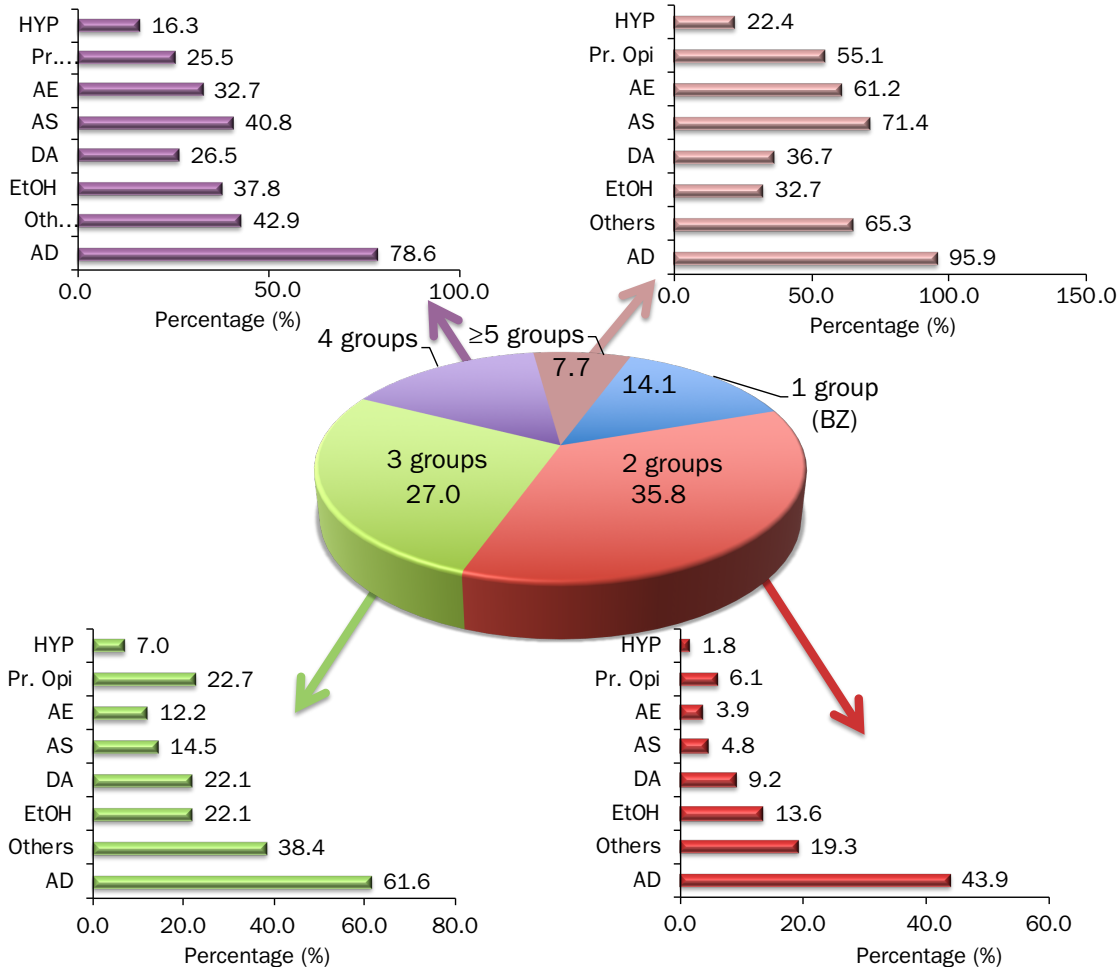
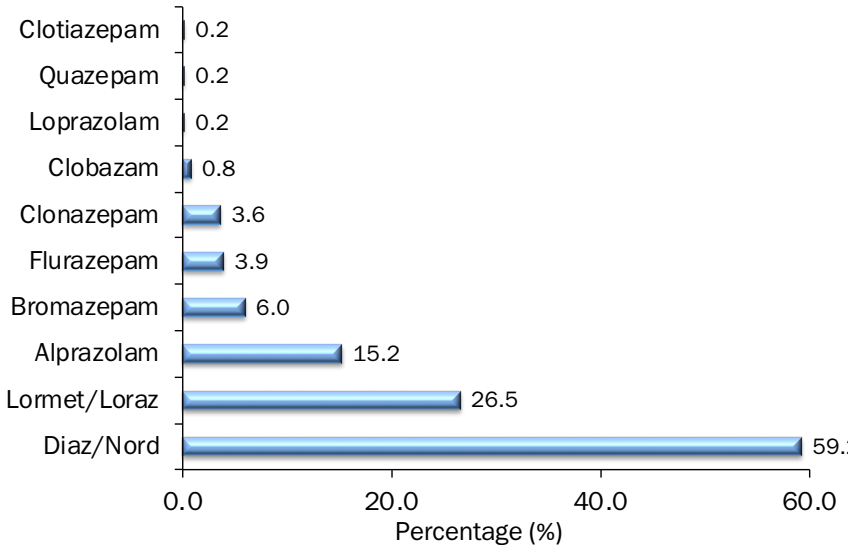


Figura 2.59. Combinations of BZ with other groups of substances (%)



active ingredients of medications but, in turn, lorazepam is a metabolite for lormetazepam. As before, the presence of lorazepam (in low concentrations) does not exclude that it was due to the metabolism of lormetazepam. The BZ compounds most frequently found were: diazepam/nordiazepam (59.2%) lorazepam/lormetazepam (26.5%) and alprazolam (15.2%). Positive results were also obtained for bromazepam (6.0%), flurazepam and metabolite (3.9%), clonazepam and metabolite (3.6%), clobazam (0.8%), and only one case was positive (0.2%) for clotiazepam, loprazolam and quazepam.

Figura 2.60. Distribution of the BZ detected, not considering possible associations



The table below shows a statistical study of the concentrations of each of the BZ compounds. The table specifies the total number of cases in which each compound is detected and the statistical study of the concentrations, that includes the range of concentrations detected (minimum and maximum concentrations), average and median concentrations, and percentiles 25 and 75.

	Concentrations in blood (mg/l)					
	No. of cases	Range	Average	Median	Percentile 25	Percentile 75
DIAZEPAM	204	0.01-5.00	0.28	0.14	0.08	0.29
Nordiazepam	215	0.01-4.75	0.49	0.20	0.09	0.53
Alprazolam	97	0.01-1.10	0.12	0.07	0.03	0.16
Lormetazepam	82	0.01-8.43	0.36	0.07	0.04	0.20
Lorazepam	99	0.01-3.22	0.28	0.09	0.04	0.21
Bromazepam	38	0.03-3.00	0.45	0.19	0.08	0.52

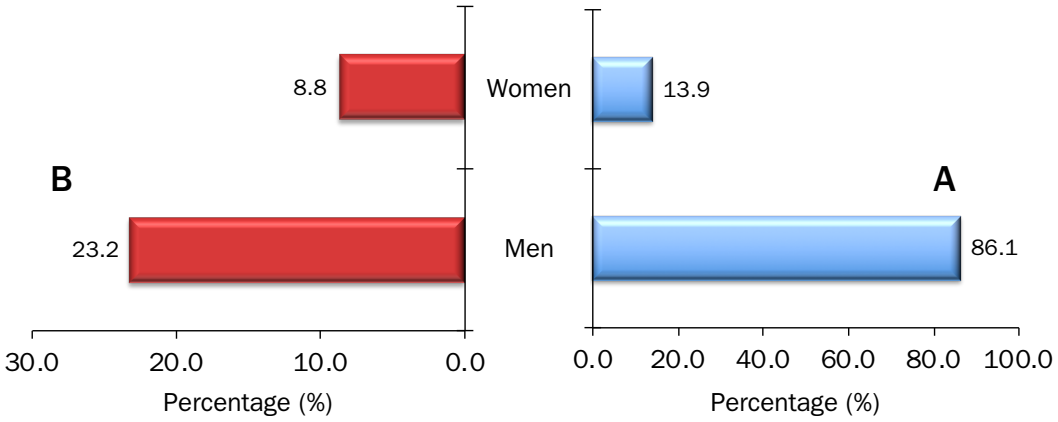
2.9. Drugs of abuse (DA)

252 of the suicides received at the INTCF in 2019 had consumed drugs of abuse, which represent a 14.7% of all suicides, and 18.9% of the cases with positive results.

2.9.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for drugs of abuse

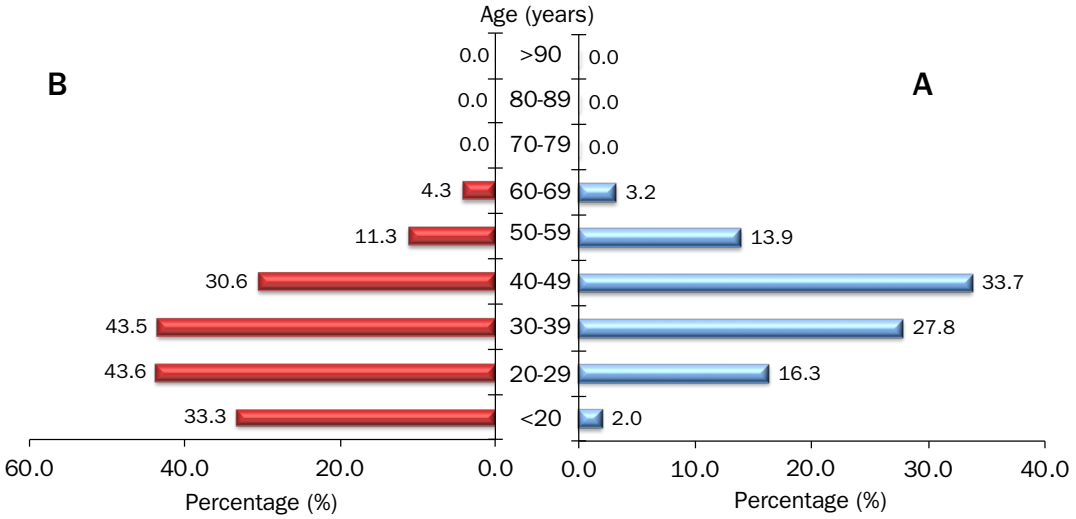
If we consider the sex in DA positive cases, 86.1% were men and 13.9% women (Figure 2.61A). The same profile was obtained when comparing with the total of positive cases in each of the sexes: 23.2% of men with positive result had consumed DA, compared to 8.8% of women (Figure 2.61B).

Figure 2.61. Influence of sex. A: Percentage distribution of the cases positive for DA in both sexes; B: Percentage distribution of positives for DA regarding the total of positive cases in each of the sexes



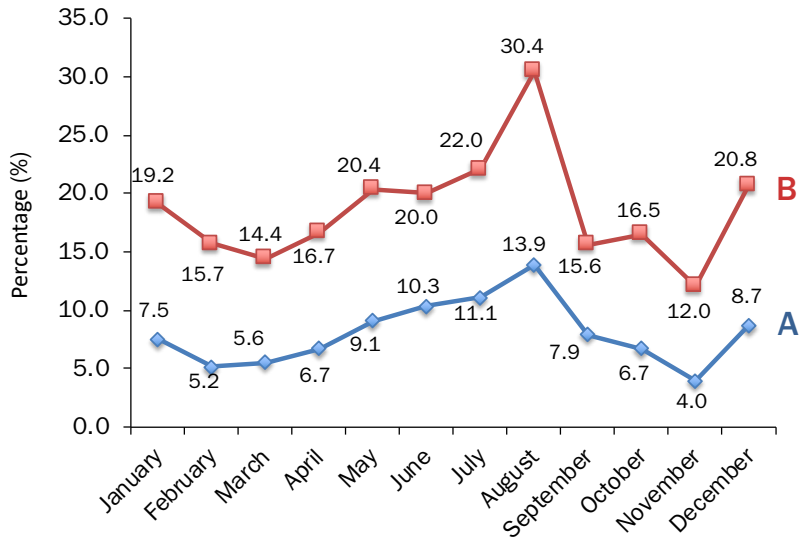
In order to study the influence of age, different profiles were obtained depending on whether only the DA positive cases were studied, or if the comparison was performed with the cases with positive result in each of the age ranges considered. In the first case, we obtained the pyramid-shaped profile increasing from the under-20s at 2.0% to ages from 40 to 49 (33.7%), and then decreasing up to the ages 60-69 years old (3.2%) (Figure 2.62A). In the second case (Figure 2.62B), the highest percentages were found in the age ranges between 20 and 39 (43.5%), followed by the under-20s (33.3%) and from 40-49 (30.6%). The values decreased in the suicides in ages from 50-59 (11.3%) and 60-69 (4.3%). The oldest person with a positive result for drugs of abuse was 66 years old.

