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Life expectancy associated with specific mental disorders and the contribution of causes of death: a population-based study in the region of Catalonia

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ABSTRACT

There is strong evidence that people with mental disorders have a premature mortality, with physical diseases, as well as suicide, accounting for it in large part. However, there is a lack of studies focused on common mental disorders in Southern Europe. This study aims to calculate the reduction in life expectancy for different mental disorders according to all-cause mortality and for specific causes of death using national registers from Catalonia (Spain).

This population register-based study includes clinical information on all adults over 18 years of age using the Catalan public healthcare system from January 2005 to December 2016 (355,540 females and 182,529 males with mental disorders). Mental disorders were classified into eleven categories, and causes of death were grouped as natural and unnatural and then further divided into nine groups. For each disorder, the life-years lost were estimated for all-cause mortality and for each specific cause of death in males and females.

All mental disorders showed a shorter remaining life expectancy after diagnosis than the reference population of the same age. The disorders associated with the largest reduction in life expectancy were alcohol and drug dependence and abuse, and schizophrenia. Natural causes and, to a lesser extent, suicide, were the predominant contributors to excess mortality for all types of mental disorders.

Our findings suggest that mental disorders are associated with premature mortality in Catalonia. Furthermore, natural causes are the primary contributors to premature mortality, indicating the need for better management of medical conditions in this population.

1. Introduction

One in three people experiences a lifetime mental disorder, and mental disorders are key contributors to the global increase in morbidity and disability (Vigo et al., 2016). Although life expectancy has increased in high-income countries in recent decades, the increase does not appear to apply to people with mental disorders (Chang et al., 2021; Plana-Ripoll et al., 2020c). In fact, people with mental disorders die on average 10 to 20 years earlier than people without them (Erlangsen et al., 2017; Melo et al., 2022; Nordentoft et al., 2013) with males showing larger differences than females (Nordentoft et al., 2013). Various mortality measures have been used in previous studies, but differences in life

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expectancy are simple, intuitive, and clearer measures for government and policy makers to understand (Andersen, 2017). A recent meta-analysis that included 109 studies from 24 countries/regions found that people with mental disorders experienced reduced life expectancy relative to the general population, with a potential loss of 14.7 years of life (Chan et al., 2023) .

Numerous studies confirm that the main causes associated with this premature mortality are physical health conditions, including cardiovascular diseases, infectious diseases, cancer, and respiratory diseases (Melo et al., 2022; Olaya et al., 2023; Plana-Ripoll et al., 2019) Other studies from Denmark found that suicide contributed substantially to the total differences in life expectancy for all groups of mental disorders (Plana-Ripoll et al., 2019; Weye et al., 2020a). Despite the fact that understanding the nature of the association between mortality and mental disorders is crucial for guiding health and social policies, evidence on excess mortality associated with mental disorders in Southern Europe remains scarce. One study analyzed data from Italy (Girardi et al., 2021), and a recent study from Spain reported the excess mortality associated with schizophrenia spectrum disorders using data from community-care and an in-patient register (Moreno-Küstner et al., 2021). In a recent study, we showed mortality rates to be higher for those with mental disorders in Catalonia (Spain) than for those without (Olaya et al., 2023) However, there are no data on the reduction in life expectancy associated with common mental disorders, such as mood or anxiety disorders, in Southern Europe.

This study focused on the differences in life expectancy – measured as life years lost (LYLs) – because this enabled us to study the relationship between particular disorders and premature mortality, regardless of the primary underlying cause of death. In fact, this had the advantage of making it possible to break down the total years of life lost with a specific disorder according to the cause of death using competing risk models (Weye et al., 2020a). Thus, the present study aimed to: (a) estimate the excess of LYLs in males and females with eleven types of mental disorders using data from the health registers of the region of Catalonia, and (b) determine the contribution of each specific cause of death to these LYLs.

Based on the literature from other countries, we hypothesized that 1) the average life expectancy for people with mental disorders will be shorter than that for people without mental disorders; 2) most LYLs associated with mental disorders will be due to natural causes; 3) the remaining life expectancy after diagnosis in men with a mental disorder will be shorter than in women with mental disorders; 4) people with schizophrenia or psychoses disorders will have shorter life expectancy than people with mood or anxiety disorders.

2. Methods

2.1. Study population and definition of mental disorders

We analyzed data from the health registers of Catalonia, which contain clinical information on all individuals who use the Catalan public health system. The database contains pseudo-anonymized records for approximately 75 % of the Catalan population. The total adult population (i.e., aged ≥18 years in 2005) in Catalonia was 6032,882 people. We selected individuals who had at least one contact with the Catalan health system from January 1, 2005 to December 31, 2016 and had at least one of the following diagnoses in the registers of general hospitals, outpatient mental health care, psychiatric hospitals and outpatient care based on the International Classification of Diseases, Ninth Revision (ICD-9) (International Classification of Diseases Ninth revision, 1978): (a) schizophrenia spectrum disorders (295.0–295.9), (b) mood disorders (296.0- 296.9), (c) delusional disorders (297.0–297.9), (d) other non-organic psychoses (298.0–298.9), (e) anxiety disorders (300.0–300.9), (f) acute reaction to stress (308), (g) adjustment reaction (309), and (h) depressive disorder not elsewhere classified (311). The diagnoses were, in most cases, made by psychiatrists. This procedure retrieved data from 538,069 people with at least one of these mental diagnoses (355,540 females and 182,529 males). Based on this population, eleven categories of mental disorders were created (Supplementary Table S1). The term *disorder* is used for each diagnosis and the following abbreviations are used: schizophrenia, other non-affective psychoses, bipolar disorders (BD), major depression disorders (MDD), other depressive disorders, personality disorder, alcohol and drugs dependence and abuse (substance use disorders), anxiety disorders, panic disorder, generalized anxiety disorders (GAD), and obsessive-compulsive disorders (OCD). Anxiety disorders include all the anxiety diagnosis (300.xx, excluding 300.4: dysthymic disorder), acute reaction to stress (308), and adjustment reaction (309). The date of onset for each disorder was defined as the date of first contact for the specific disorder. Individuals who had multiple disorders were considered as being exposed to each one, with the beginning of each disorder differing based on the date of initial diagnosis. For instance, an individual with MDD and panic disorder was considered separately for each of the analyses. Subjects were followed from the age at first contact until death or the end of the study (December 31, 2016), whichever occurred first.

