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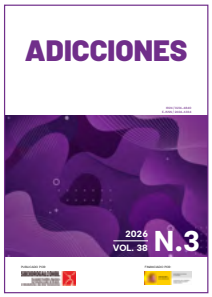

ORIGINAL

Premature mortality recorded with mention of substance use disorders in Spain according to death records: Sex- and substance-specific differences

Mortalidad prematura registrada por trastornos por uso de sustancias en España según registros de defunción: Diferencias por sexo y tipo de sustancia

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Abstract

Substance use disorders (SUDs) are a significant cause of premature death, although their impact is often underestimated when only the number of deaths is considered. This study used three premature mortality indicators—Potential Years of Life Lost (PYLL), mean PYLL per death (mPYLL), and life expectancy at death (LE)—to quantify premature mortality with documented mention of substance use disorders on death certificates and to analyze differences by sex and substance type in Spain between 2016 and 2020. A retrospective observational study was conducted using national mortality records from the Spanish National Statistics Institute, including deaths in which an ICD-10 code corresponding to substance use disorders (F10–F19) appeared anywhere on the death certificate. Premature mortality was estimated using PYLL, which represent the years of life not lived relative to an age limit, and mPYLL and LE were also calculated, stratified by sex and substance type. A total of 13,772 deaths with mention of substance use disorders (75.1% in men), accounting for 184,158 PYLL, with a mean of 17.3 years lost per death. Illegal drugs and polydrug use showed higher mPYLL and lower LE values, whereas alcohol and tobacco accounted for a higher overall burden but at older ages. LE was 66.6 years, lower than that of the general population. The findings describe a high burden of premature mortality recorded with mention of substance use disorders, with distinct patterns by sex and substance. The use of indicators such as potential years of life lost may help strengthen epidemiological surveillance and inform prevention and care strategies.

Keywords: substance use disorders, premature mortality, potential years of life lost, life expectancy, sex differences, Spain

Resumen

Los trastornos por uso de sustancias (TUS) son una causa relevante de muerte prematura, aunque su impacto suele subestimarse cuando se valora solo el número de defunciones. Este estudio empleó tres indicadores de mortalidad prematura —Años Potenciales de Vida Perdidos (APVP), promedio de APVP por defunción (APVPM) y esperanza de vida al fallecimiento (EV)— para cuantificar la mortalidad prematura registrada con mención de TUS en los certificados de defunción y analizar las diferencias por sexo y tipo de sustancia en España entre 2016 y 2020. Se realizó un estudio observacional retrospectivo utilizando los registros nacionales de mortalidad del Instituto Nacional de Estadística, incluyendo las defunciones en las que figuró, en cualquier posición del certificado, algún código CIE-10 correspondiente a TUS (F10–F19). La mortalidad prematura se estimó mediante los APVP, que expresan los años de vida no vividos respecto a una edad límite, y se calcularon también el APVPM y la EV, estratificados por sexo y tipo de sustancia. Se registraron 13.772 defunciones con mención de TUS (75,1% en hombres), que concentraron 184.158 APVP, con una media de 17,3 años perdidos por fallecimiento. Las drogas ilegales y el policonsumo presentaron valores más elevados de APVPM y menor EV, mientras que alcohol y tabaco concentraron una carga mayor, aunque a edades más avanzadas. La EV fue de 66,6 años, inferior a la población general. Los resultados describen una elevada carga de mortalidad prematura en defunciones con mención de TUS y patrones diferenciados por sexo y sustancia. El uso de indicadores como los APVP puede ser útil para complementar la vigilancia epidemiológica y orientar la planificación preventiva y asistencial.

Palabras clave: trastornos por uso de sustancias, mortalidad prematura, años potenciales de vida perdidos, esperanza de vida, diferencias de sexo, España

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Substance use disorders (SUDs) constitute a public health problem with major social, health, and economic repercussions, in addition to a clear increase in morbidity and mortality (World Health Organization [WHO], 2024). The harmful use of alcohol, tobacco, and other drugs is associated both with direct deaths from poisoning or medical complications and with an increased risk of injuries, violent behavior, and chronic non-communicable diseases (Degenhardt et al., 2018; WHO, 2021).

Globally, the United Nations Office on Drugs and Crime (UNODC) estimates that 296 million people used drugs in 2021, equivalent to 5.8% of the global population. Cannabis is the most widely used substance, followed by amphetamines and cocaine (UNODC, 2023). For its part, the World Health Organization estimates that alcohol is responsible for about 3 million deaths per year (5.3% of the total), while tobacco causes more than 8 million deaths each year, including more than one million non-smokers exposed to second-hand smoke (WHO, 2021; WHO, 2024).

In Europe, the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) recorded 6,392 overdose deaths in the European Union in 2022, compared with 6,166 in 2021. Opioids were present in approximately 74% of these cases, although an increase in deaths linked to cocaine use and polydrug use is also observed, especially among people aged 40 to 59 years (EMCDDA, 2024).