Figure 2.62. Influence of age. A: Percentage distribution of the age ranges in the cases positive for DA (252 cases); B: Percentage distribution regarding each of the age ranges



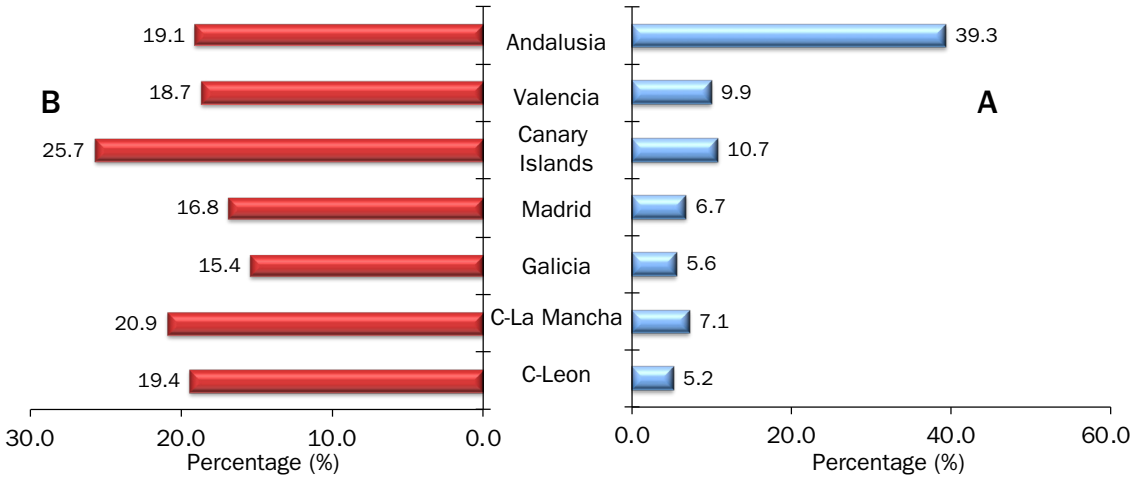
If we consider the evolution of positive cases over the twelve months of the year, the profiles were parallel when compared with the total of DA positive cases (Figure 2.63A) and when compared with the number of cases with positive result of each month (Figure 2.63B). In both cases, there were increases in the percentages from March to August, and then they decreased until November, and increased again in December.

Figure 2.63. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for DA (252 cases); B: Percentage distribution regarding each of the months of the year



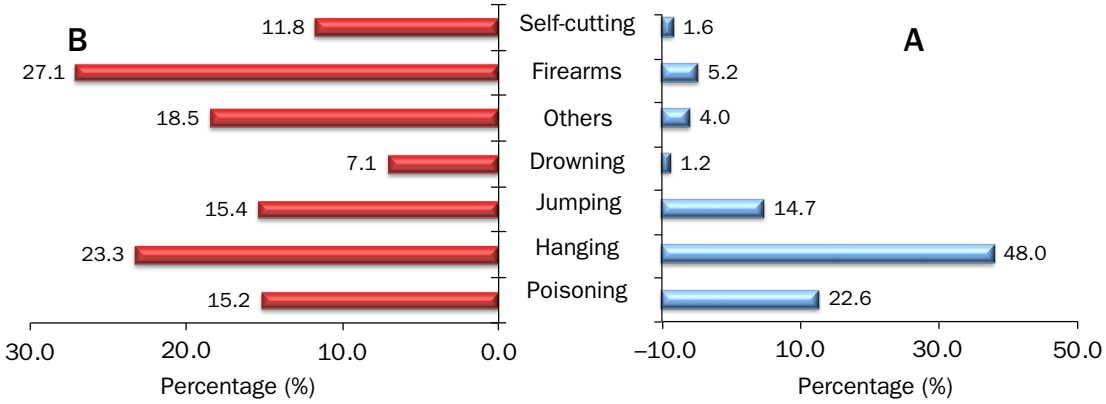
In the AC, 39.3% of the DA positive results were found in Andalusia, much higher than the percentage of the other AC, which ranged from 10.7% in the Canary Islands to 5.2% in C-Leon (Figure 2.64A). As in the previous cases, the profiles differed when they were compared with the total of positive cases from each AC. In this case the highest percentage was found in the Canary Islands; 25.7% of the people who committed suicide in this AC had consumed DA and the percentages were similar in the other AC, ranging from 15.4% in Galicia to 20.9% in C-La Mancha (Figure 2.64B).

Figure 2.64. Influence of the AC. A: Percentage distribution of the number of cases positive for DA in each AC; B: Percentage distribution of positives for DA regarding the total of positive cases in each AC



Most of the DA positives committed suicide by hanging (48.0%), followed by poisoning (22.6%) and jumping from height (14.7%), and in a lower proportion by other mechanisms, ranging from 5.2% (firearm) to 1.2% (drowning) (Figure 2.65A). When comparing the percentage of DA positives with the number of positives per each mechanism, the data also differed; the highest percentages were found in firearms (27.1%) and hanging (23.3%), and the lowest in suicide by drowning (7.1%). The other mechanisms ranged from 11.8% (firearm) to 18.5% ("others") (Figure 2.65B).

Figure 2.65. Influence of the suicide mechanism. A: Percentage distribution of cases positive for DA in each of the suicide mechanisms; B: Percentage distribution of positives for DA regarding the total of positive cases in each of the mechanisms



2.9.2. Mono-intoxications versus poly-drug use

Figure 2.66 shows that DA only was detected in 23.0%; whereas in the other cases, combinations of DA with other groups of compounds were detected, and the percentages decreased from the combinations of 2 groups of compounds (37.3%) to 5 groups or more (8.7%).

If we consider the number of DA consumed simultaneously by the same individual (Figure 2.66B), most had consumed a single DA (85.7%), followed by the simultaneous consumption of 2 and 3 drugs (9.9% and 3.6%, respectively); while only 2 cases (0.8%) showed simultaneous consumption of 4 drugs of abuse.

Figure 2.66. Percentage distribution of simultaneous consumption of other groups of compounds along with DA (Groups) and of several DA simultaneously (Compounds)

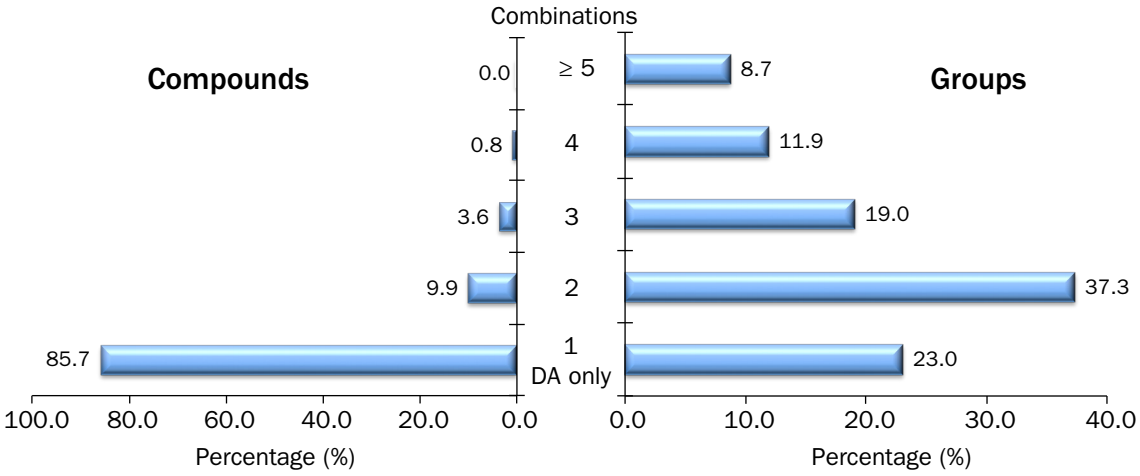


Figure 2.67 shows the percentage distribution of the combination of groups of substances detected along with the DA. The highest percentages were found with BZ (40.9%) and EtOH (36.9%), followed by AD (25.0%). The percentages of the combinations with the other groups of substances were lower, ranging from 13.1% (Pr. Opi) to 4.8% (HYP).

Figure 2.67. Percentage distribution of the combinations of substances detected along with DA

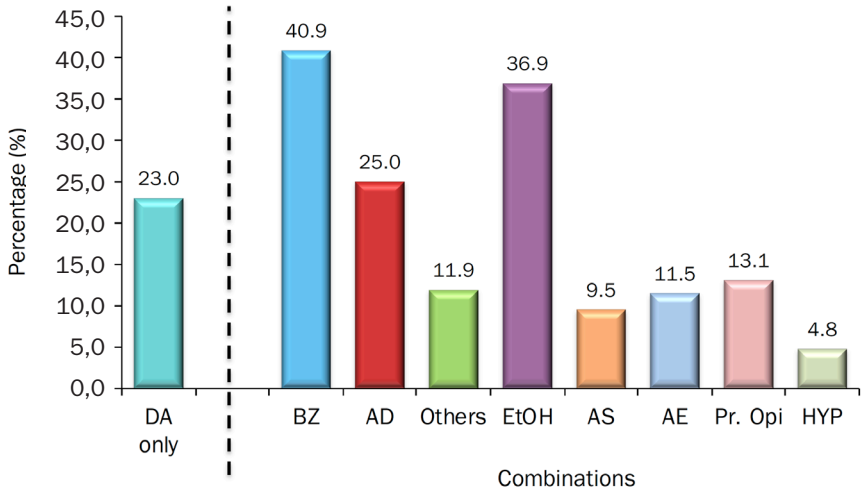


Figure 2.68 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.69 shows the percentage distribution of each of the DA that were detected in the suicides regarding the total of cases positive for drugs of abuse. The drugs that were found in the highest percentage were cocaine (67.5%) and cannabis (37.3%), followed by heroin (8.3%). Positive results were also found for amphetamine (2.0%), MDMA (1.6%), ketamine and methamphetamine (0.8%), and only one case was positive for ephedrine (0.4%).

Figure 2.68. Combinations of DA with other groups of substances (%)

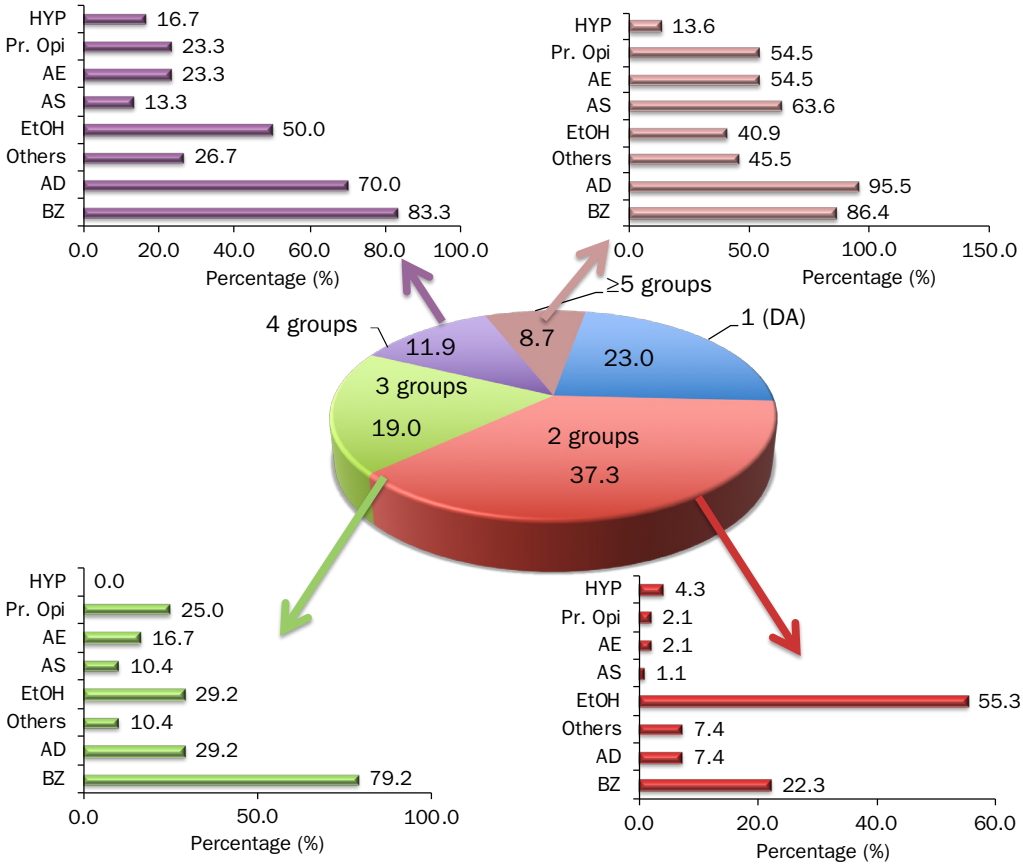
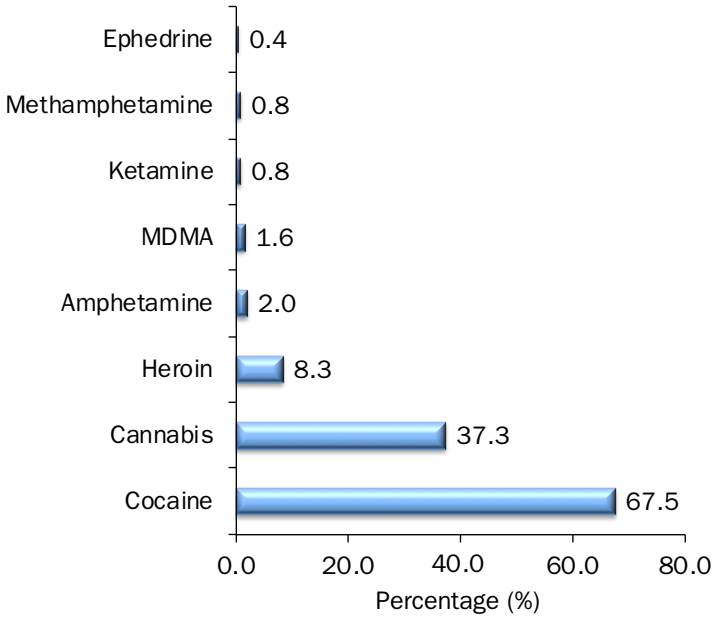


Figure 2.69. Distribution of the DA detected, not considering possible associations



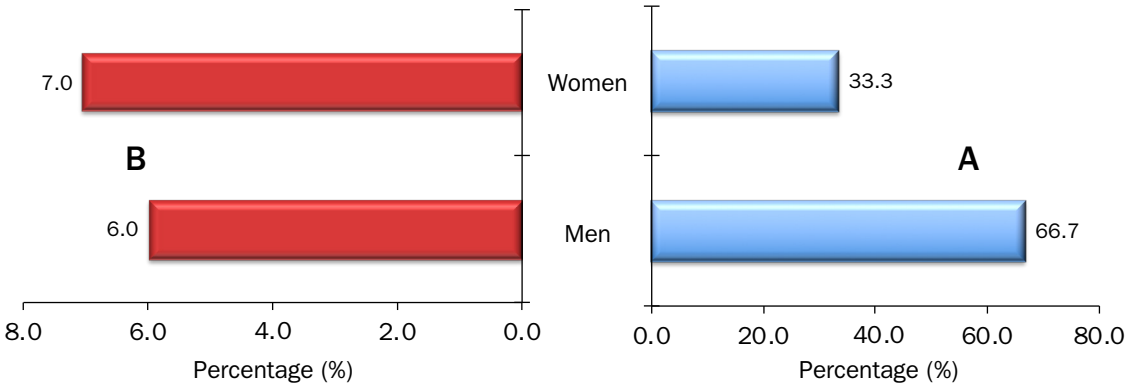
2.10. Hypnotic drugs (HIP)

84 of the suicides received at the INTCF in 2019 had consumed hypnotic drugs, which represent 4.9% of all suicides, and 6.3% of the cases with positive results.