2.2. Mortality and causes of death

Official mortality registers were linked to participants using a unique identifying number. Information included date and main cause of death. Causes of death were determined by a physician or by the forensic examiner according to the International Classification of Diseases, Tenth Revision (ICD-10). They were classified into nine non-overlapping causes of death: infectious diseases, cancer, endocrine diseases, nutrition and metabolism, cardiovascular diseases (CVD), respiratory diseases, digestive tract diseases, suicide, other external causes, and other causes. These causes were further classified into natural and unnatural. Unnatural deaths include death by external causes, or suicide, and the rest of the causes were grouped as natural causes (Supplementary Table S2).

2.3. Statistical analysis

We calculated average life expectancy at diagnosis for each mental disorder in the overall sample, males and females. Differences in remaining life expectancy between people with a mental disorder and the reference population were estimated as *excess* LYLs. This methodology has been previously described in detail (Andersen, 2017; Andersen et al., 2013; Plana-Ripoll et al., 2020a). Briefly, this method calculates the remaining life expectancy among individuals with a specific mental disorder at the time of onset and before a specified maximum age (90 years for this study), estimated as the area under the survival curve, and compares the average of these numbers to that of the general population of the same age. This measure has the advantage of allowing a breakdown of the total years of life lost with a specific disorder according to the cause of death using competing risk models. The 95 % CIs were obtained by using a bootstrap analysis with 1000 repetitions. By way of example, the survival curves after age 30 years for males and females with each mental disorder were included in Supplementary Figure S12-S22. We performed all analyses using *R* software version 4.2.2.

IDESCAT, the official statistic office in Catalonia, provided mortality rates and the specific causes of death in 2005 by sex and age for the adult general population (Idescat, 2005). Date of death and cause of death were missing for 18.7 % and 25.0 % of people who died, respectively, corresponding to 3.0 % and 3.9 % of the total sample. For each group of mental disorders, these variables were imputed using sex, age at first contact, cause of death, and time to death (number of years from diagnosis to death), depending on the availability of these variables. For instance, if a patient had no information about their cause of death, their sex, age at first contact, and time to death were used to impute the cause of death. The imputation implements cell-based random hot-desk

methods, using as the selection method the Approximate Bayesian Bootstrap (ABB). This technique was performed using PROC SURVEYIMPUTE from SAS 9.4.

Informed consent was not required, in accordance with the current regulation for the use of registry-based health data. The study was approved by the ethics committee of the Fundació Sant Joan de Deu (ref. PIC-141–16).

3. Results

The most common mental disorders in the study population were anxiety disorders and other depressive disorders (among those with a mental disorder, 44.9 % and 51.6 % of females had an anxiety or other depressive disorder, respectively, while these percentages were 49.5 % and 34.8 % in males, see Table 1). During the 11 years of follow-up, 32,747 (17.9 %) males and 52,179 (14.7 %) females died. Results for the overall sample are included in Supplementary Table S3.

All types of mental disorders were associated with shorter remaining life expectancy after diagnosis than that of the reference population of the same age. The disorders associated with most *excess* LYLs were substance use disorders with 11.43 years (95 %CI 11.27 – 11.58) in males and 11.80 years (CI95 % 11.52 – 12.09) in females, schizophrenia with 11.01 years (95 %CI 10.68 – 11.36) in males and 8.56 years (95 % CI 8.19 – 8.93) in females and other non-affective psychoses with 10.56 years (95 %CI 10.18 – 10.93) in males and 6.82 years (95 %CI 6.50 – 7.13) in females. The disorder associated with the least excess LYLs was GAD for both sexes, 1.39 years (95 %CI 0.56 – 2.19) for males and 0.40 years (95 %CI −0.06 – 0.87) for females (Fig. 1). Estimates and 95 % CI are presented in Supplementary Table S4.

3.1. LYLs due to natural and unnatural causes of death

In both males and females, most LYLs were due to natural causes. For instance, the *excess* LYLs for males and females with other depressive

Table 1
Number of people, length of the follow-up in persons-years, age at diagnosis, number of deaths, age at death and number of deaths by natural and unnatural causes for each group of mental disorder in males and females.