In Spain, an estimated 38.9% of the adult population has used some psychoactive substance in their lifetime (EMCDDA, 2024). According to the Spanish Observatory on Drugs and Addictions (OEDA), in 2022 there were 800 overdose deaths and more than 3,000 alcohol-related deaths. Likewise, 25% of deaths in traffic accidents occurred under the influence of drugs. In this context, alcohol and tobacco remain the substances with the greatest impact in terms of consumption and mortality, while cocaine continues to be the most widespread illegal drug (OEDA, 2023).

Beyond figures on substance use and overall mortality, it is essential to assess the impact of SUDs in terms of premature mortality. People with SUDs have a higher risk of dying at younger ages compared with the general population (Kim et al., 2025; Yukhnenko et al., 2023). Globally, SUDs are estimated to cause around 128,000 deaths and more than 18 million healthy years of life lost each year (Global Burden of Disease Collaborative Network [GBD], 2024; UNODC, 2023). This excess mortality is attributed to overdoses, infections, cardiovascular and respiratory complications, suicide, and other consequences arising from risk behaviors (Rehm et al., 2017).

In this regard, although international studies have highlighted the impact of SUDs on premature mortality (Kim et al., 2025; Svensson et al., 2022), evidence in Spain remains scarce and, for the most part, predates 2016. The available studies have focused on estimating prevalence or overall mortality figures, or on analyzing specific substances and geographical settings (De la Fuente et al., 2014; Fierro et al., 2010; Guitart et al., 2011; Marí-Dell'Olmo et al., 2015). Moreover, there are hardly any analyses examining differences by sex and type of substance, despite the fact that the international literature consistently shows that patterns of use and their consequences differ markedly between men and women (EMCDDA, 2024; WHO, 2024).

In light of the above, this study analyzes premature mortality recorded with mention of SUDs on death certificates in Spain during the period 2016–2020. To this end, specific indicators—Potential Years of Life Lost (PYLL), mean PYLL (mPYLL), and Life Expectancy (LE)—stratified by sex and type of substance are used. The aim is to provide evidence on the magnitude and characteristics of this recorded mortality, with potential usefulness for epidemiological surveillance and public health planning.

Method

A retrospective observational study was conducted based on the records of deaths occurring in Spain between 2016 and 2020, provided by the National Statistics Institute (INE). This period was selected because it corresponded to the most recent data available with complete and homogeneous information at the time of the analysis, and because it allowed more stable estimates of the premature mortality indicators using a multi-year interval.

All deaths were included in which, among the 42 causes of death coded in each record, a diagnosis corresponding to mental and behavioral disorders due to psychoactive substance use appeared, according to the International Classification of Diseases, 10th Revision (ICD-10) (WHO, 1992), specifically codes F10-F19. This group comprises disorders related to alcohol (F10), opioids (F11), cannabinoids (F12), sedatives and hypnotics (F13), cocaine (F14), other stimulants (F15), hallucinogens (F16), tobacco (F17), volatile solvents (F18), and polydrug use or other substances (F19). This approach includes both the underlying cause of death and the contributing causes recorded on the certificate, which enables more cases to be captured, although it introduces heterogeneity in the attribution of the cause of death.

The choice of codes F10–F19 responded to a criterion of specificity, with the aim of identifying deaths in which SUDs were explicitly recorded on death certificates. This approach avoids inferring their presence from potentially related causes in which the disorder cannot be confirmed, although it does not include all deaths attributable to substance use. Therefore, the results should be interpreted as mortality recorded with explicit mention of SUDs on death certificates, and not as total mortality attributable to substance use.

The variables analyzed were sex, age, and type of substance. Premature mortality was quantified using three indicators: Potential Years of Life Lost (PYLL)—years of life not lived relative to an age limit, which reflect the overall loss due to early deaths; mean PYLL per death (mPYLL)—the mean number of years lost per death; and Life Expectancy (LE)—the average age that a person could reach according to the observed mortality rates. For the calculation of PYLL, the age interval was set between 1 and 79 years, following the methodological criteria of the INE (National Institute of Statistics, Spain), which defines the indicator for this range with the aim of estimating premature mortality and ensuring comparability between causes of death. The use of the same interval also made it possible to calculate the indicators homogeneously for the set of major causes of death included in the analysis (INE, 2024).

PYLL and mPYLL were calculated by applying the classical formulas for these indicators (Gardner & Sanborn, 1990). This procedure consists of subtracting the age at death from the predefined age limit (79 years) and then summing all the differences. This approach makes it possible to estimate both the total and the mean potential years of life lost, providing a sensitive measure of the real impact of premature mortality. LE was estimated using the Sullivan method, an indirect procedure widely used in public health that combines age-specific mortality rates with the population structure in life tables. This method offers a summary measure of life expectancy adjusted to the actual distribution of mortality, providing a more precise view of the effect of SUDs on the average length of life in the affected population (Sullivan, 1971).