2.10.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for hypnotic drugs

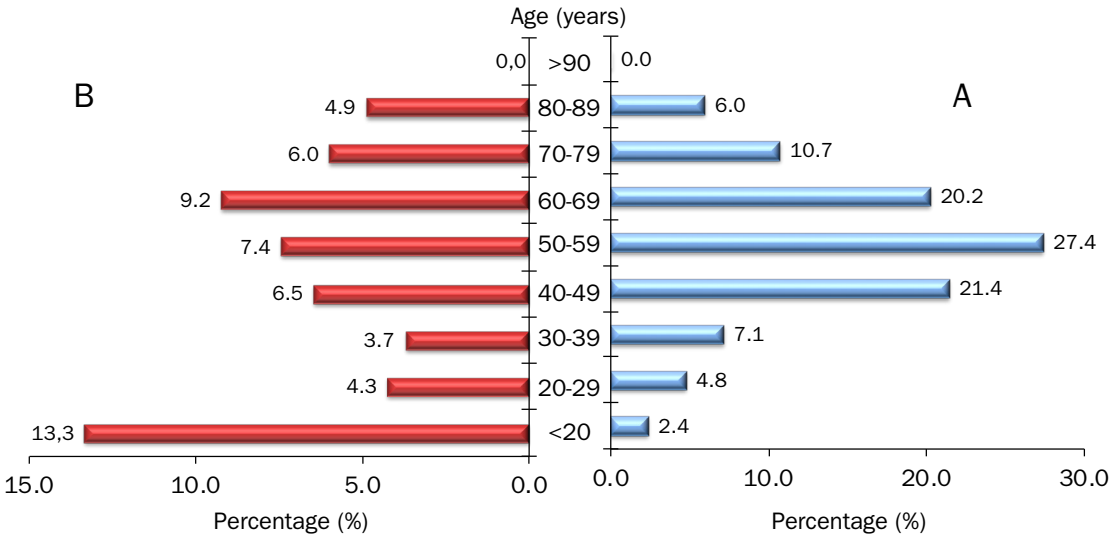
If we consider the sex of the HP positive cases, 66.7% were men and 33.3% women (Figure 2.70A). When comparing with the total of positive cases in each of the sexes, the percentages were reversed and closer to each other 7.0% of women with positive result had consumed HYP, compared to 6.0% of men (Figure 2.70B).

Figure 2.70. Influence of sex. A: Percentage distribution of the cases positive for HYP in both sexes; B: Percentage distribution of positives for HYP regarding the total of positive cases in each of the sexes



In order to study the influence of age, different profiles were obtained depending on whether only the HYP positive cases were studied, or if the comparison was performed with the cases with positive result in each of the age ranges considered. In the first case, we obtained the pyramid-shaped profile increasing from the under-20s at 2.4% to ages from 50 to 59 (27.4%), and then decreasing up to the 80-89 range (6.0%). No case was positive for HYP in those over 90 years-old (Figure 2.71A). In the second case (Figure 2.71B), the highest percentage was found in the under-20s (13.3%); after 20-29 years old the profile was also pyramid-shaped, increasing from the 20-29-year-olds (4.3%) to 60-69-year-olds (9.2%) and then decreasing up to the 80-89-year-olds (4.9%).

Figure 2.71. Influence of age. A: Percentage distribution of the age ranges in the cases positive for HYP (84 cases); B: Percentage distribution regarding each of the age ranges



If we consider the evolution of positive cases over the twelve months of the year, the profiles were parallel when compared with the total of HYP positive cases (Figure 2.72A) and when compared with the number of cases with positive result of each month (Figure 2.72B). In both cases, the percentages decreased from January to April, followed by an increase up to June, another decrease until August, and starting in October the percentages increased during the last months of the year.

In the AC, the highest percentage was found in Andalusia (29.8%), followed by Valencia (13.1%), Madrid (11.9%), and the Canary Islands (9.5%). The percentages in the other AC were lower (from 4.8% in Galicia to 7.1% in C-Leon) (Figure 2.73A). As in the previous cases, the profiles differed when they were compared with the total of positive cases from each AC. In this case, the highest percentage was found in Madrid, where 9.9% of the people who committed suicide in this AC had consumed HYP, quite similar to the data in C-Leon (9.0%), Valencia (8.2%) and the Canary Islands (7.6%), and higher than C-La Mancha (5.8%), Andalusia (4.8%) and Galicia (4.4%) (Figure 2.73B).

Most of the HYP positives committed suicide by poisoning (53.6%), followed by hanging (19.0%) and jumping from height (8.3%), and in a lower proportion by other mechanisms, varying from 4.8% (drowning and self injury by cutting) to 2.4% (firearm) (Figure 2.74A). When comparing the percentage of HYP positives with the number of positives per each mechanism, the highest percentages were found by poisoning (12.0%), self injury by cutting (11.8%) and drowning (9.5%). The other mechanisms ranged from 2.9% (jumping from height) to 5.6% (“others”) (Figure 2.74B).

Figure 2.72. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for HYP (84 cases); B: Percentage distribution regarding each of the months of the year

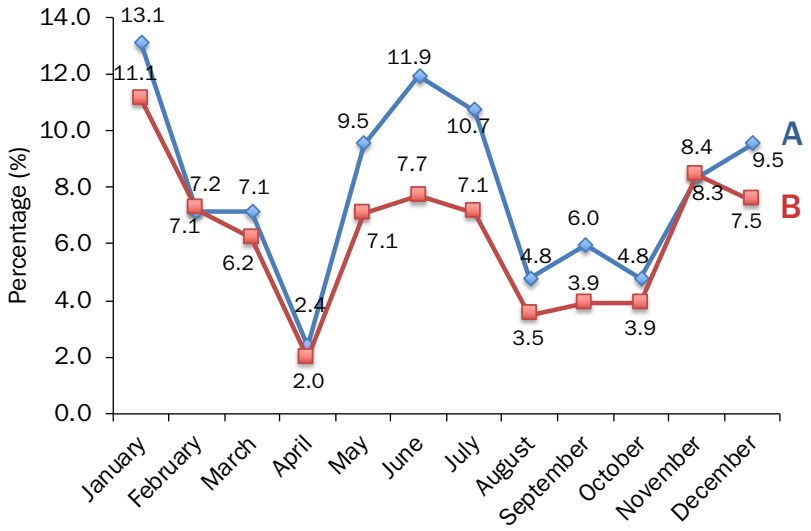


Figure 2.73. Influence of the AC. A: Percentage distribution of the number of cases positive for HYP in each AC; B: Percentage distribution of positives for HYP regarding the total of positive cases in each AC

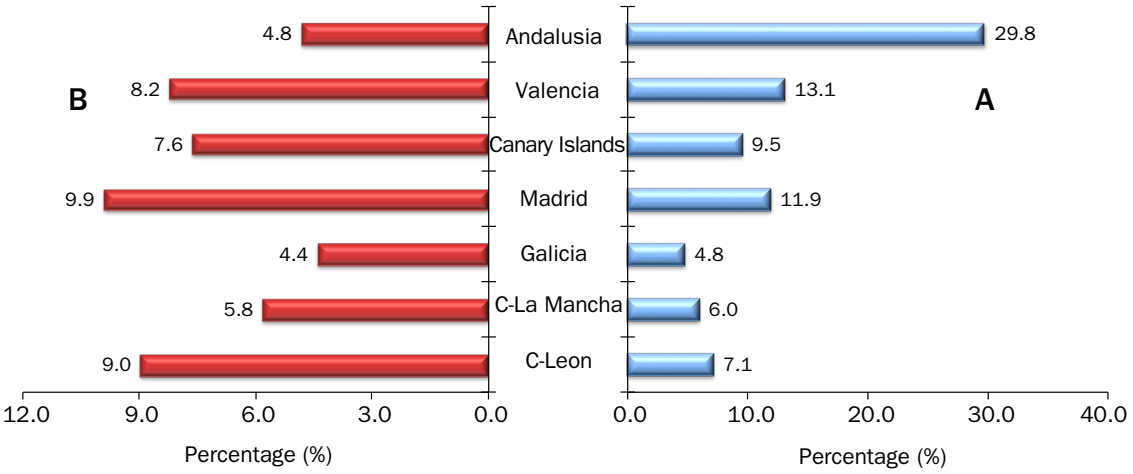
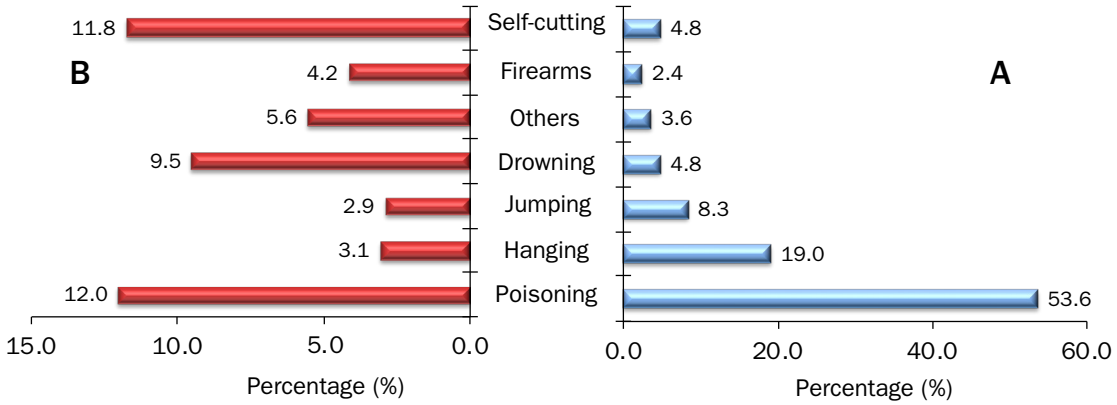


Figure 2.74. Influence of the suicide mechanism. A: Percentage distribution of cases positive for HYP in each of the suicide mechanisms; B: Percentage distribution of positives for HYP regarding the total of positive cases in each of the mechanisms



2.10.2. Mono-intoxications versus poly-drug use

HYP only was detected in just 7.1% of the cases (Figure 2.75A); whereas in the other cases, combinations of HYP with other groups of compounds were detected, and the percentages were similar in the combinations of 2, 3 and 4 groups of compounds (27.4%, 21.4% and 28.6%, respectively), and decreased in the cases where 5 groups or more were detected (15.5%).

If we consider the number of HYP compounds consumed simultaneously by the same individual (Figure 2.75B), in almost all of the cases a single hypnotic medication had been consumed (97.2%) and in only two cases (2.4%) there was simultaneous consumption of 2 HYP.

Figure 2.75. Percentage distribution of simultaneous consumption of other groups of compounds along with HYP (groups) and of several HYP medications simultaneously (compounds)

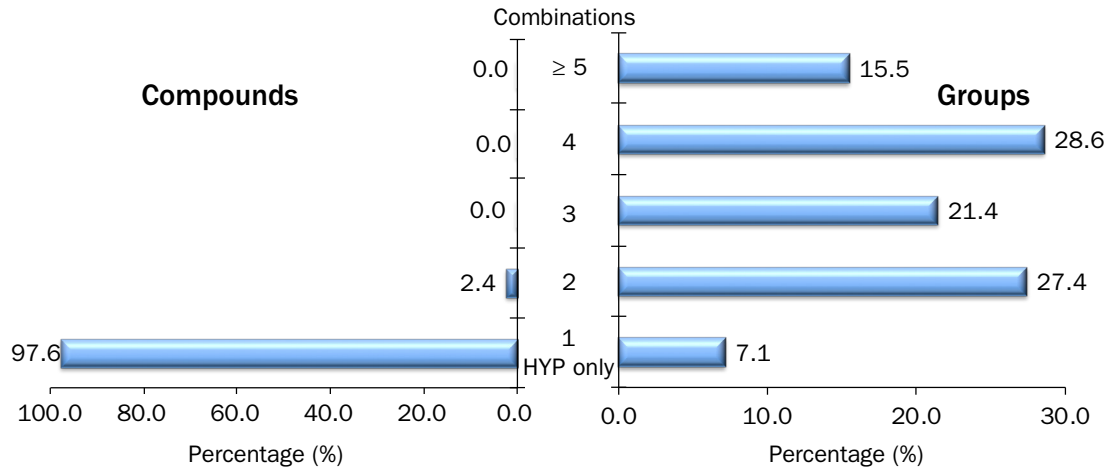


Figure 2.76 shows the percentage distribution of the combination of groups of substances detected along with the HYP. The highest percentages were found with BZ (51.2%), AD (42.9 %), "others" (41.7%), and EtOH (35.7%). The combinations with the other groups of substances were similar, ranging from 11.9% (AE) to 15.5% (AS).