Males with mental disorders (N = 182,529)	N	%	Person-years	Age at diagnosis	Deaths	Age at death	Natural[1]	Unnatural[1]
Schizophrenia	20,700	11.34 %	131,606.84	43.56 (35.05 - 54.04)	3171 (15.32 %)	64.14 (52.58 - 76.30)	2602 (82.06 %)	569 (17.94 %)
Other non-affective psychosis	14,960	8.20 %	70,567.51	47.04 (36.71 - 65.89)	3249 (21.72 %)	77.97 (64.41 - 84.43)	2887 (88.86 %)	362 (11.14 %)
Bipolar disorders	10,682	5.85 %	57,955.19	50.05 (40.04 - 62.04)	1617 (15.14 %)	70.79 (57.92 - 79.88)	1332 (82.37 %)	285 (17.63 %)
Major depression disorder	24,545	13.45 %	120,036.38	55.05 (46.04 - 64.04)	3381 (13.77 %)	72.75 (61.72 - 81.49)	2863 (84.68 %)	518 (15.32 %)
Other depressive disorder	63,557	34.82 %	279,730.27	62.51 (50.34 - 74.45)	18,682 (29.39 %)	77.60 (67.46 - 83.92)	17,565 (94.02 %)	1117 (5.98 %)
Personality disorders	20,624	11.30 %	107,575.04	46.04 (37.67 - 56.04)	2155 (10.45 %)	62.34 (50.44 - 75.89)	1640 (76.10 %)	515 (23.90 %)
Substance use disorders	55,375	30.34 %	287,937.64	51.75 (41.29 - 63.04)	12,965 (23.41 %)	68.19 (57.40 - 78.06)	11,739 (90.54 %)	1226 (9.46 %)
Anxiety disorders	90,281	49.46 %	442,727.12	48.04 (39.04 - 60.04)	9578 (10.61 %)	71.76 (59.77 - 81.60)	8611 (89.90 %)	967 (10.10 %)
Panic disorders	8097	4.44 %	43,796.09	42.59 (35.05 - 52.04)	309 (3.82 %)	64.89 (54.42 - 76.40)	257 (83.17 %)	52 (16.83 %)
GAD	6388	3.50 %	32,479.17	47.04 (38.05 - 57.05)	341 (5.34 %)	69.72 (56.50 - 79.70)	299 (87.68 %)	42 (12.32 %)
OCD	5162	2.83 %	26,788.74	43.05 (36.04 - 54.04)	329 (6.37 %)	67.88 (55.19 - 80.40)	276 (83.89 %)	53 (16.11 %)
Females with mental disorders (N = 355,540)	**N**	**%**	**Person-years**	**Age at diagnosis**	**Deaths**	**Age at death**	**Natural[1]**	**Unnatural[1]**
Schizophrenia	14,928	4.20 %	91,078.96	51.05 (40.78 - 64.83)	2518 (16.87 %)	76.53 (62.70 - 84.43)	2263 (89.87 %)	255 (10.13 %)
Other non-affective psychosis	15,879	4.47 %	76,725.78	58.05 (43.05 - 76.86)	3590 (22.61 %)	84.32 (76.24 - 88.84)	3281 (91.39 %)	309 (8.61 %)
Bipolar disorders	15,343	4.32 %	85,716.39	52.99 (41.97 - 65.32)	1876 (12.23 %)	78.55 (66.52 - 84.98)	1665 (88.75 %)	211 (11.25 %)
Major depression disorder	47,147	13.26 %	241,870.88	56.04 (45.05 - 67.04)	4173 (8.85 %)	79.54 (68.49 - 85.57)	3704 (88.76 %)	469 (11.24 %)
Other depressive disorder	183,310	51.56 %	925,019.47	65.31 (52.61 - 77.53)	38,295 (20.89 %)	83.86 (76.32 - 88.44)	36,306 (94.81 %)	1989 (5.19 %)
Personality disorders	30,793	8.66 %	166,024.07	48.04 (39.04 - 59.05)	2232 (7.25 %)	70.23 (54.73 - 82.61)	1811 (81.14 %)	421 (18.86 %)
Substance use disorders	44,887	12.63 %	236,788.87	48.49 (39.20 - 57.67)	4986 (11.11 %)	62.24 (53.10 - 73.99)	4499 (90.23 %)	487 (9.77 %)
Anxiety disorders	159,580	44.88 %	828,714.83	49.35 (39.04 - 62.77)	11,344 (7.11 %)	80.70 (67.09 - 87.23)	10,577 (93.24 %)	767 (6.76 %)
Panic disorders	15,781	4.44 %	88,541.19	43.05 (35.05 - 53.05)	411 (2.60 %)	69.40 (58.06 - 82.25)	372 (90.51 %)	39 (9.49 %)
GAD	12,820	3.61 %	67,443.05	49.05 (39.05 - 61.05)	485 (3.78 %)	78.30 (65.94 - 85.31)	424 (87.42 %)	61 (12.58 %)
OCD	5093	1.43 %	26,427.19	45.04 (36.31 - 57.04)	279 (5.48 %)	76.99 (62.33 - 85.23)	248 (88.89 %)	31 (11.11 %)

Substance use disorders: alcohol and drugs dependence and abuse; GAD: generalized anxiety disorders; OCD: obsessive-compulsive disorders.
[1] Natural and unnatural causes of death n (%). The percentages are based on the number of people who died.
Age at diagnosis and age at death: Median and IQR of age among those diagnosed with the specific disorder.