The indicators were calculated after stratification by sex and type of substance. In addition, they were compared with those corresponding to the 17 major causes of death defined by the INE for the same period (INE, 2024), which made it possible to situate the burden of premature mortality recorded with mention of SUDs in relation to the other causes of death at the national level. The analysis was designed with a descriptive approach aimed at characterizing the values observed in the national death records.

Given that the present study analyzed the entire set of national death records with mention of substance use disorders in Spain during the period 2016–2020, the results should be interpreted as descriptions of an exhaustive population-based register and not as estimates derived from a sample. Consistent with the descriptive aim of the study, no statistical inference tests were applied, nor were confidence intervals calculated or between-group statistical tests performed, since the analysis was aimed at describing the observed values of PYLL, mPYLL, and LE in that register, rather than at extrapolating sample results to a population.

The statistical analysis was performed with the Epidat 4.2 software (Consellería de Sanidade, Organización Panamericana de la Salud, & Universidad CES de Colombia, 2016).

Results

Between 2016 and 2020, 13,772 deaths with mention of SUDs (F10–F19) were recorded in Spain, equivalent to an average annual rate of 5.9 deaths per 100,000 inhabitants. Mortality predominantly affected men (75.1%), compared with women (24.9%). The mean age at death was 65.9 years (SD: 13.6), with a median of 67 years and an interquartile range of 18 years, as shown in Table 1.

Regarding the distribution by type of substance, tobacco (51.8%) and alcohol (43.5%) accounted for the majority of deaths, while polydrug use and other substances represented 3.3% of the total. The remaining substances showed a marginal weight (<1% each), although with notable gender differences: for opioids, women represented 39.8% of deaths, a higher proportion than for alcohol (29.0%) or tobacco (21.8%).

Table 2 presents the premature mortality indicators in Spain during the period 2016–2020, broken down by sex. In total, 184,158 PYLL were accumulated, representing a mean of 17.3 years lost per death. Men accounted for most of this burden, with 148,356 PYLL and an mPYLL of 17.0 years, whereas in women 35,802 PYLL and an mPYLL of 17.6 years were recorded. These results show that, in the period analyzed, although men accumulate a higher absolute number of years lost, the observed mPYLL value was higher in women. LE at death in people with SUDs was 66.6 years, with no relevant differences found by sex.

As shown in Figure 1, LE in the Spanish population as a whole during the period 2016–2020 was 83.1 years, compared with 66.6 years in those who died from SUDs, representing a difference of 16.5 years. This gap was maintained when disaggregating by sex: in men, the difference was 13.8 years (80.3 versus 66.5), while in women it reached 19 years (85.7 versus 66.7).

After analyzing the overall differences by sex, the distribution of premature mortality according to the type of substance used was explored (Table 3). Tobacco and alcohol accounted for the largest absolute burden of years lost, with 95,049 and 89,575 PYLL, respectively, followed at a great distance by polydrug use/other substances (11,877 PYLL), opioids (1,538 PYLL), cocaine (1,372 PYLL), and sedatives and hypnotics (496 PYLL).

When comparing by sex, men systematically accumulated most of the burden, with male/female PYLL ratios ranging from 1.8 for sedatives and hypnotics to 5.8 for polydrug use. For alcohol and tobacco, the ratios were 2.3 and 3.4, respectively, whereas among other substances, the highest values were observed for opioids (2.7) and cocaine (3.5).

Table 1
General characteristics of deaths due to substance use disorders in Spain, 2016–2020

Descriptive statistics			
Statistic	**Total**	**Men**	**Women**
Total number of deaths	13,772	10,338 (75.1%)	3,434 (24.9%)
Mean (years)	65.94	65.93	65.97
Standard deviation (years)	13.63	14.83	13.33
Median (years)	67	66	67
Interquartile range (years)	18	18	19
Distribution by substance			
Statistic	**Total**	**Men**	**Women**
Alcohol (F10)	5,997 (43.5%)	4,260 (71.0%)	1,737 (29.0%)
Opioids (F11)	103 (0.8%)	62 (60.2%)	41 (39.8%)
Cannabis (F12)	3	2	1
Sedatives and hypnotics (F13)	33 (0.2%)	17 (51.5%)	16 (48.5%)
Cocaine (F14)	47 (0.3%)	36 (76.6%)	11 (23.4%)
Hallucinogens (F16)	1	1	0
Tobacco (F17)	7,130 (51.8%)	5,578 (78.2%)	1,552 (21.8%)
Polydrug use / other substances (F19)	458 (3.3%)	382 (83.4%)	76 (16.6%)

Note. Codes F15 (other stimulants) and F18 (volatile solvents) recorded no deaths in the period analyzed. Categories with very few cases (cannabis and hallucinogens) are presented for completeness, although their relative weight is marginal.
Source. INE. Authors' own elaboration, 2025.