Figure 2.76. Percentage distribution of the combinations of substances detected along with HYP

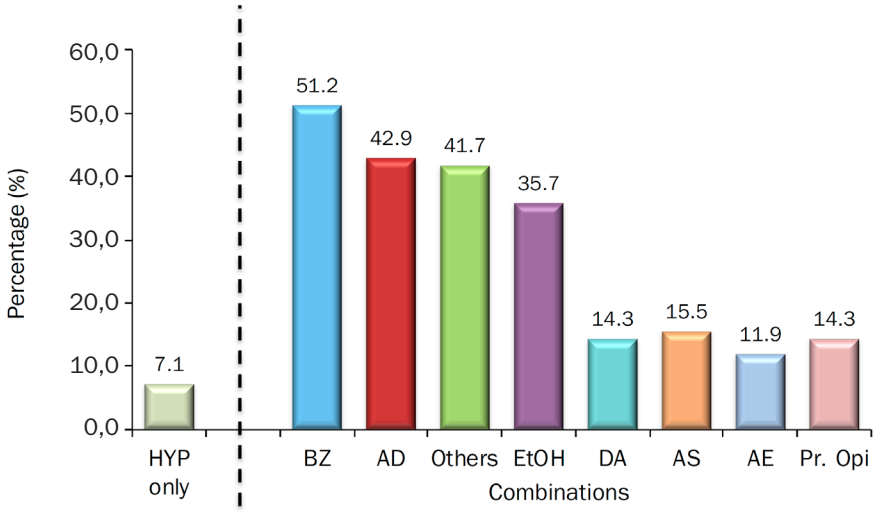


Figure 2.77 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.78 shows the percentage distribution of each of the HYP that were detected in the suicides regarding the total of cases positive for these compounds. The HYP found in the highest percentage were zolpidem (39.3%) and doxylamine (35.7%), followed by clomethiazole (15.5%), and only 8 cases were found positive for diphenhydramine (9.5%).

The table below shows a statistical study of the concentrations of each of the hypnotic drug compounds. The table specifies the total number of cases in which each compound is detected and the statistical study of the concentrations, that includes the range of concentrations detected (minimum and maximum concentrations), average and median concentrations, and percentiles 25 and 75.

	Concentrations in blood (mg/l)					
	No. of cases	Range	Average	Median	Percentile 25	Percentile 75
HYPNOTIC DRUGS						
Zolpidem	33	0.01-7.3	1.0	0.5	0.1	1.2
Doxylamine	30	0.1-15.0	1.6	0.5	0.2	1.3
Clomethiazole	13	0.1-54.0	9.4	3.0	0.6	11.7
Diphenhydramine	8	0.04-3.0	0.8	0.5	0.2	0.5

Figure 2.77. Combinations of HYP with other groups of substances (%)

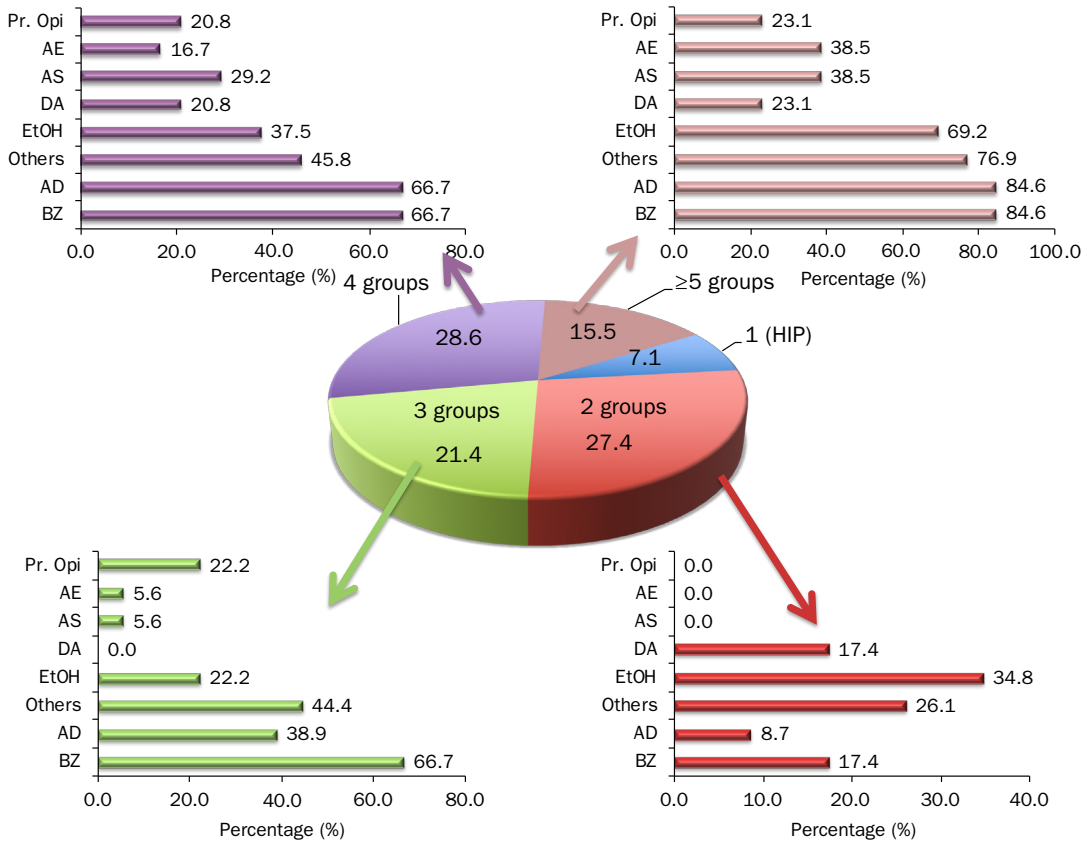
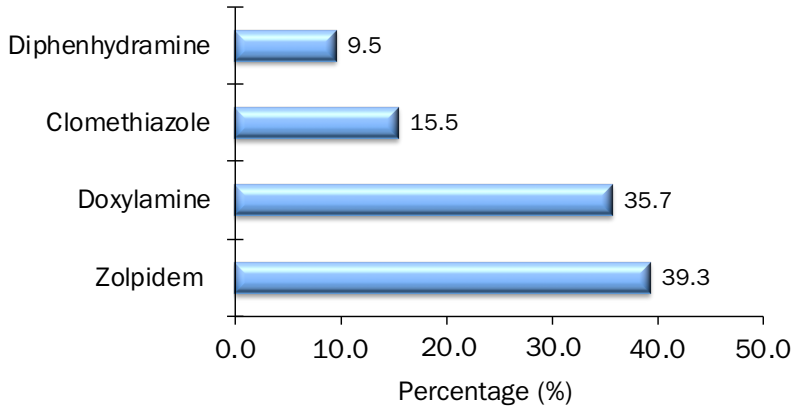


Figure 2.78. Distribution of the HYP compounds detected, not considering possible associations



2.11. Prescription opioids (Opl Tto)

As mentioned above, this group of compounds includes opioid compounds used as medication due to their ability to bind to the opioid receptors in the central nervous system.

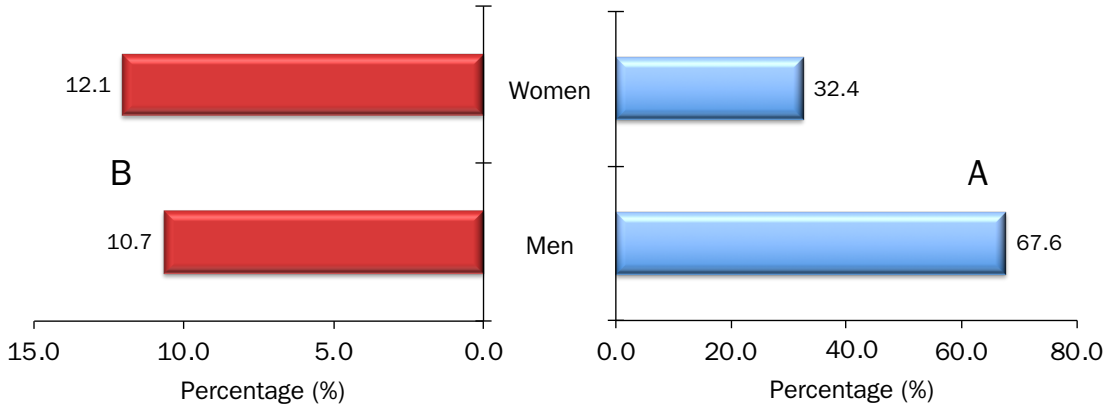
The medications included in this report are: codeine, dextromethorphan, fentanyl, methadone, morphine, oxycodone, pethidine, tapentadol and tramadol.

148 of the suicides received at the INTCF in 2019 had consumed prescription opioids, which represent 8.6% of all suicides, and 11.1% of the cases with positive results.

2.11.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for prescription opioids

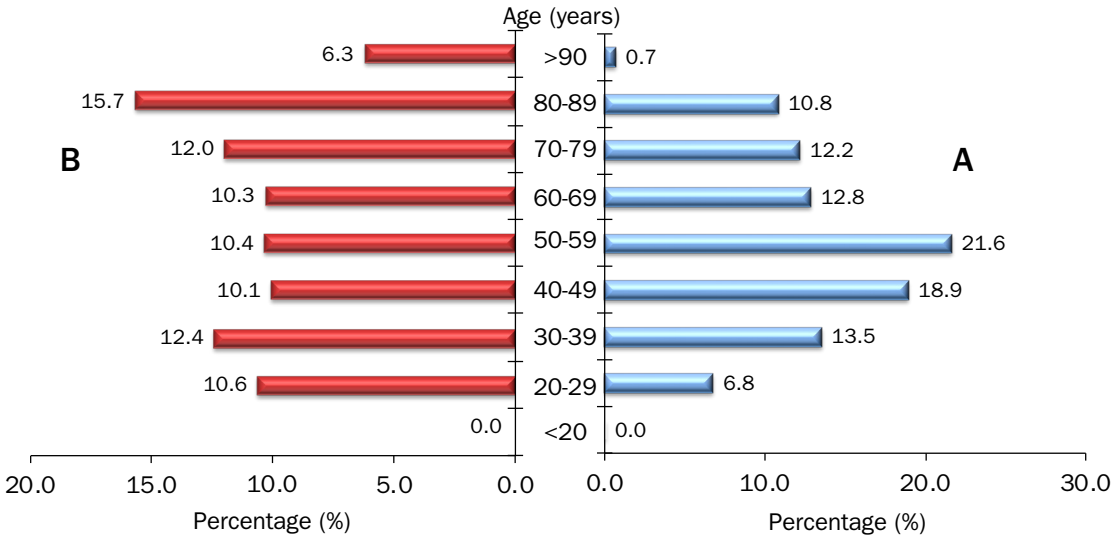
If we consider the sex of the Pr. Opi positive cases, 67.6% were men and 32.4% women (Figure 2.79A). However, when comparing with the total of positive cases in each of the sexes, the percentages were closer to each other: 12.1% of women with positive result had consumed Pr. Opi and 10.7% of men (Figure 2.79B).

Figure 2.79. Influence of sex. A: Percentage distribution of the cases positive for Pr. Opi in both sexes; B: Percentage distribution of positives for Pr. Opi regarding the total of positive cases in each of the sexes



In order to study the influence of age, different profiles were obtained depending on whether only the Pr. Opi positive cases were studied, or if the comparison was performed with the cases with positive result in each of the age ranges considered. In the first case, we obtained the pyramid-shaped profile, which increased from the ages from 20 to 29 (6.8%) to ages from 50 to 59 (21.6%), and then decreased up to the over-90s (0.7%, only one person) (Figure 2.80A). Medications in this group were not found in any of the persons under 20 years-old. In the second case (Figure 2.80B), the lowest percentage was found in the over 90s (6.3%) and the highest in the 80-89 range (15.7%). The percentages were similar in the other age ranges, ranging from 10.1% (40-49-year-olds) to 12.4% (30-39 year olds).

Figure 2.80. Influence of age. A: Percentage distribution of the age ranges in the cases positive for Pr. Opi (148 cases); B: Percentage distribution regarding each of the age ranges



If we consider the evolution of positive cases over the twelve months of the year, the profiles were parallel when compared with the total of Pr. Opi positive cases (Figure 2.81A) and when compared with the number of cases with positive result of each month (Figure 2.81B). In both cases there was a decrease in the percentages from January to June, followed by an increase up to October, another decrease in November and a new increase in December.

In the AC, 35.8% of the Pr. Opi positive results were found in Andalusia, much higher than the percentage of the other AC, which varied from 11.5% in Valencia to 5.4% in Madrid (Figure 2.82A). As in the previous cases, the profiles differed when they were compared with the total of positive cases from each AC. In this case, the lowest percentage was found in Madrid, where 7.9% of the people who committed suicide in this AC had consumed Pr. Opi. The percentages in the other AC were similar, they ranged from 10.2% (Andalusia) to 13.4% (C-Leon) (Figure 2.82B).