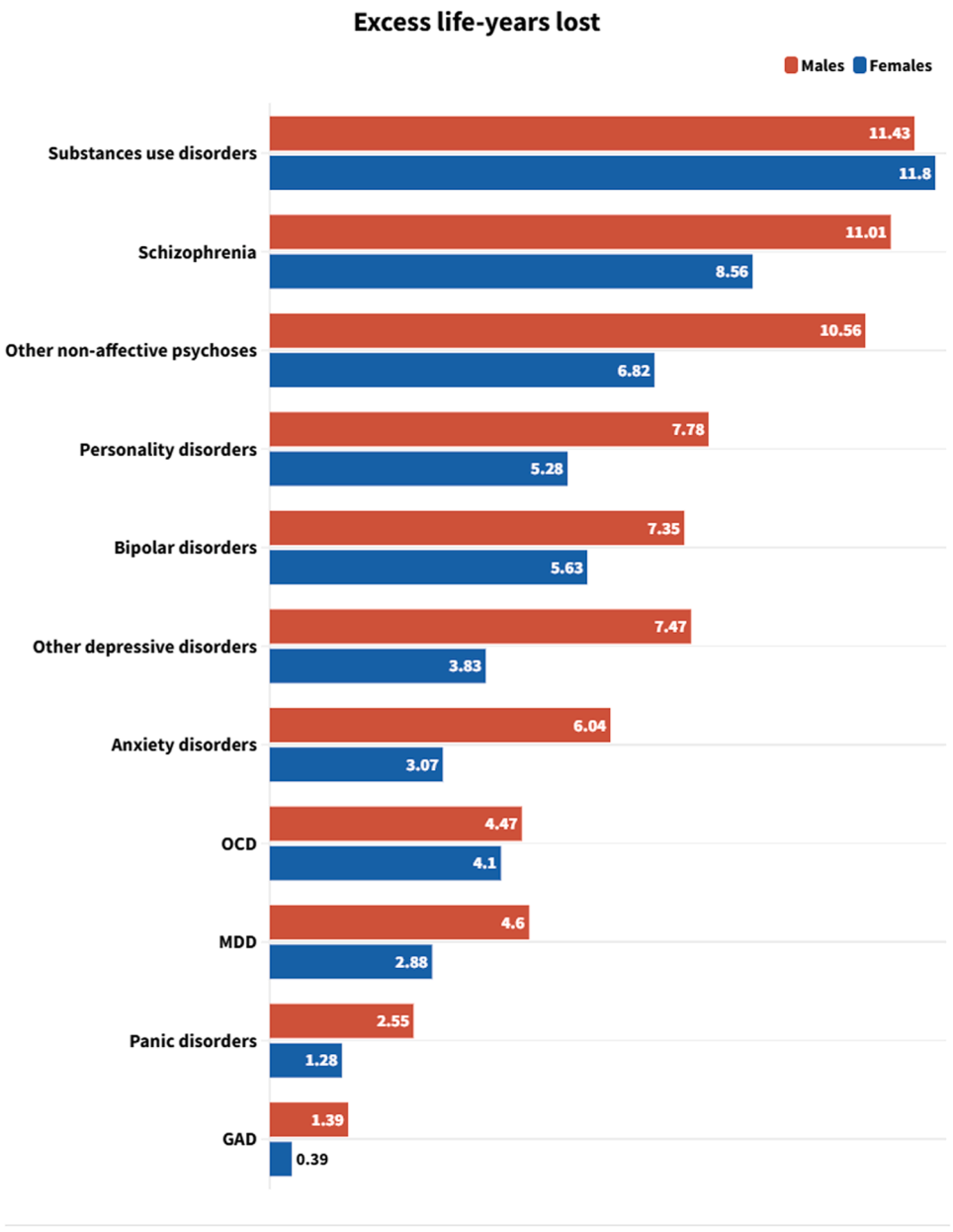

Fig. 1. Excess life-years lost for individuals with each specific mental disorder compared with the general population of Catalonia at the same age and sex. Estimates and their 95 %CI are shown in supplementary Table S4.
MDD: major depressive disorder; Substance use disorders: alcohol and drug dependence and abuse; GAD: generalized anxiety disorders; OCD: obsessive compulsive disorders.

disorders were linked to natural causes (males lost 6.73 years (90.1 %) due to natural causes out of 7.47 *excess* LYLs and females lost 3.56 years (93 %) out of 3.83 *excess* LYLs), compared with the reference population with the same age. Nevertheless, unnatural causes explained an important proportion (about 30 %) of LYLs in people with MDD or personality disorders. Additionally, we observed that the proportion of LYLs due to unnatural causes, in relation to the total excess of LYLs, was higher in males than females. Moreover, females with GAD lost fewer years due to natural causes than the reference population (excess LYLs −0.1 (95 % −0.54 – 0.35)) (Figs. 2 and 3 and Table S4 supplementary).

3.2. LYLs due to specific causes of death

When we analyzed *excess* LYLs by specific causes, we found that, for males, CVD were the natural causes contributing most to *excess* LYLs for subjects with schizophrenia (2.44 years (CI95 % 2.12 – 2.80)), personality disorders (1.44 years (CI95 % 1.08 – 1.80)), OCD (1.60 years (CI95 % 0.79 – 2.54) and bipolar disorders (1.10 years (CI95 % 0.74 – 1.48). In contrast, males with other non-affective psychoses, MDD, other depressive disorders, substance use disorders, and anxiety disorders had the highest *excess* LYLs due to cancer. In males with panic disorders and GAD, the main contributor to LYLs were respiratory diseases (1.09 years and 0.49 years, respectively).In contrast, males with panic disorders had fewer LYLs due to endocrine diseases (*excess* LYLs −0.26 (95 %CI −0.28 – −0.22)) and males with GAD had fewer *excess* LYLs due to CVD (*excess* LYLs −0.36 (95 %CI −0.86 – 0.14) compared to the reference population (Fig. 4, and Table S4 supplementary).