Table 2
Premature mortality indicators for substance use disorders in Spain, 2016–2020, by sex

Year	PYLL			mPYLL			LE		
	Men	**Women**	**Total**	**Men**	**Women**	**Total**	**Men**	**Women**	**Total**
2016	29,607	11,188	40,795	19.8	18.7	19.44	63.8	67.1	64.8
2017	28,580	5,720	34,300	16.6	17.8	16.8	67.2	66.2	67.0
2018	28,668	5,736	34,403	16.6	17.8	16.8	67.4	65.6	67.1
2019	27,549	5,977	33,526	16.2	16.8	16.3	67.3	67.3	67.3
2020	33,953	7,182	41,134	16.4	16.4	16.4	66.7	66.6	66.7
Total	**148,356**	**35,802**	**184,158**	**17.0**	**17.6**	**17.3**	**66.5**	**66.7**	**66.6**

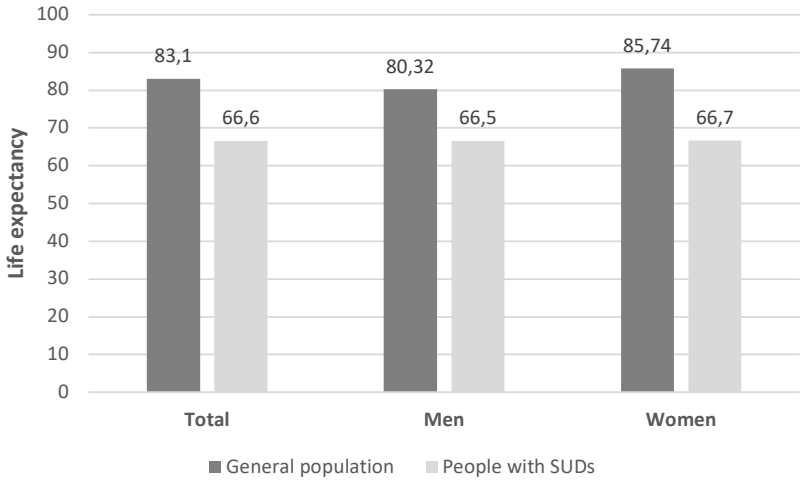
Note. PYLL = Potential Years of Life Lost; mPYLL = mean Potential Years of Life Lost per death; LE = Life Expectancy.
Source. INE. Authors' own elaboration, 2025.

Table 3
Premature mortality indicators for substance use disorders in Spain, 2016–2020, by type of substance

Substance used	PYLL			Male/female PYLL ratio	mPYLL			LE
	Men	**Women**	**Total**		**Men**	**Women**	**Total**	
Alcohol (F10)	62,225	27,350	89,575	2.3	16.6	18.8	17.2	65.8
Opioids (F11)	1,126	412	1,538	2.7	22.1	17.2	20.5	67.2
Sedatives and hypnotics (F13)	320	176	496	1.8	29.1	17.6	23.6	68.0
Cocaine (F14)	1,067	305	1,372	3.5	29.6	30.5	29.8	51.5
Tobacco (F17)	73,399	21,650	95,049	3.4	16.2	16.7	16.3	67.7
Polydrug use / other substances (F19)	10,125	1,752	11,877	5.8	27.4	26.6	27.3	54.6

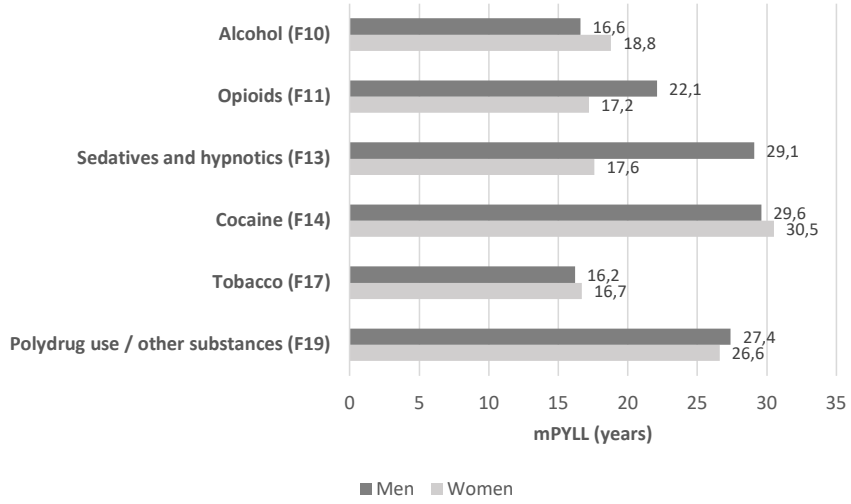
Note 1. Categories with a very small number of cases (cannabis, other stimulants, hallucinogens, and volatile solvents) are not shown in the table due to their small relative weight (<0.05% of PYLL).
Note 2. PYLL = Potential Years of Life Lost; mPYLL = mean Potential Years of Life Lost per death; LE = Life Expectancy.
Source. INE. Authors' own elaboration, 2025.