Most of the Pr. Opi positive cases committed suicide by poisoning (51.4%), followed by hanging (23.0%) and jumping from height (12.2%), and in a lower proportion by other mechanisms, ranging from 3.4% (drowning and self injury by cutting) to 2.0% (firearm and "others") (Figure 2.83A). When comparing the percentage of Pr. Opi positives with the number of positives per each mechanism, the highest percentages were found by poisoning (20.3%), self injury by cutting (14.7%) and drowning (11.9%). The other mechanisms ranged between 5.6% ("others") and 7.5% (jumping from height) (Figure 2.83B).

Figure 2.81. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for Pr. Opi (148 cases); B: Percentage distribution regarding each of the months of the year

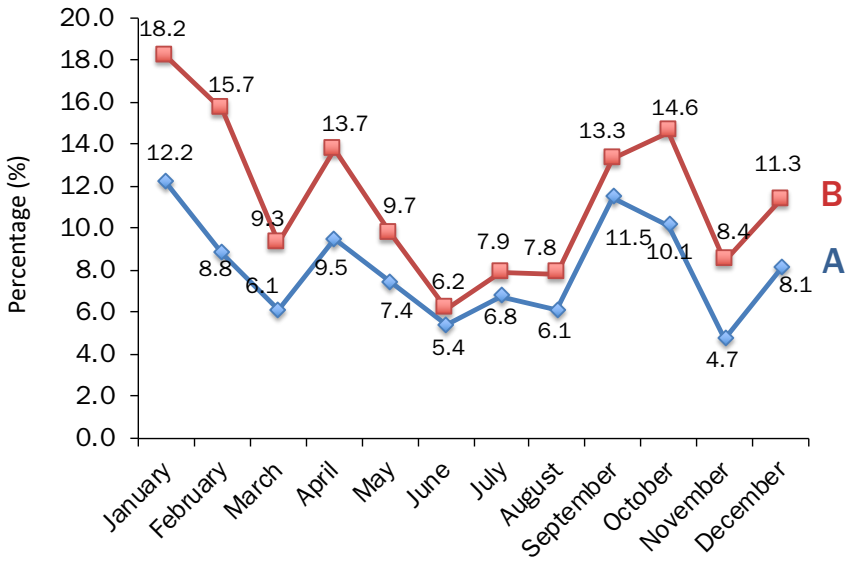


Figure 2.82. Influence of the AC. A: Percentage distribution of the number of cases positive for Pr. Opi in each AC; B: Percentage distribution of positives for Pr. Opi regarding the total of positive cases in each AC

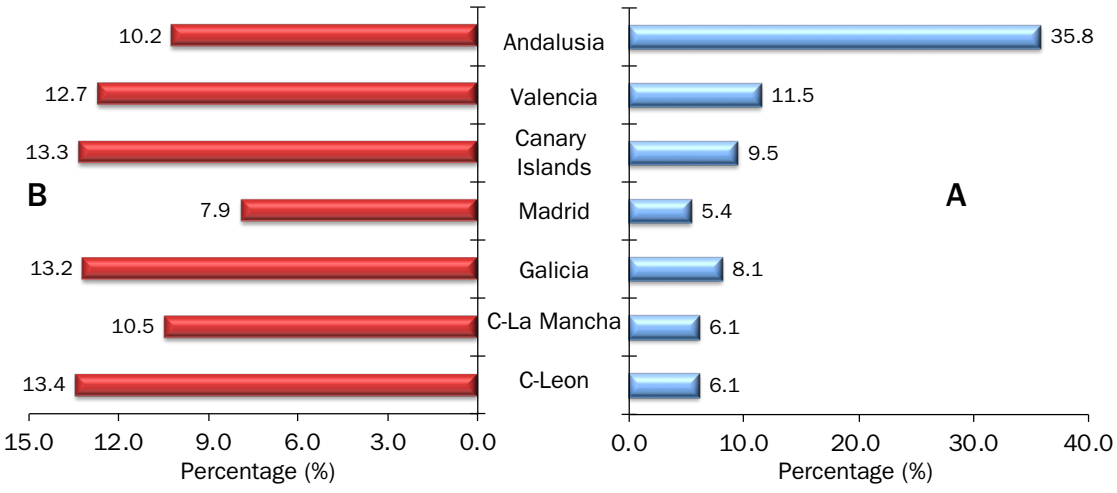
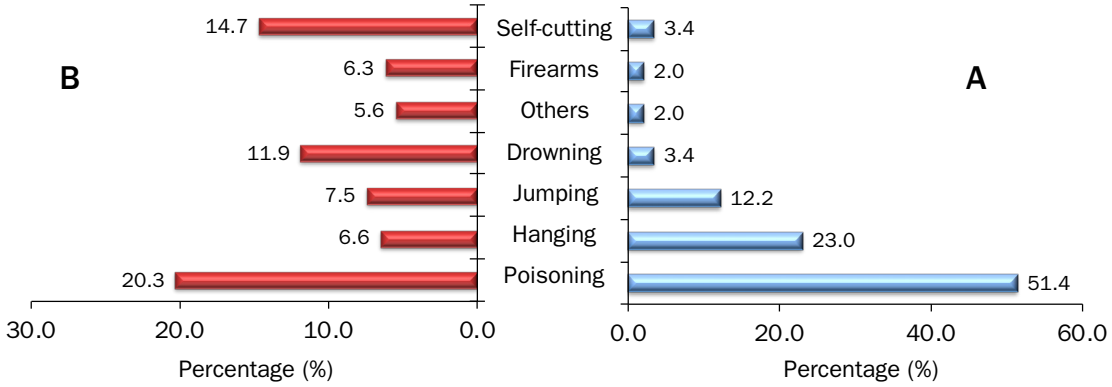


Figure 2.83. Influence of the suicide mechanism. A: Percentage distribution of cases positive for Pr. Opi in each of the suicide mechanisms; B: Percentage distribution of positives for Pr. Opi regarding the total of positive cases in each of the mechanisms



2.11.2. Mono-intoxications versus poly-drug use

As with other groups of compounds, Pr. Opi only was found in just 8.1% of cases, whereas in the other cases, combinations of Pr. Opi were found with other groups of compounds. The highest percentage was found in the combinations with 3 groups of compounds (35.1%) and the percentages were similar in the combinations with 2, 4 and 5 or more groups of compounds (17.6%, 18.9% and 20.3%, respectively) (Figure 2.84A).

If we consider the number of Pr. Opi consumed simultaneously by the same individual (Figure 2.84), most of them had consumed a single Pr. Opi (87.8%) followed by 2 (11.5%); while only one case (0.7%) showed simultaneous consumption of 3 or 4 Pr. Opi.

Figure 2.84. Percentage distribution of simultaneous consumption of other groups of compounds along with Pr. Opi (groups) and of several Pr. Opi simultaneously (compounds)

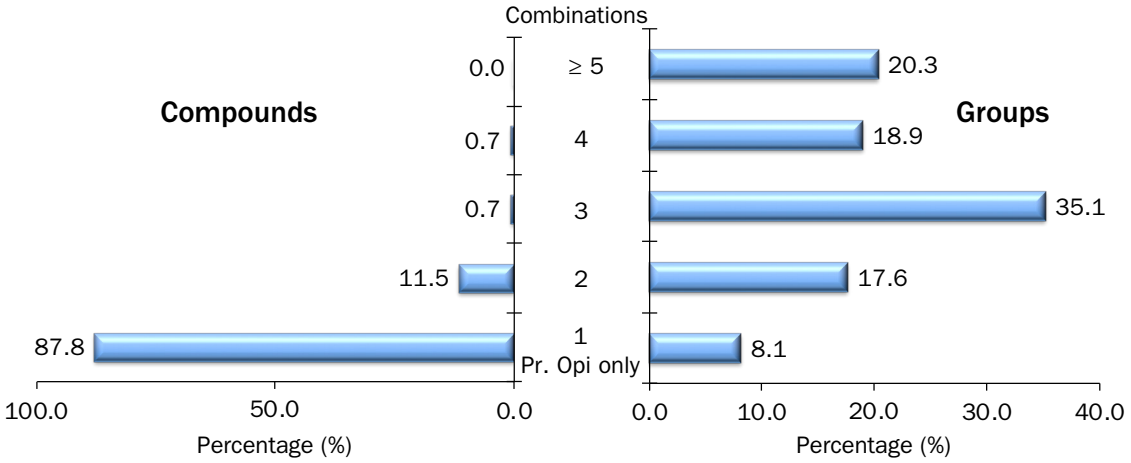


Figure 2.85 shows the percentage distribution of the combination of groups of substances detected along with the Pr. Opi. The highest percentages were recorded with BZ (70.9%), AD (48.0%) and the group "others" (35.1%), and the lowest with HYP (8.1%). The combinations with the other groups of substances were similar, ranging from 15.5% (AE) to 22.3% (DA and AS).

Figure 2.85. Percentage distribution of the combinations of substances detected along with Pr. Opi

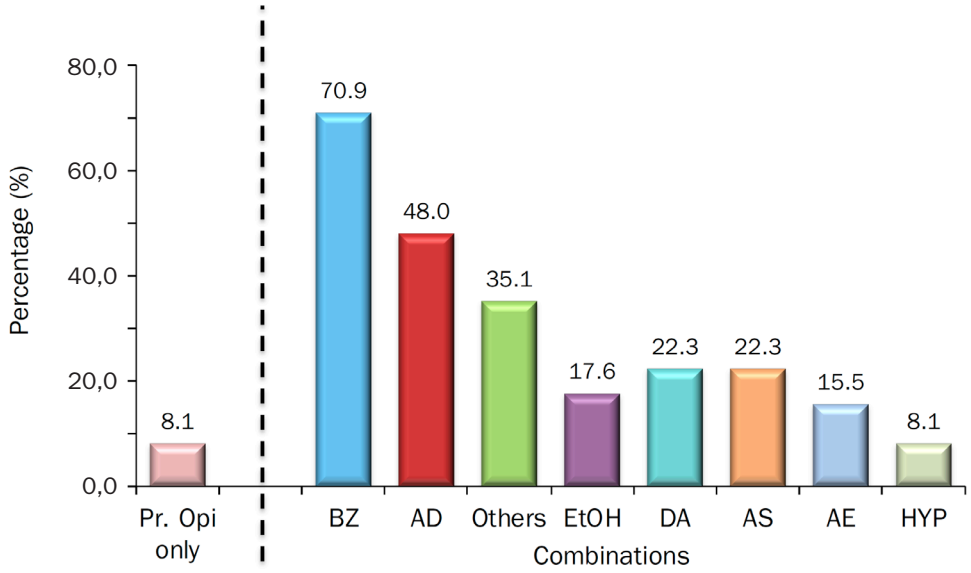


Figure 2.86 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.87 shows the percentage distribution of each of the Pr. Opi that were detected in the suicide cases regarding the total of compounds of this group. The highest percentage was found with tramadol (62.2%), followed by methadone (17.6%), and in lower percentages the other Pr. Opi: morphine (7.4%), fentanyl (6.8%), tapentadol (6.1%), codeine (4.1%), oxycodone (2.7%), pethidine (1.4%), and only one positive case (0.7%) was found with dextromethorphan.

The table below shows a statistical study of the concentrations of the main Pr. Opi compounds. The table specifies the total number of cases in which each compound is detected and the statistical study of the concentrations, that includes the range of concentrations detected (minimum and maximum concentrations), average and median concentrations, and percentiles 25 and 75.

	Concentrations in blood (mg/l)					
	No. of cases	Range	Average	Median	Percentile 25	Percentile 75
PRESCRIPTION OPIOIDS						
Tramadol	92	0.1-22.5	2.0	0.4	0.2	1.4
Methadone	26	0.1-2.6	0.6	0.4	0.2	0.7
Morphine	11	0.01-6.2	1.3	0.4	0.2	1.2
Fentanyl	10	0.002-11.3	1.8	0.06	0.03	0.7
Tapentadol	9	0.1-62.0	8.5	0.7	0.3	1.5

Figure 2.86. Combinations of Pr. Opi with other groups of substances (%)