For females, cancer was the main contributing cause of life-years lost in all types of mental disorders, except for bipolar disorders in which the highest *excess* LYLs were due to other causes, and for GAD, in which respiratory diseases were the main contribution of *excess* LYLs. Remaining life expectancy due to cancer ranged from 4.97 years (95 %CI

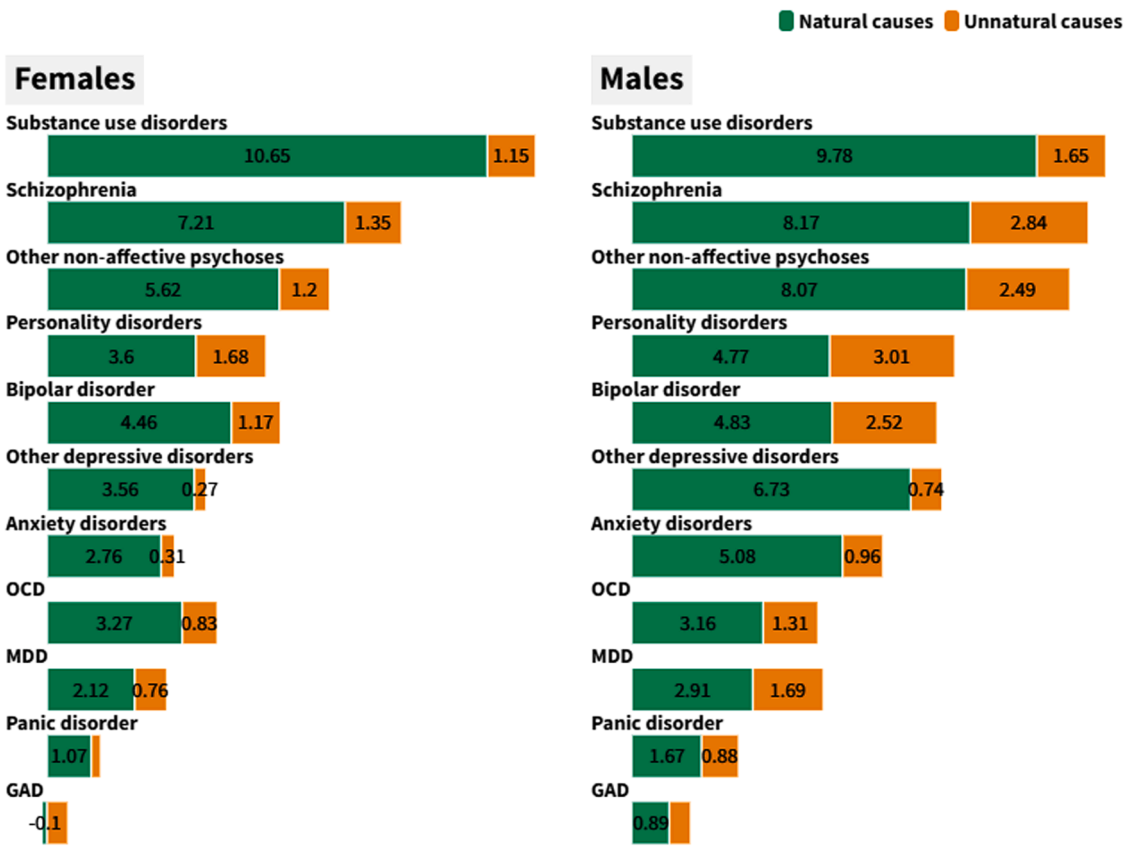

Fig. 2. Excess life-years lost due to natural and unnatural causes of death in females and males compared with the Catalan reference population at the same age and sex. Estimates and 95 % confidence intervals are available in Supplementary Table S4.
MDD: major depressive disorder; Substance use disorders: alcohol and drug dependence and abuse; GAD: generalized anxiety disorders; OCD: obsessive-compulsive disorders.

4.69 – 5.24) for females with substance use disorders to 0.65 (95 %CI 0.50 – 0.80) for subjects with MDD (Fig. 5, and Table S4 supplementary).

Unnatural causes also play an important role in the reduction of the remaining life expectancy. In particular, suicide accounts for a notable proportion of premature mortality in those with different types of mental disorders. The proportion of excess LYLs due to suicide was higher in males than females for all types of mental disorders. For instance, males with personality disorders lost 1.67 years and females lost 0.94 years.

Excess LYLs for each mental disorder due to each specific cause of death in males and females are available in Supplementary Figures S1 to S11.

4. Discussion

To the best of our knowledge, this is the first study to provide data about life expectancy in people with mental disorders in Catalonia, a Southern region in Europe. Overall, our findings show that people with mental disorders die earlier than the reference population, with males with mental disorders losing more years of life than females with the same diagnoses.

In both sexes, the highest excess LYLs were found in people with substance use disorders, followed by people with schizophrenia who presented the second largest life expectancy gap relative to their reference population. These results are in line with previous studies conducted in other countries (Chan et al., 2023; Nordentoft et al., 2013; Plana-Ripoll et al., 2019; Weye et al., 2020b). However, in a study conducted by Laursen et al. (Munk et al., 2018) in the Danish population, they found that males with schizophrenia lost 13.5 years of life, and females 11.4. In our study, we found that males with schizophrenia lost on average 11 years, and females 8.5 years. These differences could be explained by different socio-economic and cultural factors and differing access to healthcare (Chang et al., 2021; Fiorillo and Sartorius, 2021).

Our findings suggest that premature mortality affects not just persons with severe mental disorders, but also those with less severe diagnoses such as personality disorders, OCD, and GAD, which is consistent with earlier studies in Denmark (de la Cruz et al., 2024; Meier et al., 2016; Weye et al., 2020a).