Figure 1
Life expectancy at death in the general population and in people with substance use disorders in Spain, 2016–2020, total and by sex



Source. INE. Authors' own elaboration, 2025.

Figure 2
Mean Potential Years of Life Lost per death (mPYLL) by type of substance and sex in Spain, 2016–2020



Source. INE. Authors' own elaboration, 2025.

However, the observed mPYLL value was higher in women for alcohol, cocaine, and tobacco. The distribution of mPYLL by type of substance and sex is presented visually in Figure 2.

Regarding LE at death, variations were observed depending on the substance: the lowest values were found for cocaine (51.5 years) and polysubstance use (54.6 years), whereas tobacco and alcohol recorded 67.7 years and 65.8 years, respectively.

The premature mortality figures obtained were compared with the 17 major causes of mortality in Spain during the study period (Table 4). In absolute terms, SUDs accumulated 184,158 PYLL, ranking below causes such as external causes (1,253,736 PYLL), neoplasms (4,745,281 PYLL), or diseases of the circulatory system (2,079,010 PYLL). However, when analyzing the mean number of years lost per death, SUDs presented 17.3 mPYLL, one of the highest figures, higher than that observed for high-mortality causes such as neoplasms (13.9 years) or circulatory diseases (12.2 years), and only below groups that concentrate deaths at very early ages, such as pregnancy, childbirth and the puerperium (44.3 years) or perinatal conditions (41.6 years).

Regarding LE at death, people with SUDs reached a mean value of 66.6 years, lower than that recorded for neoplasms (74.1 years) or digestive diseases (78.5 years), and similar to that of external causes (67.2 years).

Table 4
Premature mortality indicators for substance use disorders and major causes of death in Spain, 2016–2020

Diagnostic group	PYLL	Diagnostic group	mPYLL	Diagnostic group	LE
II. Neoplasms	4,745,281	XV. Pregnancy, childbirth and the puerperium	44.25	XV. Pregnancy, childbirth and the puerperium	36.07
IX. Diseases of the circulatory system	2,079,010	XVI. Conditions originating in the perinatal period	41.55	XVI. Conditions originating in the perinatal period	37.61
XX. External causes of mortality	1,253,736	XVII. Congenital malformations, deformations and chromosomal abnormalities	29.90	XVII. Congenital malformations, deformations and chromosomal abnormalities	54.87
X. Diseases of the respiratory system	658,878	XX. External causes of mortality	26.40	**SUDs**	**66.57**
XI. Diseases of the digestive system	616,171	XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	19.02	XX. External causes of mortality	67.17
VI-VIII. Diseases of the nervous system and sense organs	432,606	**SUDs**	**17.33**	II. Neoplasms	74.12
I. Infectious and parasitic diseases	429,525	III. Diseases of the blood and blood-forming organs, and certain disorders involving the immune mechanism	15.01	XI. Diseases of the digestive system	78.53
XVIII. Symptoms, signs and abnormal clinical and laboratory findings	303,789	I. Infectious and parasitic diseases	14.80	XVIII. Symptoms, signs and abnormal clinical and laboratory findings	79.08
IV. Endocrine, nutritional and metabolic diseases	228,017	XI. Diseases of the digestive system	14.07	I. Infectious and parasitic diseases	81.03
SUDs	184,158	II. Neoplasms	13.88	III. Diseases of the blood and blood-forming organs	81.27
XIV. Diseases of the genitourinary system	106,415	IX. Diseases of the circulatory system	12.15	IV. Endocrine, nutritional and metabolic diseases	81.98
V. Mental and behavioral disorders	98,350	VI-VIII. Diseases of the nervous system and sense organs	11.96	VI-VIII. Diseases of the central nervous system and sense organs	82.03
XVII. Congenital malformations, deformations and chromosomal abnormalities	75,659	IV. Endocrine, nutritional and metabolic diseases	11.38	IX. Diseases of the circulatory system	82.11
XIII. Diseases of the musculoskeletal system and connective tissue	50,441	XIII. Diseases of the musculoskeletal system and connective tissue	10.95	X. Diseases of the respiratory system	83.07
III. Diseases of the blood and blood-forming organs	43,382	X. Diseases of the respiratory system	10.74	XIII. Diseases of the musculoskeletal system and connective tissue	84.65
XII. Diseases of the skin and subcutaneous tissue	14,558	XII. Diseases of the skin and subcutaneous tissue	9.12	XII. Diseases of the skin and subcutaneous tissue	84.89
XVI. Conditions originating in the perinatal period	5,650	XIV. Diseases of the genitourinary system	8.67	XIV. Diseases of the genitourinary system	85.01
XV. Pregnancy, childbirth and the puerperium	2,253	V. Mental and behavioral disorders	7.88	V. Mental and behavioral disorders	86.57

Note. PYLL = Potential Years of Life Lost; mPYLL = mean Potential Years of Life Lost per death; LE = Life Expectancy.
Source. INE. Authors' own elaboration, 2025.