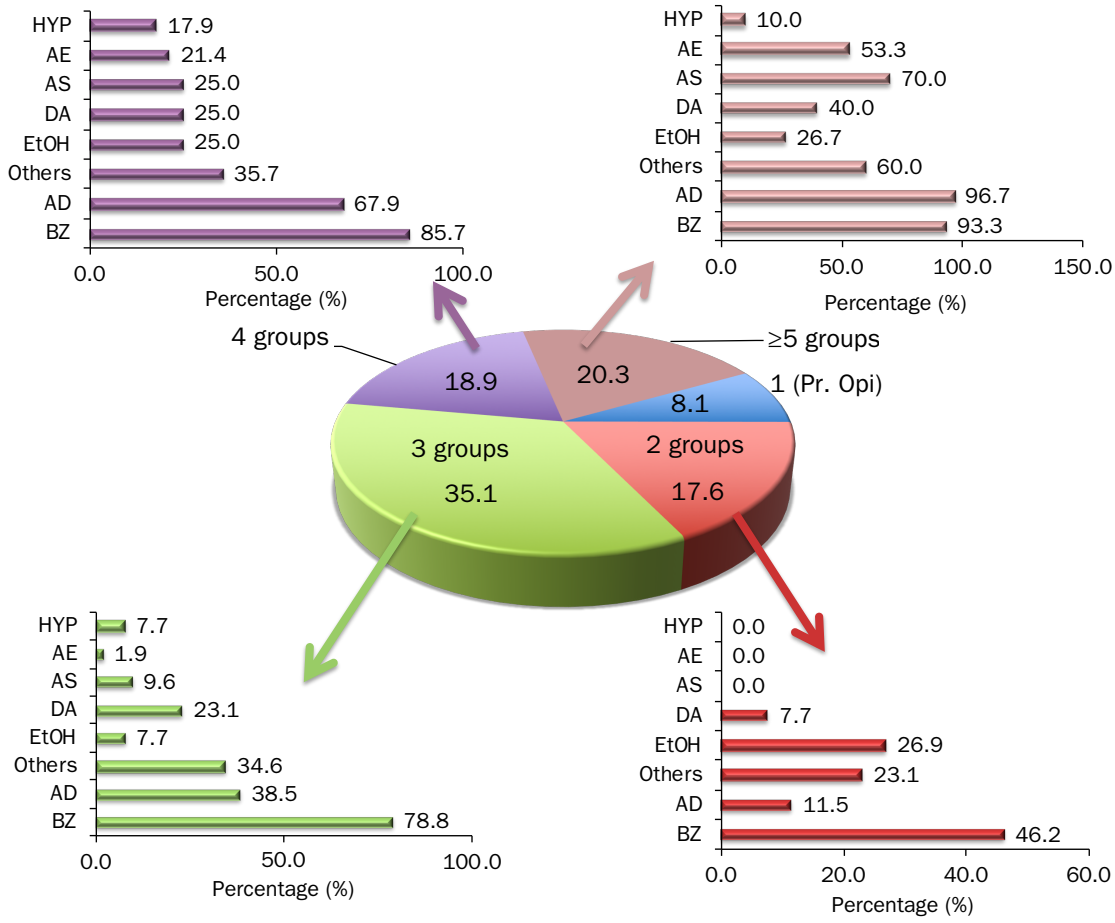
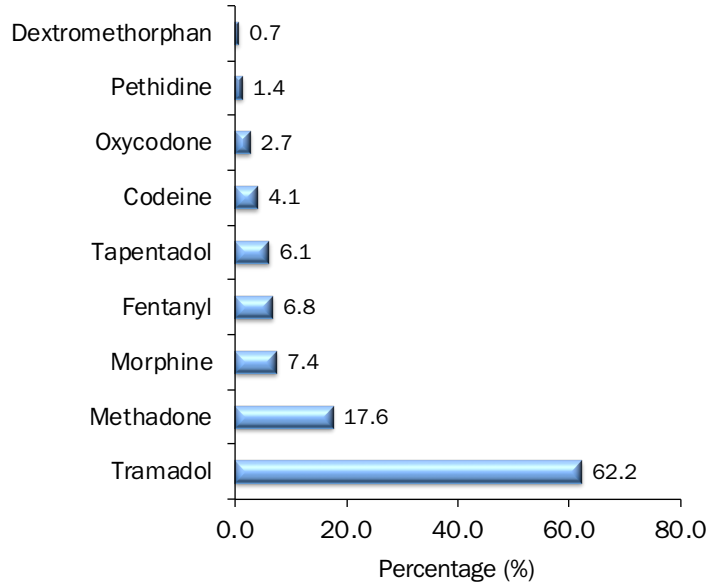


Figure 2.87. Distribution of the Pr. Opi detected, not considering possible associations



2.12. Other compounds ("others")

This group includes the medications and other compounds (caustic substances, pesticides and related substances, carbon monoxide, cyanide, etc.) not included in the above groups.

436 of the suicides received at the INTCF in 2019 had consumed "others" compounds, which represent 25.42% of all suicides, and 32.7% of the cases with positive results.

2.12.1. Sex, age, date of the suicide, Autonomous Community and suicide mechanism in the cases positive for "others" compounds

If we consider the sex of the cases positive for "others" compounds, 69.5% were men and 30.5% women (Figure 2.88A). However, when comparing with the total of positive cases in each of the sexes, the percentages were similar: 33.4% of women with positive result had consumed "others" compounds, compared to 32.4% of men (Figure 2.88B).

In order to study the influence of age, different profiles were obtained depending on whether only the "others" positive cases were studied or if the comparison was performed with the cases with positive result in each of the age ranges considered. In the first case, the pyramid-shaped profile typical of the other groups of compounds was not obtained; the percentages from 40 to 89 years-old were similar (ranging from 13.3% in the 60-69 year-old to 17% in the 70-79 year-old group). The exception was found in the 50-59 year-old group, with a higher percentage (22.7%) (Figure 2.89A). In the second case (Figure 2.89B), there was a gradual increase in percentages from the under-20s (20%) to the over 90s (81.3%), with a decrease only in the 30-39-year-old range (18%).

Figure 2.88. Influence of sex. A: Percentage distribution of the cases positive for "others" in both sexes; B: Percentage distribution of positives for "others" regarding the total of positive cases in each of the sexes

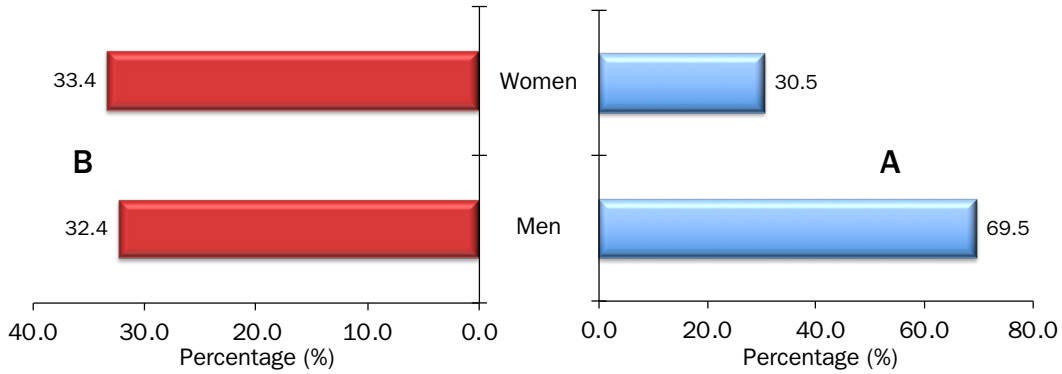
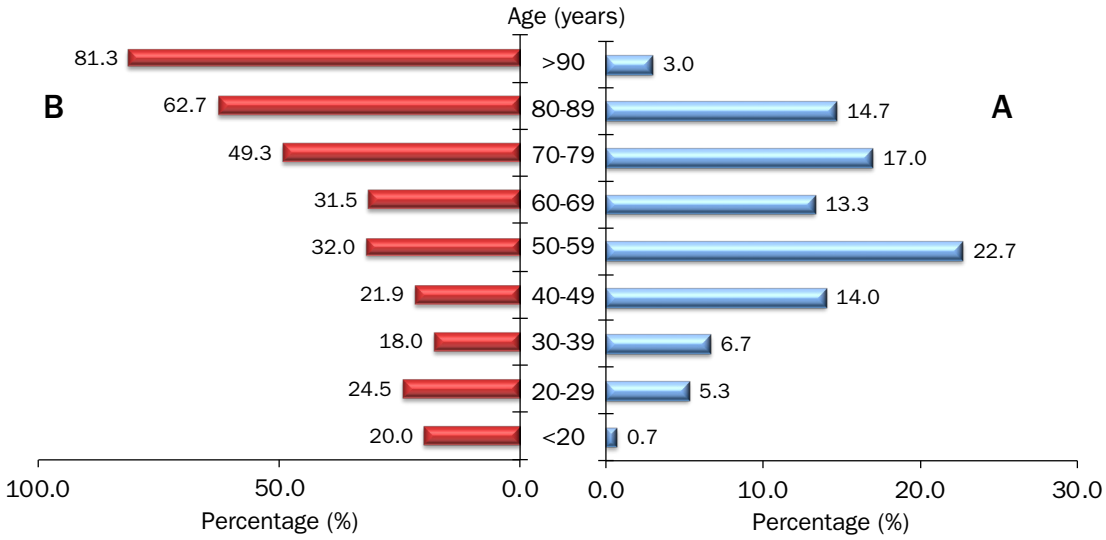


Figure 2.89. Influence of age. A: Percentage distribution of the age ranges in the cases positive for "others" (436 cases); B: Percentage distribution regarding each of the age ranges



If we consider the evolution of positive cases over the twelve months of the year, differences were found in the percentages when compared with the total of cases positive for "others" (Figure 2.90A) and when compared with the number of cases with positive result of each month (Figure 2.90B). In the first case, the percentages were similar, although with variations; the highest percentage was found in January (10.3%) and the lowest in August (5.7%). In the second case, there was a decrease from January (45.5%) to August (21.7%) followed by a recovery up to November (38.6%) and another decrease in December (33.0%)

In the AC, 37.6% of the results positive for "others" compounds were found in Andalusia, much higher than the percentage of the other AC, which varied from 10.3% in Madrid to

6.0% in Castile-Leon (Figure 2.91A). As in the previous cases, the profiles differed when they were compared with the total of positive cases from each AC. In this case, the lowest percentage was found in Valencia (20.9%); the percentages in the other AC were similar, ranging from 31.4% in the Canary Islands to 44.6% in Madrid (Figure 2.91B).

Figure 2.90. Influence of the date of the suicide. A: Percentage distribution of date (months) regarding the total of cases positive for "others"; B: Percentage distribution regarding each of the months

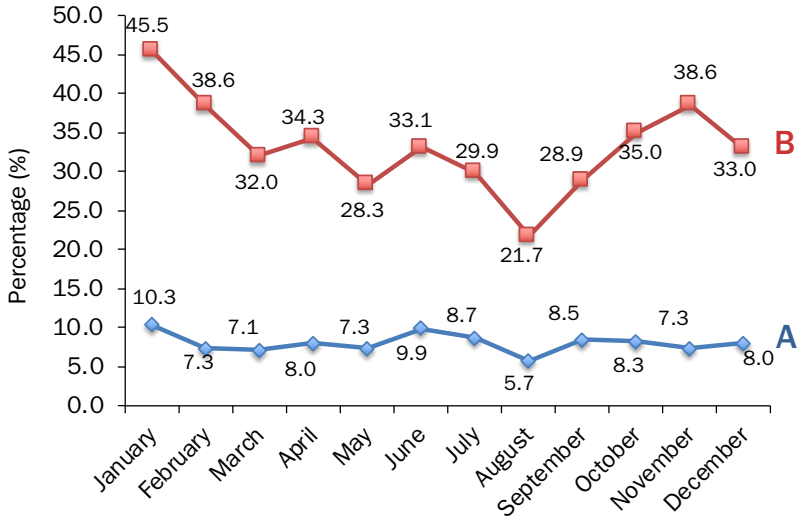
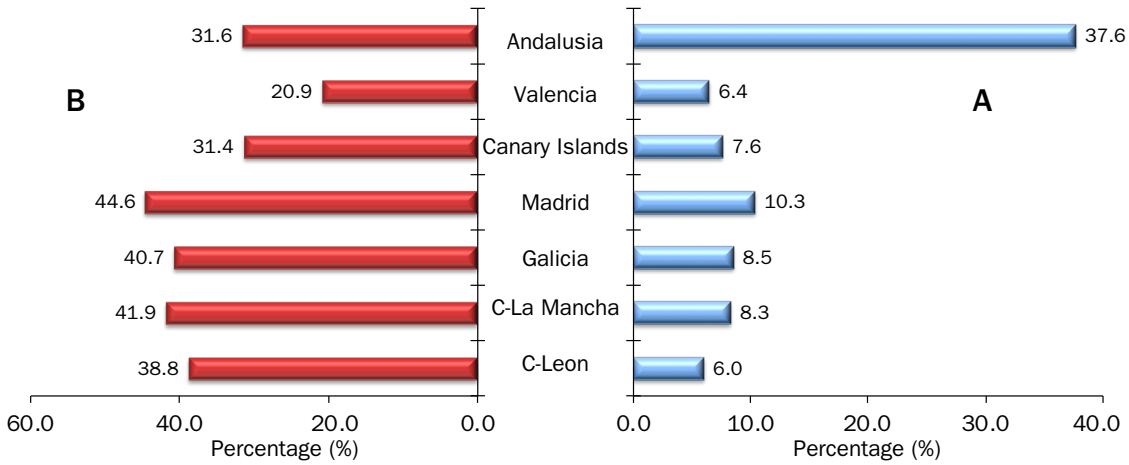


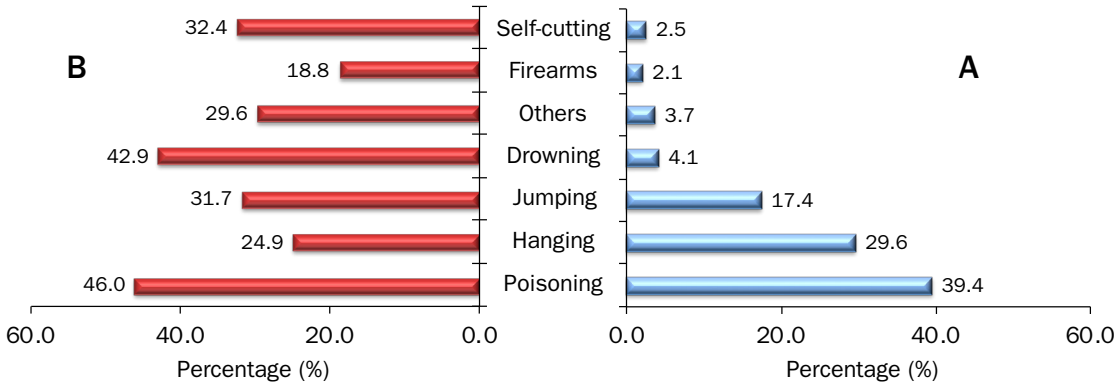
Figure 2.91. Influence of the AC. A: Percentage distribution of the nomber of cases positive for "others" in each AC; B. Percentage distribution of positives for "others" regarding the total of positive cases in each AC



Most of the positives for "others" compounds committed suicide by poisoning (39.4%) and hanging (29.6%), followed by jumping from height (17.4%), and in a lower proportion

by other mechanisms, ranging from 2.1% (firearm) to 4.1% (drowning) (Figure 2.92A). When comparing the percentage of "others" positives with the number of positives per each mechanism, the profile was different: the highest percentages were found in poisoning (46.0%) and drowning (42.9%), and the lowest in suicide by firearms (18.8%). The other mechanisms ranged from 24.9% (hanging) to 32.4% (self injury by cutting) (Figure 2.92B).