Our study confirms that the causes of death related to medical conditions (natural causes) are the main causes associated with excess LYLs for people with mental disorders, in line with the existing evidence from Denmark (Erlangsen et al., 2017; Firth et al., 2019; Plana-Ripoll et al., 2019). Moreover, for all types of mental disorders, except GAD, the proportion of excess life years lost due to natural causes was higher for females than for males with the same disorder. As a consequence, the proportion of excess life-years lost related to suicides and external causes was higher in males.

In relation to the specific causes of death, two medical conditions appear as the main contributors to a shorter life expectancy in males with mental disorders: CVD for schizophrenia, bipolar disorders and personality disorders, and cancer for MDD, other affective disorders, panic, and substance use disorders. In females with mental disorders, cancer seems to be the main natural cause for excess LYLs. In a similar study conducted in Denmark (Plana-Ripoll et al., 2019), the authors found that people (mostly men) with mental disorders lost fewer years due to cancer than did the general population. Since LYLs take into account competing risks, this would indicate that in our cohort, for some specific disorders, such as affective disorders, people do not die for other causes as much and thus we can observe an increase mortality due to cancer. On the one hand, it is important to detect and prevent the risk for

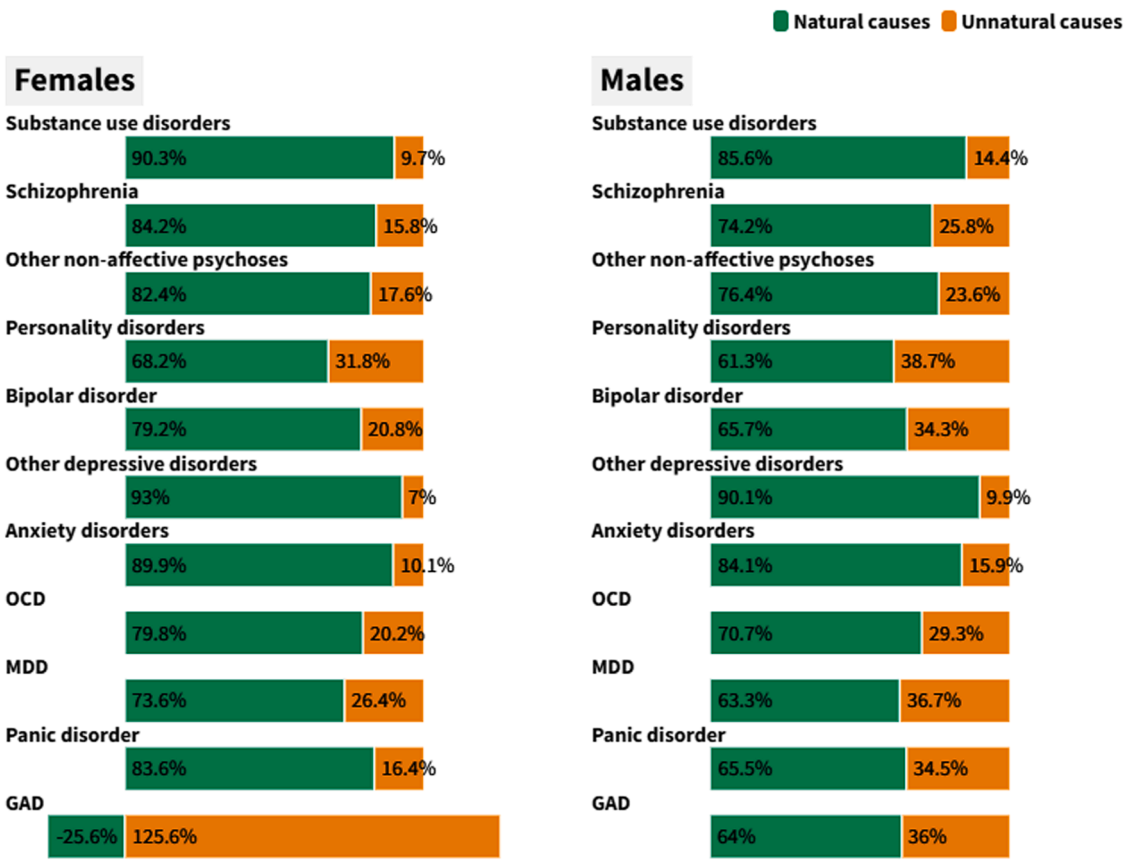

Fig. 3. Proportion of excess life-years lost due to natural and unnatural causes in females and males compared with the Catalan reference population at the same age. Estimates and their 95 %CI are shown in supplementary Table S4.
MDD: major depressive disorder; Substance use disorders: alcohol and drug dependence and abuse; GAD: generalized anxiety disorders; OCD: obsessive-compulsive disorders.

CVD in diagnoses such as schizophrenia, bipolar disorders and personality disorders. On the other, it is imperative to implement measures, such as screening programs, addressed to reducing the risk of cancer in people with mental disorders.

We found negative estimates of LYLs associated with some specific causes of death in individuals with panic disorders, GAD, and OCD. For instance, in males with GAD, the excess LYLs for CVD was −0.36, indicating that they lost fewer years due to CVD than did the reference population. Although the reason for these results is unknown, previous studies have reported greater health care utilization in people with these disorders, which might in turn translate into early detection and management for several medical conditions (Horenstein and Heimberg, 2020).

Although natural causes were associated with premature mortality in all types of mental disorders, the contribution of suicide to the excess LYLs was significant in people with MDD, bipolar disorders, personality and panic disorders. This contribution (about 20 %) was higher in males than females. It was consistent with results published by Moitra et al. (Moitra et al., 2021) although the methodology they used was different. A recent study from Italy showed a strong association between suicide and affective disorders (Girardi et al., 2021). Chesney et al. (Chesney et al., 2014) also reported that people with borderline personality, depression and bipolar disorders had the highest suicide risk.