Discussion

The present study analyzes premature mortality recorded with mention of SUDs on death certificates in Spain between 2016 and 2020, using specific indicators such as PYLL, mPYLL, and LE, stratified by sex and type of substance. The results show that, although SUDs represent a limited proportion of deaths in absolute terms, they present high mPYLL values (17.3 years) and a lower LE (66.6 years) than other high-prevalence causes.

However, these findings should be interpreted taking into account the methodological approach used. Case identification was based on the presence of codes F10–

F19 on death certificates, which allows high diagnostic specificity but entails a relevant underestimation of mortality associated with substance use. Comparison with surveillance systems such as the OEDA shows that in 2020, 872 deaths due to acute reaction to psychoactive substances were recorded, with cocaine present in 52.9% of cases, approximately 460 deaths per year (OEDA, 2022), compared with the 47 cocaine deaths identified in the death records over the entire study period. This discrepancy highlights the difficulty of death certificates in capturing polydrug use and cases in which the substance is not explicitly recorded. In this sense, the results should be interpreted as a conservative estimate of mortality recorded with explicit mention of SUDs, and not as total mortality attributable to substance use.

Regarding the distribution by substance, tobacco and alcohol accounted for the largest absolute burden of PYLL, in line with the literature highlighting their contribution to premature mortality and to the global burden of disease (López et al., 2006; Rehm et al., 2017; WHO, 2024). In contrast, illegal drugs, especially cocaine, opioids, and polydrug use situations, presented higher mPYLL values. This pattern is consistent with international reports and toxicological surveillance systems, in which polydrug use is present in the majority of deaths due to acute reaction, which prevents it being adequately captured in registers based exclusively on clinical certification (EMCDDA, 2024; OEDA, 2022; UNODC, 2023).

The analysis by sex shows that men account for the largest absolute burden of premature mortality in terms of PYLL, with a ratio of 4:1 with respect to women, in line with the 2024 Global Burden of Disease Study (GBD, 2024). In women, the overall mPYLL was slightly higher than that observed in men, although the differences in mean and median age at death were small. This descriptive finding can be contextualized in light of international studies that have pointed to possible sex differences in stigmatization, access to treatment, and clinical course in people with SUDs (Apsley et al., 2023; Molina-Fernández et al., 2024; Meyers et al., 2021; Webb et al., 2022; Pinedo et al., 2020).

The results are consistent with what has been described in the international literature, which estimates the reduction in LE in people with SUDs at between 10 and 20 years (Kim et al., 2025; Yukhnenko et al., 2023) and mPYLL at between 15 and 25 years (Glei & Preston, 2020; Rehm, 2020). Studies such as that of Degenhardt et al. (2018) have also pointed to the high risk of premature mortality associated with opioid and stimulant use, especially at young ages. These comparisons should be interpreted with caution, given that many of these studies estimate attributable mortality, whereas the present work analyzes mortality recorded with an explicit diagnosis.

Compared with other major causes of death, recorded SUDs show a lower absolute burden in PYLL, but indicators compatible with a greater concentration of deaths at relatively earlier ages, in line with what has been described in the international literature (Jalal et al., 2020; Shiels et al., 2019; Svensson et al., 2022). These results should be interpreted with caution since, although the indicators have been calculated homogeneously from death certificates, there are differences in the capture of causes, and SUDs tend to be underrepresented compared with other causes such as neoplasms or cardiovascular diseases.

From a public health perspective, these results support the usefulness of incorporating premature mortality indicators into epidemiological surveillance and suggest the advisability of strengthening prevention, harm reduction, and treatment access strategies, with attention to differences by sex and substance.

Among the main limitations, the exclusive use of codes F10–F19 to identify cases stands out, which probably underestimates mortality associated with substance use, especially in comparison with other information systems that use broader criteria, such as toxicological and forensic registers (OEDA, 2022). In addition, the inclusion of these codes in any position on the certificate, without distinguishing between the underlying cause and contributing causes, introduces heterogeneity in the attribution of the cause of death. Consequently, the results should be interpreted as a conservative estimate of mortality recorded with mention of SUDs. Likewise, no measures of uncertainty were calculated and no statistical tests were performed, so the observed differences should be interpreted in descriptive terms. Although the study is based on an exhaustive population-based register and is not subject to sampling error, the precision of the results may be affected by other sources of uncertainty, such as the quality of coding, the completion of death certificates, and the heterogeneity arising from the inclusion of underlying and contributing causes.