Figure 2.92. Influence of the suicide mechanism. A: Percentage distribution of cases positive for "others" in each of the suicide mechanisms; B: Percentage distribution of positives for "others" regarding the total of positive cases in each of the mechanisms



2.12.2. Mono-intoxications versus poly-drug use

In this group of compounds, the percentage of cases where only "others" compounds were found was high (28.7%), only exceeded by the combinations of 2 groups of compounds (30.5%) (Figure 2.93A), and then the percentages progressively decreased to the combinations of 5 groups or more (8.3%).

If we consider the number of compounds in the "others" group consumed simultaneously by the same individual (Figure 2.93B), most of them had consumed a single medication (72.9%), followed by those who had consumed 2, 3 and 4 medications (19.5%, 3.9% and 2.5%, respectively), while only five cases (1.1%) showed simultaneous consumption of five medications.

Figure 2.94 shows the percentage distribution of the combination of groups of substances detected along with the compounds in the "others" group. The highest percentages were recorded with BZ (42.2%) and AD (37.4%), followed by EtOH (18.8%); the combinations with the other groups of substances were similar, ranging from 11.9% (Pr. Opi) to 6.9% (DA).

Figure 2.93. Percentage distribution of simultaneous consumption of other groups of compounds along with "others" (groups) and of several medications in the "others" group simultaneously (compounds)

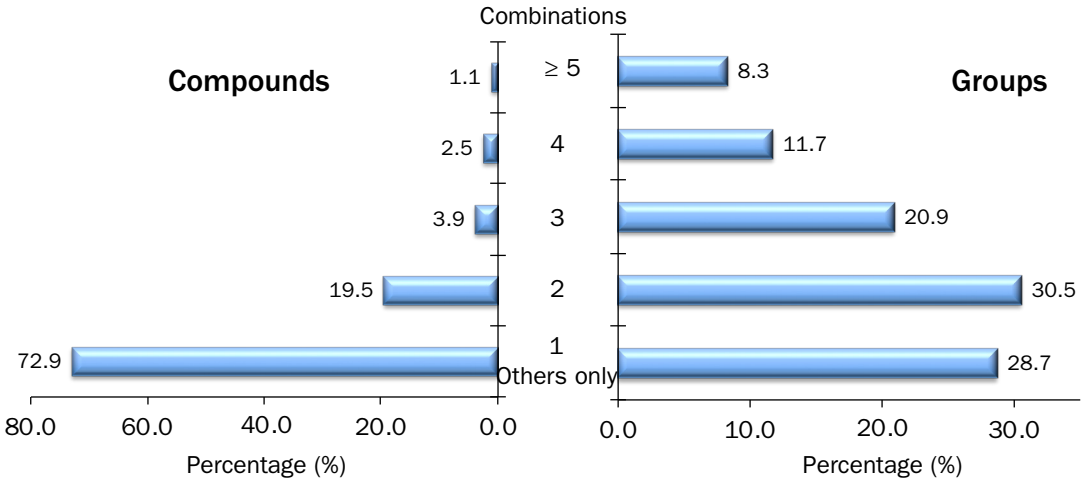


Figure 2.94. Percentage distribution of the combinations of substances detected along with compounds in the "others" group

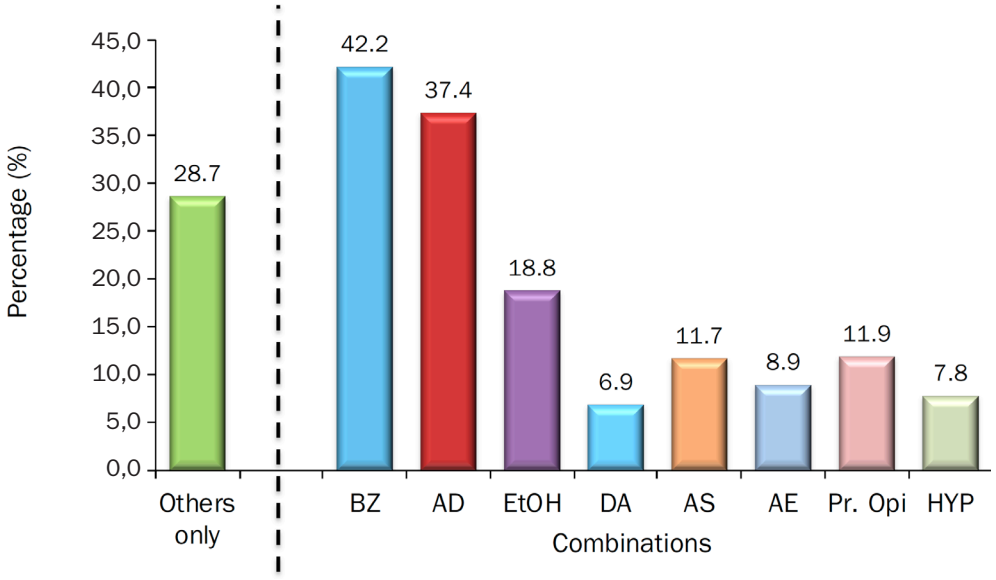
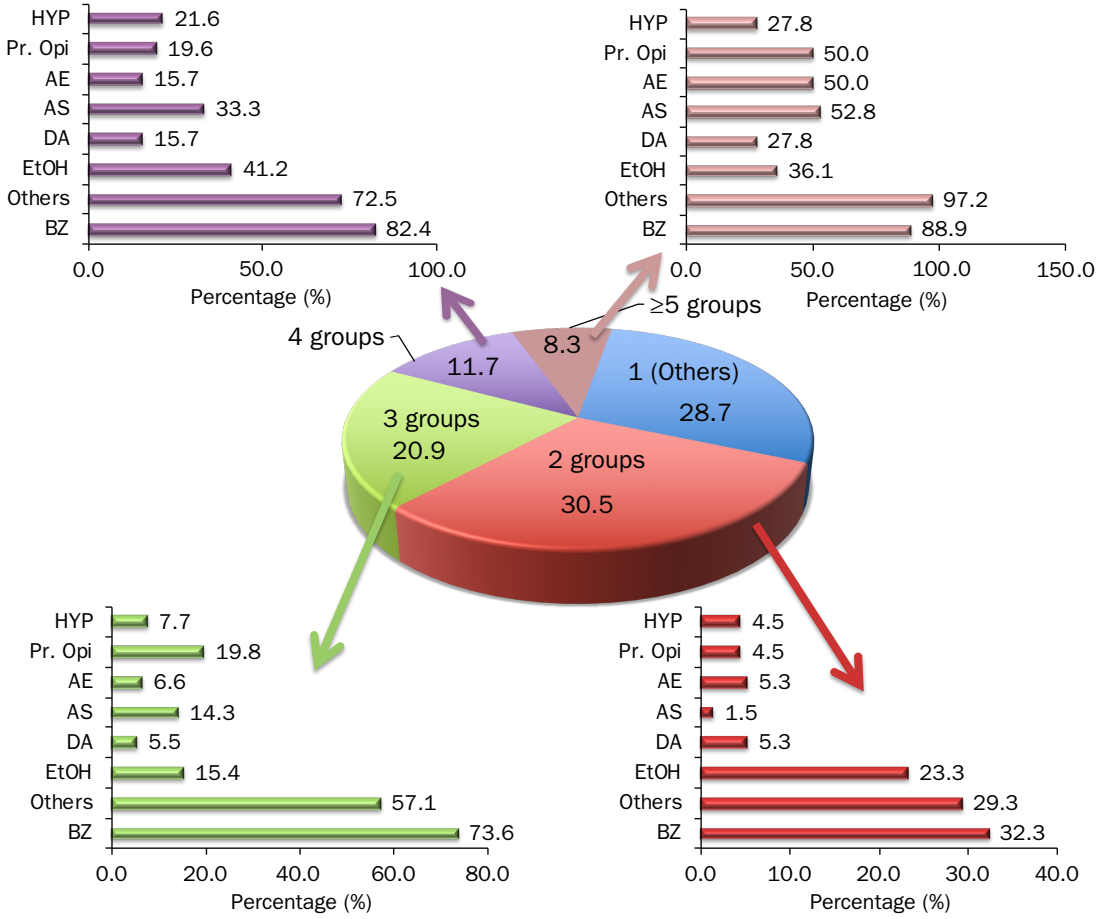


Figure 2.95 shows in further detail the percentage distribution of the various groups of substances in each of the combinations.

Figure 2.95. Combinations of "others" compounds with other groups of substances (%)



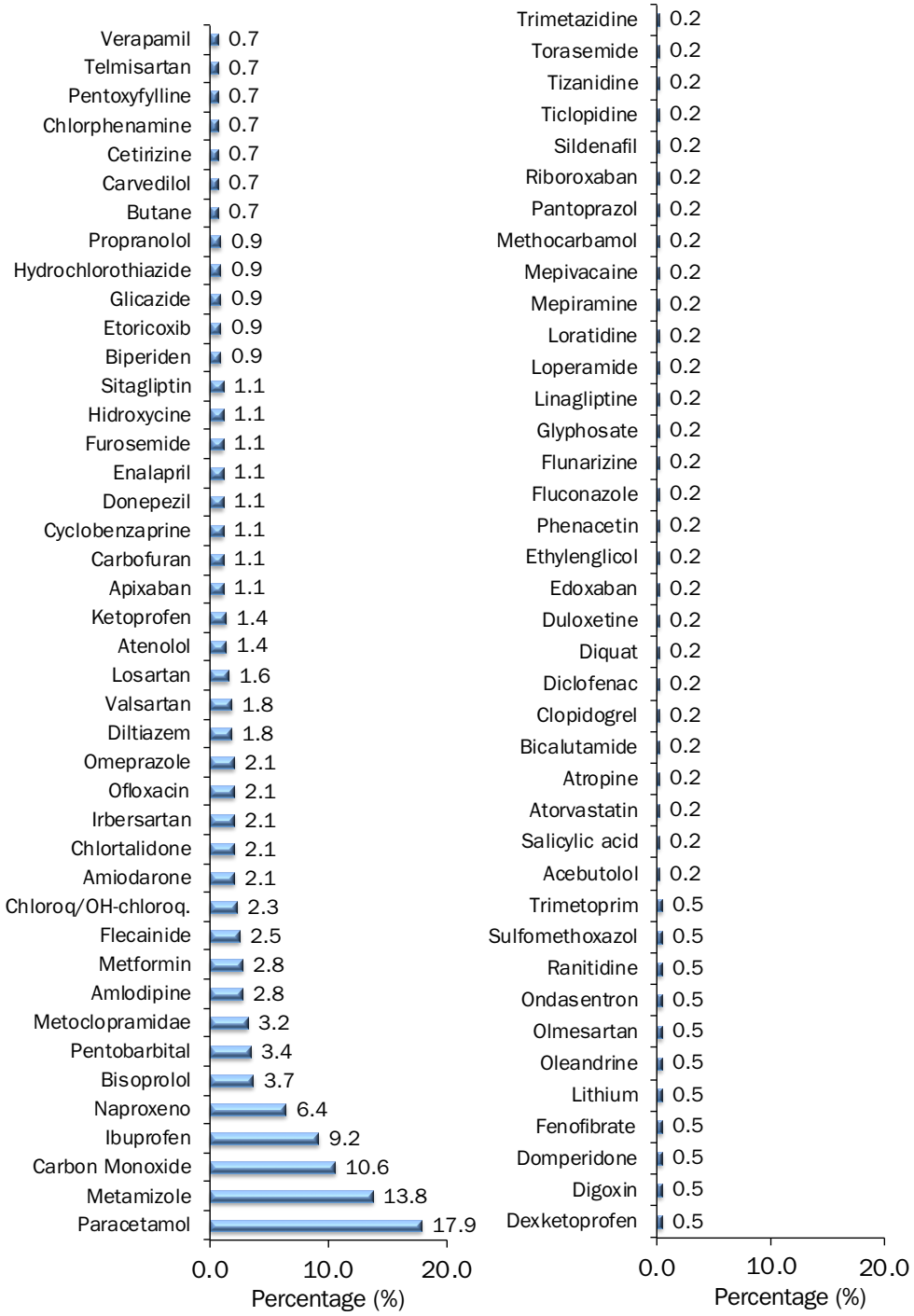
The table below shows a statistical study of the concentrations of the "others" compounds. The table specifies the total number of cases in which each compound is detected and the statistical study of the concentrations, that includes the range of concentrations detected (minimum and maximum concentrations), average and median concentrations, and percentiles 25 and 75.