Increase in mortality in people with mental disorders is a complex and multifactorial issue that has several potential explanations. Those with mental disorders are more likely to have unhealthy lifestyle behaviours, such as, smoking, poor nutrition, and lower levels of physical activity. These behaviours contribute to the high rates of chronic medical conditions. Additionally, individuals with mental disorders are often treated with psychotropic medication. These treatments can lead to weight gain, metabolic syndrome, and cardiovascular issues. In turn, low motivation and sedentary lifestyles can exacerbates the risk of medical conditions like obesity and cardiovascular disease (Mazereel et al., 2020; Perez-Cruzado et al., 2018). Furthermore, people with mental disorders are more likely to have a low socioeconomic position (i.e., low income, short education, or unemployment), which is associated with limited access to healthcare services that contribute to the earlier mortality.

Our study has several strengths, including its large sample size and the use of health registers from Catalonia. Since Catalonia offers free health care, this allowed us to include the entire population and minimize selection bias. Second, the use of inpatient and outpatient registers also increased the generalizability of mental disorder cases, since it allowed for the inclusion of milder, non-hospitalized patients.

However, some limitations should be recognized. First, compared to other population-based studies (i.e., community-based, randomized samples), those based on health registers might include severe cases. Second, we did not include data from primary care due to the fact that this register presented several limitations during the period observed, such as incomplete and inaccurate information. This may have translated into a bias in case identification, especially for anxiety and depressive disorders, which are typically treated by the general practitioner (Serrano-Blanco et al., 2010). Third, as the individuals analysed were not followed up for their entire lives and because the health data does not specify the nature of the contact or whether there had been a previous contact before the beginning of the study period, we had to use age at first diagnosis for the study period as age of first contact. This would explain why our average age of first contact is higher than the

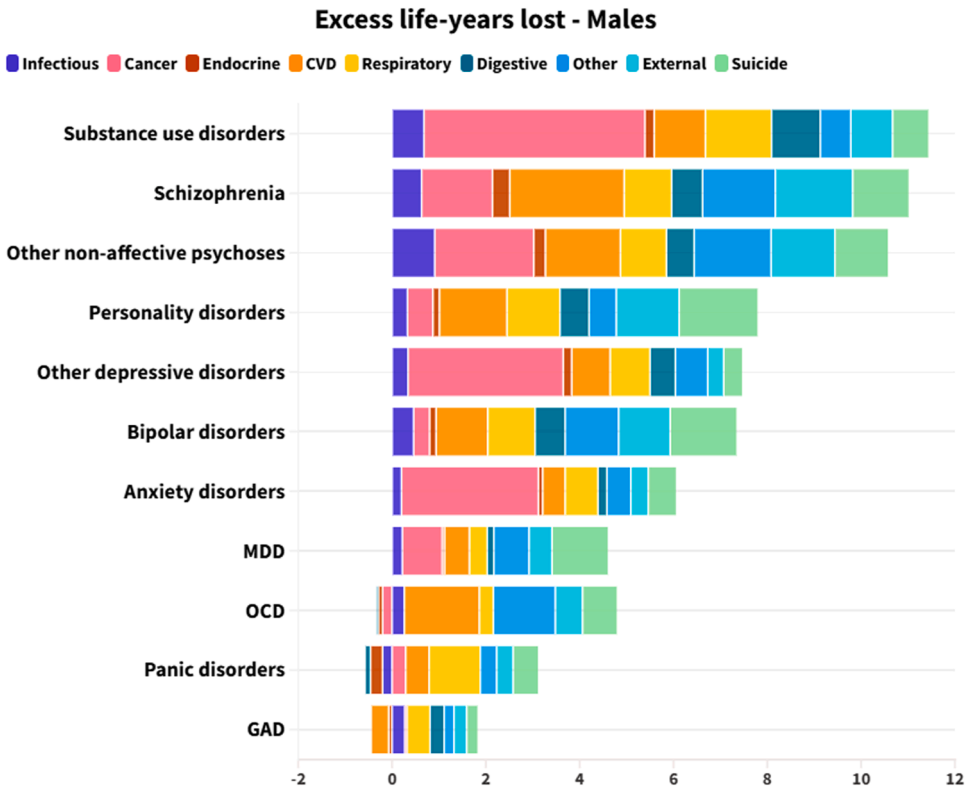

Fig. 4. Excess life years lost due to specific cause of death for males with each mental disorder in comparison with Catalan reference population at same age. Estimates and their 95 %CI are shown in supplementary Table S4.
MDD: major depressive disorder; Substances: alcohol and drug dependence and abuse; GAD: generalized anxiety disorders; OCD: obsessive compulsive disorders.