In conclusion, mortality recorded with mention of SUDs shows a relevant burden of premature mortality in Spain, with differentiated patterns according to sex and type of substance. These findings reinforce the interest in incorporating premature mortality indicators into epidemiological surveillance and may be useful for guiding preventive and care planning.

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Conflict of interest

The authors declare that they have no conflicts of interest.

Author contributions

José María Rosales-Crespo: Conceptualization, Methodology, Formal analysis, Data curation, Visualization, Writing – original draft, Writing – review & editing, Project administration.

Carolina Lagares-Franco: Methodology, Validation, Supervision, Writing – review & editing.

José Almenara-Barrios: Conceptualization, Validation, Supervision, Writing – review & editing.

Antonio Linares-Cobacho: Resources, Writing – review & editing.

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Declaration on the use of generative artificial intelligence

During the revision of the manuscript, a generative artificial intelligence tool was used as support for tasks of language improvement and revision of writing and style. The authors fully reviewed, edited, and validated the final version of the manuscript and assume full responsibility for its content.

References

Apsley, H., Martin, G., Staiger, P. K., Hall, K., Greenwood, C., & Lubman, D. I. (2023). Non-engagement in substance use treatment among women: The role of family, social, and individual factors. *Drug and Alcohol Dependence, 244,*109755. https://doi.org/10.1016/j.drugalcdep.2022.109755

Consellería de Sanidade, Organización Panamericana de la Salud (OPS), & Universidad CES de Colombia. (2016). *Epidat 4.2: Programa para análisis epidemiológico de datos*. Santiago de Compostela: Xunta de Galicia. Retrieved from https://www.sergas.es/Saude-publica/EPIDAT

De la Fuente, L., Saavedra, P., Barrio, G., Royuela, L., & Vicente, J. (2014). Mortality risk factors and excess mortality in a cohort of cocaine users admitted to drug treatment in Spain. *Journal of Substance Abuse Treatment, 46*(2), 219–226. https://doi.org/10.1016/j.jsat.2013.08.019

Degenhardt, L., Charlson, F., Ferrari, A., Santomauro, D., Erskine, H., Mantilla-Herrara, A., et al. (2018). The global burden of disease attributable to alcohol and drug use in 195 countries and territories, 1990–2016: A systematic analysis. *The Lancet Psychiatry, 5*(12), 987–1012. https://doi.org/10.1016/S2215-0366(18)30337-7

European Monitoring Centre for Drugs and Drug Addiction. (2024). *European drug report 2024: Trends and developments*. Publications Office of the European Union. https://www.euda.europa.eu/publications/european-drug-report/2024_en

Fierro, I., Yáñez, J. L., & Álvarez, F. J. (2010). Mortalidad prematura y años potenciales de vida perdidos relacionados con el consumo de alcohol en España y en las comunidades autónomas en el año 2004. *Atención Primaria, 42*(2), 95–101. https://doi.org/10.1016/j.aprim.2009.04.002

Gardner, J. W., & Sanborn, J. S. (1990). Years of potential life lost (YPLL)—What does it measure? *Epidemiology, 1*(4), 322–329. https://doi.org/10.1097/00001648-199007000-00012

Glei, D.A., & Preston, S.H. (2020). Estimating the impact of drug use on US mortality, 1999-2016. *Plos One*, 15(1), e0226732. https://doi.org/10.1371/journal.pone.0226732

Global Burden of Disease [GBD]. (2024). *Global Burden of Disease Study 2021 results*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME). https://vizhub.healthdata.org/gbd-results/

Guitart, A. M., Espelt, A., Castellano, Y., Bartroli, M., Villalbí, J. R., & Domingo-Salvany, A. (2011). Impacto del trastorno por consumo de alcohol en la mortalidad: ¿Hay diferencias según la edad y el sexo? *Gaceta Sanitaria, 25*(5), 385–390. https://doi.org/10.1016/j.gaceta.2011.01.004

Instituto Nacional de Estadística (INE). (2024). *Defunciones según la causa de muerte. Metodología*. Madrid: INE. Retrieved from

https://www.ine.es/daco/daco42/sanitarias/metodologia_00.pdf

Jalal, H., Burke, D. S., & Ghitza, U. E. (2020). Analysis of age–period–cohort effects on drug overdose mortality in the United States. *Science Advances, 6*(39), eabc1340. https://doi.org/10.1126/sciadv.abc1340

Kim, S., Kim, H., Choi, J., Lee, S., & Park, S. (2025). Global, regional, and national trends in drug use disorder mortality rates across 73 countries from 1990 to 2021, with projections up to 2040. *The Lancet eClinicalMedicine,* 80, 102202. https://doi.org/10.1016/j.eclinm.2024.102202