	Concentrations in blood (mg/l)					
	No. of cases	Range	Average	Median	Percentile 25	Percentile 75
OTHER COMPOUNDS						
Acetaminophen[1]	78	0.1-108.2	90.0	105.4	24.5	139.8
Metamizole[2]	60	0.7-232.0	47.2	16.5	8.0	40.0
COHb[3]	46	7.0-93.4	66.6	71.0	58.2	79.1
Ibuprofen	40	0.1-120.0	7.9	1.2	0.4	5.5
Naproxen	28	0.1-108.0	7.1	0.73	0.32	2.70

1. Quantitative results are only available in 8 of the 78 cases positive for acetaminophen
2. Quantitative results are only available in 14 of the 70 cases positive for metamizole
3. In the poisonings by CO (carbon monoxide), COHb (carboxyhaemoglobin) is measured. All of the concentrations are expressed in mg/ml, except for COHb, which is expressed in %.

Figure 2.96 shows the percentage distribution of each of the "others" compounds that were detected in the suicide cases regarding the total of compounds of this group.

Figure 2.96. Distribution of the "others" compounds detected, not considering possible associations



CONCLUSIONS

The data obtained in the studies presented in this report led to the following conclusions:

Epidemiological study

Deaths by suicide represented 37.2% of violent deaths in the cases received at the INTCF in 2019.
The data obtained from the epidemiological study lead to conclude that:

- Almost three-fourths of the suicides received at the INTCF were men (73.1%), as opposed to 26.9% of women.
- The age ranged from 11 to 97 years-old, and the highest rate was in people in the 40-49 (20.8%) and 50-59 (22.2%) ranges. No differences were found in the distribution of age ranges in women and men.
- No differences were found in the percentage of suicides throughout the year, ranging from 6.3% in November to 9.1% in June.
- The most common suicide mechanism was hanging (40.9%), followed by poisoning (22.4%) and jumping from height (18.9%).
- There were differences in the suicide mechanisms used by men and women. Most men committed suicide by hanging (46.4%), followed by poisoning (18.7%) and jumping from height (16.2%); whereas in women, the highest percentages were found in suicide by poisoning (32.7%), followed by jumping from height (26.3%) and hanging (25.9%).
- Differences were also found in the most frequently used suicide mechanisms in some of the AC, specifically in Galicia, C-La Mancha and Andalusia, where an increase in the cases of hanging and a decrease in poisonings and jumping from height were observed compared to the other AC.
- The data obtained from the cases of the INTCF were similar to those reported by the INE and by the WHO for high-income countries, but differed from the WHO global data, especially in the age range of the suicide victims.

Toxicological study

The toxicological analyses performed on the samples received at the INTCF showed positive results in 77.8% of the suicides, while in 22.2% no substance of toxicological interest was found.

- The comparison of the epidemiological profiles of the cases with positive and negative toxicological results showed that:

- There were differences between sexes. The number of positives was higher in women than in men. The positive:negative ratio in men was 2.9:1 and in women 6.5:1.
- When the age was studied, differences were only found in the lowest and highest age ranges. The positive:negative ratio in the age range from 20 to 90 years-old was, approximately, 4:1, whereas in the under-20s and in the over 90s the ratio was 1:1 in both cases.
- No differences were found in the percentages of positive and negative cases over the twelve months of the year. Positives cases ranged from 74.1% to 83.1% and negatives cases from 16.9% to 25.9%.
- No differences were found either in the results obtained in the AC included in the report. The positive:negative ratio was 3:1 in all AC (2.9:1 - 3.5:1); the exceptions were found in C-La Mancha (4.8:1) and Madrid (5.3:1).
- In the mechanisms used for suicide, the only differences were found in poisoning, where positive toxicological results were found in all cases. The positive:negative ratio in the other mechanisms was 2.5:1 (ranging from 2.0:1 in firearm and 2.7:1 in hanging).

• Toxicological studies showed that almost half of the positive cases had consumed benzodiazepines (47.8%), followed by antidepressants (40.2%), the group "others" (32.7%) and EtOH (27.4%). The percentages of the other groups were lower and ranged from 18.9% for drugs of abuse to 6.2% for hypnotic drugs.

- When considering the sex, in all of the groups studied, the men:women ratio ranged from 1.1:1 for AE to 2.3:1 for the "others" group. The exception was found in EtOH (3.5:1) and DA (6.3:1).
- The age ranges were in the range from 20 to 90-year-olds in most cases. The exception was found in the group for drugs of abuse, where the oldest person was 66 years-old. Differences were also found in the distribution of ages in the DA group. Most groups showed a gradual increase up to 50-59-year-olds, and a later decrease up to 90-year-olds, however, the DA group showed a rapid increase from the 20-29 year-olds to the maximum at 40-49-year-olds and then a sudden decrease in the 50-59-year-olds.
- No major differences were found in the profiles of the mechanisms in the various groups of compounds throughout the twelve months of the year. The exceptions were also found in EtOH and in DA, with similar profiles and where the percentages increased from February to August, decreased until November and then increased again in December.
- No differences were observed in the profiles of the groups detected in the AC included in the report. In most cases, although with slight variations, the profile

was similar to the total of positive cases: BZ > AD > "others" > EtOH > DA > AS > Pr. Opi > HYP.

– No differences were observed either in the profiles of the groups detected in the seven suicide mechanisms. Although there were some variations, the percentages of positives followed the same profile: BZ > AD > "others" > EtOH > DA > AS > Pr. Opi > HYP. The exceptions, as in the other aforementioned parameters, were found in EtOH and DA, which were predominant in the suicides by hanging and firearms; no antipsychotic compound was found in the latter mechanism.

- Most of the suicide cases were related to poly-drug use due to the simultaneous consumption not only of compounds of several groups, but also of several medications of the same group and, therefore, with the same pharmacological activity:

  – In only 38.7% of the suicides a single group of compounds was detected, and in even less cases (33.5%) there was consumption of a single substance.

  – When looking at each of the groups of compounds individually, in all of the cases simultaneous consumption of more than one group of compounds was found. The percentages exceeded 80%, except for DA (77.0%), "others" (71.4%) and EtOH (67.4%).

  – Opposite profiles were obtained when looking at the number of compounds of each group consumed simultaneously. In most cases only one compound of each group was detected, with percentages in the 80% range (Pr. Opi, AE, AS, DA, BZ) and some groups with lower percentages (70%: "others" and AD) or higher (90%: HYP).

ADDENDA

Appendix 1. Influence of age in the suicides committed in the various autonomous communities (%)

	Andalusia	Valencia	Canary Islands	Galicia	C- La Mancha	Madrid	C-Leon
< 20 years-old	0.5	0.2	0.2	0.1	0.1	0.3	0.1
20 -29 years-old	2.5	0.5	1.0	0.3	0.3	0.7	0.4
30 -39 years-old	4.2	1.1	0.7	0.8	0.9	1.3	0.7
40-49 years-old	9.2	2.1	1.8	1.2	1.2	1.2	0.8
50-59 years-old	8.5	3.1	1.7	1.9	1.1	1.2	0.9
60-69 years-old	5.0	1.5	1.2	0.5	0.8	0.7	0.9
70-79 years-old	5.2	0.8	0.5	1.0	0.8	0.4	0.4
80-89 years-old	3.0	1.0	0.4	0.7	0.5	0.7	0.3
> 90 years-old	0.8	0.0	0.0	0.2	0.2	0.1	0.1

Appendix 2. Epidemiological data of suicide mechanisms (%)

	Hanging	Poisoning	Jumping from height	Firearm	Other	Drowning	Self injury by cutting
SEX							
Male	46.4	18.7	16.2	6.5	4.4	2.8	3.5
Female	25.9	32.7	26.3	0.4	4.9	6.3	1.6
AGE (years)							
<20	0.7	0.2	0.7	0.0	0.3	0.0	0.0
20-29	2.6	1.3	2.1	0.4	0.4	0.0	0.2
30-39	5.6	2.4	2.1	0.5	0.2	0.3	0.4
40-49	9.5	5.1	3.1	1.0	1.0	0.3	0.5
50-59	8.8	6.4	3.6	1.2	0.6	0.7	0.6
60-69	5.2	3.1	2.1	0.9	0.6	0.7	0.5
70-79	4.0	2.3	2.6	0.4	0.7	0.7	0.4
80-89	3.0	1.0	1.9	0.2	0.4	0.8	0.3
>90	0.8	0.2	0.3	0.1	0.1	0.1	0.1
DATE OF SUICIDE							
January	2.7	1.7	1.2	0.3	0.5	0.4	0.5
February	3.0	1.8	1.2	0.1	0.4	0.3	0.1
March	3.1	1.6	1.2	0.7	0.2	0.2	0.1
April	3.5	1.5	1.4	0.4	0.2	0.3	0.1
May	3.5	1.8	1.4	0.5	0.2	0.3	0.4
June	3.6	1.9	1.7	0.3	0.7	0.6	0.1
July	3.8	2.3	1.5	0.3	0.3	0.5	0.2
August	3.9	1.8	1.9	0.5	0.4	0.1	0.2
September	3.7	1.9	1.4	0.5	0.4	0.1	0.2
October	2.9	1.8	1.9	0.4	0.4	0.3	0.2
November	2.5	1.5	1.4	0.2	0.1	0.3	0.1
December	2.9	1.8	1.9	0.3	0.3	0.1	0.3
AUTONOMOUS COMMUNITY							
Madrid	29.0	27.4	23.4	2.4	6.5	2.4	4.0
C-Leon	33.7	27.9	18.6	7.0	5.8	4.7	2.3
Canary Islands	35.5	25.4	25.4	1.4	5.8	2.2	1.4
Valencia	36.1	26.8	17.0	5.2	3.6	4.1	1.5
Galicia	41.6	24.8	14.4	5.6	3.2	5.6	4.0
C-La Mancha	47.3	21.8	13.6	2.7	4.5	2.8	4.5
Andalusia	50.0	15.9	20.0	5.1	3.7	2.0	2.8

Appendix 3. Epidemiological data of the groups of compounds detected in the suicide cases received at the INTCF (%)

	Benzodiazepines	Antidepressants	Other	Ethyl alcohol	Drugs of abuse	Antipsychotic drugs	Antiepileptic drugs	Prescription opioids	Hypnotic drugs
SEX									
Male	28.6	23.8	22.7	21.3	16.3	7.5	5.8	7.5	4.2
Female	19.2	16.3	10.0	6.1	2.6	5.2	5.5	3.6	2.1
AGE (years)									
<20	0.2	0.4	0.2	0.4	0.4	0.1	0.1	0.0	0.1
20-29	2.8	2.2	1.7	2.3	3.1	1.5	1.0	0.7	0.3
30-39	6.1	4.0	2.2	4.0	5.2	1.6	1.4	1.5	0.4
40-49	10.0	7.2	4.6	6.7	6.4	2.4	2.2	2.1	1.3
50-59	12.3	9.9	7.4	7.9	2.6	3.4	2.6	2.4	1.7
60-69	7.7	7.6	4.3	2.9	0.6	2.0	2.0	1.4	1.3
70-79	4.4	5.2	5.5	1.9	0.0	0.8	1.1	1.3	0.7
80-89	2.8	2.8	4.8	0.6	0.0	0.4	0.5	1.2	0.4
>90	0.4	0.2	1.0	0.1	0.0	0.1	0.0	0.1	0.0
DATE OF SUICIDE									
January	3.9	3.0	3.4	1.7	1.4	1.0	1.3	1.3	0.8
February	2.8	2.4	2.4	1.0	1.0	0.9	0.5	1.0	0.4
March	4.3	3.3	2.3	1.9	1.0	1.0	1.0	0.7	0.4
April	3.7	2.7	2.6	2.3	1.3	0.8	0.5	1.0	0.1
May	4.1	4.0	2.4	2.4	1.7	1.1	0.7	0.8	0.6
June	3.9	2.8	3.2	2.9	1.9	1.1	1.2	0.6	0.7
July	4.0	4.3	2.8	2.4	2.1	0.9	0.8	0.7	0.7
August	4.2	3.4	1.9	3.1	2.6	1.0	1.0	0.7	0.3
September	4.6	3.4	2.8	2.8	1.5	1.3	1.0	1.3	0.4
October	3.4	3.1	2.7	2.3	1.3	0.8	0.9	1.1	0.3
November	3.1	2.5	2.4	1.1	0.7	0.4	0.5	0.5	0.5
December	4.0	3.2	2.6	2.2	1.6	1.5	1.2	0.9	0.6
AUTONOMOUS COMMUNITY									
Andalusia	19.7	13.6	12.3	11.2	7.4	2.2	3.9	4.0	1.9
Valencia	4.7	3.6	2.1	2.6	1.9	1.6	0.7	1.3	0.8
Canary Islands	4.4	3.6	2.5	2.0	2.0	0.7	0.4	1.0	0.6
Madrid	3.3	3.4	3.4	2.4	1.3	1.3	1.1	0.6	0.7
Galicia	2.8	3.2	2.8	1.3	1.0	1.6	1.0	0.9	0.3
C- La Mancha	2.2	2.2	2.7	2.2	1.3	0.8	1.0	0.7	0.4
C-Leon	2.0	2.6	1.9	1.5	1.0	1.1	0.9	0.7	0.4
MECHANISM									
Hanging	15.7	13.6	9.7	13.7	9.1	2.4	3.5	2.5	1.2
Poisoning	17.1	13.9	12.9	6.7	4.3	5.9	4.0	5.7	3.4
Jumping from height	8.0	7.7	5.7	3.1	2.8	2.7	2.2	1.3	0.5
Firearm	1.3	0.7	0.7	1.4	1.0	0.0	0.1	0.2	0.1
Self injury by cutting	1.3	1.0	0.8	0.6	0.3	0.3	0.4	0.4	0.3
Drowning	1.9	1.3	1.3	0.5	0.2	0.3	0.3	0.4	0.3
Other	1.7	1.4	1.2	0.8	0.7	0.7	0.7	0.2	0.2