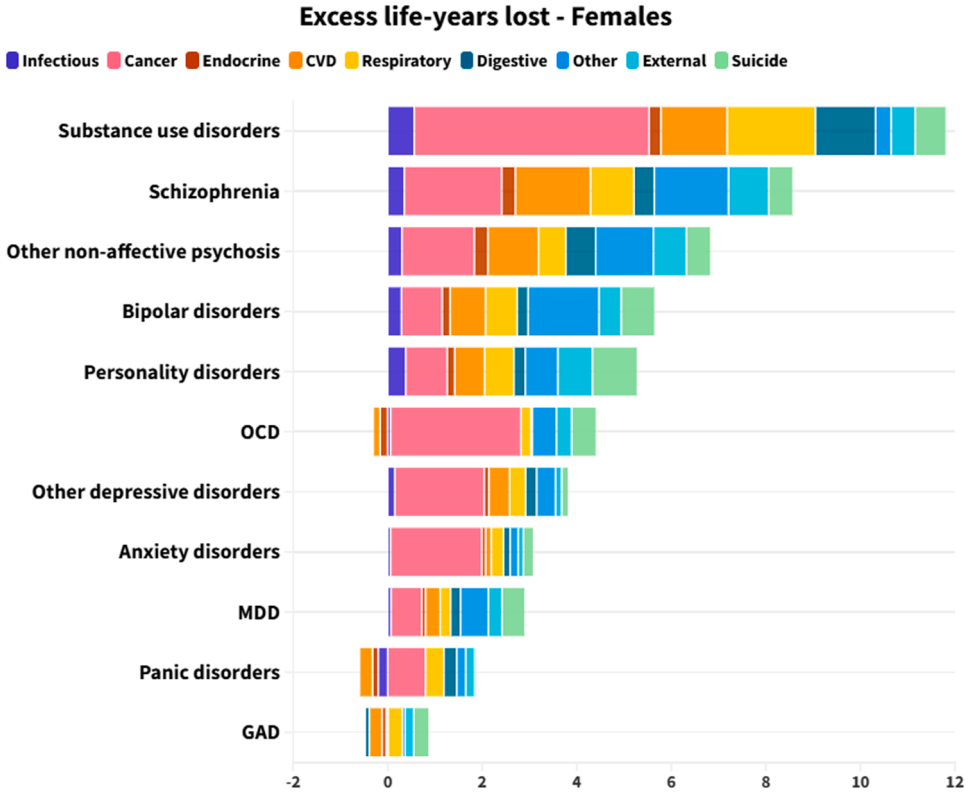

Fig. 5. Excess life years lost associated with specific causes of death for females with each mental disorder in comparison with Catalan reference population at same age. Estimates and their 95 %CI are shown in supplementary Table S4.
MDD: major depressive disorder; Substances: alcohol and drug dependence and abuse; GAD: generalized anxiety disorders; OCD: obsessive compulsive disorders.

typical onset age for mental disorders (Kessler et al., 2007). However, since our study is based on the age at first contact, we are likely to have overestimated the true age of onset of the mental disorder. Consequently, the LYLs method may slightly underestimate the actual LYLs (Plana-Ripoll et al., 2019). Fourth, people with alcohol and drug dependence and abuse disorders (substance use disorder) and people with personality disorders were not included based on the inclusion criteria; rather, those identified in our study were included due to having other mental disorders, and the estimated excess mortality could be higher than that experienced by those with these conditions regardless of other comorbid disorders (Plana-Ripoll et al., 2020b).Fifth, our results cannot be generalized to other countries, since lifetime prevalence rates of mental disorders have been shown to vary across different settings (McGrath et al., 2023).Sixth, the validity of diagnosis could vary depending on the clinical setting. However, the use of registers covered the entire population, despite the limitations in terms of internal and external validity (Munk-Jørgensen and Dinesen Østergaard, 2011). Seventh, in our study, the proportion of people with missing data in cause of death was 25 % of people who died during follow-up period (84, 926, 15.8 %). An imputation method was used in order to minimize the impact of this on the results of LYL regarding cause of death. However, we analysed the distribution of cause of death after imputation and it was similar to the original variable in each dataset. Although imputation enhances the accuracy of estimates by reducing bias that may arise from incomplete data, and our results are in line with previous publications, they should be interpreted with caution. Eighth, the inclusion of prevalent cases and older age of first contact could compromise the contribution of suicide to LYLs and this is probably due to the "survivor effect". This means that people with more severe mental disorders such as schizophrenia, bipolar disorders and major depression disorder are associated with high mortality due to suicide at earlier ages. Thus, as a result, the excess mortality due to suicide may be lower in older individuals for at least two reasons: because the most vulnerable have already been lost to suicide or other causes at younger ages, or else they survived the initial years of the disease.

This study represents the first exploration of mortality in individuals with diverse mental disorders in Catalonia, employing life years lost as a metric. Our findings contribute to improving our understanding of the impact of mental disorders on premature mortality, highlighting the contributions of natural causes. Our results provide evidence for guiding future policies addressed to increasing the life expectancy of people with mental disorders, with special focus on the treatment of comorbid medical conditions, such as CVD and cancer.

Authors contribution

All authors contributed to the formulation of the research question; BO and JMH designed the study; BO obtained the data; MVM analysed the data with the supervision of OP-R; BO, OPR and MVM drafted the article, all authors reviewed it for important intellectual contents and approved the final version.

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the manuscript. BO and MVM had full access to all data in the study and all authors had final responsibility for the decision to submit for publication.

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Data sharing statement

Anonymised data were provided by the "Agència de Qualitat i Avaluació Sanitàries de Catalunya-AQuAS", a public agency of the Generalitat de Catalunya, to conduct the analysis under the project with reference number PI16/00,321. The data that support the findings of this study are not publicly available. Any request to use them should be approved by AQuAS and the authors.

CRediT authorship contribution statement

Maria Victoria Moneta: Writing – original draft, Visualization, Software, Methodology, Formal analysis, Data curation. **Josep Maria Haro:** Writing – review & editing, Resources, Methodology, Conceptualization. **Oleguer Plana-Ripoll:** Writing – review & editing, Supervision, Software, Methodology, Investigation, Formal analysis. **Beatriz Olaya:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors report no conflict of interests.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2025.116480.

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