López, A. D., Mathers, C. D., Ezzati, M., Jamison, D. T., & Murray, C. J. L. (2006). Global and regional burden of disease and risk factors, 2001: Systematic analysis of population health data. *The Lancet, 367*(9524), 1747–1757. https://doi.org/10.1016/S0140-6736(06)68770-9

Marí-Dell'Olmo, M., Gotsens, M., Palència, L., Burström, B., Corman, D., Costa, C., Deboosere, P., Díez, E., Do-

mínguez-Berjón, F., Dzúrová, D., Gandarillas, A., Hoffmann, R., Kovács, K., Martikainen, P., Demaria, M., Pikhart, H., Rodríguez-Sanz, M., Saez, M., Santana, P., Schwierz, C., Tarkiainen, L., & Borrell, C. (2015). Socioeconomic inequalities in cause-specific mortality in 15 European cities. *Journal of Epidemiology & Community Health, 70*(10), 973–981. https://doi.org/10.1136/jech-2016-206126

Meyers, S. A., Earnshaw, V. A., D'Ambrosio, B., Courchesne, N., Werb, D., & Smith, L. R. (2021). The intersection of gender and drug use-related stigma: A mixed methods systematic review and synthesis of the literature. *Journal of Substance Abuse Treatment, 129*, 108402. https://doi.org/10.1016/j.jsat.2021.108402

Molina-Fernández, A., Herrero-Huete, A., Álvarez-Fernández, C., & Romero-Sánchez, J. M. (2024). Gender perspective and women drug users: Specific needs and vulnerabilities. *Social Sciences, 5*(4), 64. https://doi.org/10.3390/socsci5040064

Observatorio Español de las Drogas y las Adicciones. (2022). *Informe 2022. Alcohol, tabaco y drogas ilegales en España*. Ministerio de Sanidad, Delegación del Gobierno para el Plan Nacional sobre Drogas.
https://pnsd.sanidad.gob.es/eu/profesionales/publicaciones/informes/

Observatorio Español de las Drogas y las Adicciones. (2023). *Informe 2023. Alcohol, tabaco y drogas ilegales en España*. Ministerio de Sanidad, Delegación del Gobierno para el Plan Nacional sobre Drogas.
https://pnsd.sanidad.gob.es/eu/profesionales/publicaciones/informes/

Pinedo, M., Zemore, S., & Rogers, S. (2020). Women's barriers to specialty substance abuse treatment: A qualitative exploration of racial/ethnic differences. *Journal of Ethnicity in Substance Abuse, 19*(4), 529–546.
https://doi.org/10.1080/15332640.2018.1479907

Rehm J. (2020). Alcohol use is a key factor in recent decreases of life expectancy in the United States. *Alcohol Clin Exp Res*, 44(2), 404-406.
https://doi.org/10.1111/acer.14300.

Rehm, J., Shield, K. D., Gmel, G., Gual, A., & Rehm, M. X. (2017). The impact of alcohol use on the burden of disease in Spain. *Adicciones, 29*(3), 199–208. https://doi.org/10.20882/adicciones.954

Shiels, M. S., Freedman, N. D., Thomas, D., & de González, A. B. (2019). Trends in premature mortality in the USA by sex, race, and ethnicity from 1999 to 2014: An analysis of death certificate data. *The Lancet Public Health, 4*(2), e76–e86. https://doi.org/10.1016/S2468-2667(18)30208-1

Sullivan, D. F. (1971). A single index of mortality and morbidity. *HSMHA Health Reports, 86*(4), 347–354. https://doi.org/10.2307/4594169

Svensson, J., Bergström, J., Kåberg, M., & Becker, P. (2022). Patterns of mortality risk among patients with substance use disorder: An opportunity for proactive patient safety?. *BMC Psychiatry,* 22, 770. https://doi.org/10.1186/s12888-022-04437-6

United Nations Office on Drugs and Crime. (2023). *World drug report 2023*. Vienna: United Nations. https://www.unodc.org/res/wdr2023

Webb, C., Davis, C., & Gilchrist, G. (2022). Editorial: Women and substance use: Specific needs and challenges. *Frontiers in Psychiatry, 13*, 1078605. https://doi.org/10.3389/fpsyt.2022.1078605

World Health Organization. (1992). *The International Classification of Diseases, 10th Revision*. World Health Organization.

World Health Organization. (2021). *WHO report on the global tobacco epidemic 2021: Addressing new and emerging products*. World Health Organization. https://www.who.int/publications/i/item/9789240032095

World Health Organization. (2024). *Global status report on alcohol and health and treatment of substance use disorders*. World Health Organization. https://www.who.int/publications/i/item/9789240096745

Yukhnenko, D., Sridhar, S., Patel, V., Fusar-Poli, P., & Fazel, S. (2023). Association of substance use and other psychiatric disorders with premature death among people given community sentences: a nationwide cohort study. *The Lancet Regional Health – Europe,* 29, 100652. https://doi.org/10.1016/j.lanepe.2023.100652