Suicide Mortality among Psychiatric Patients in Northeast Italy. A 10-year Cohort Study

Journal:	*Epidemiology and Psychiatric Sciences*
Manuscript ID	EPS-21-0272.R1
Manuscript Type:	Original Article
Date Submitted by the Author:	04-Dec-2021
Complete List of Authors:	Girardi, Paolo; University of Padua, Department of developmental psychology and socialization Boldrini, Tommaso; University of Padua, Department of developmental psychology and socialization Braggion, Marco; Azienda Zero, Epidemiological Department Schievano, Elena; Azienda Zero, Epidemiological Department Amaddeo, Francesco; University of Verona, Department of Neurosciences, Biomedicine and Movement Fedeli, Ugo; Azienda Zero, Epidemiological Department
Keywords:	Suicide, Common Mental Disorders, Epidemiology, Psychiatric Services, Risk Factors
Abstract:	Aims. The present study investigated the relationship between suicide mortality and contact with a community mental health center (CMHC) among the adult population in the Veneto Region (northeast Italy, population 4.9 million). Specifically, it estimated the effects of age, gender, time elapsed since the first contact with a CMHC, calendar year of diagnosis, and diagnostic category on suicide mortality and modality. Methods. The regional mortality archive was linked to electronic medical records for all residents aged 18–84 years who had been admitted to a CMHC in the Veneto Region in 2008. In total, 54,350 subjects diagnosed with a mental disorder were included in the cohort and followed up for a period of 10 years, ending in 2018. Years of life lost (YLL) were computed and suicide mortality was estimated as a mortality rate ratio (MRR). Results. During the follow-up period, 4.4% of all registered deaths were from suicide, but, given the premature age of death (mean 52.2 years), suicide death accounted for 8.7% of YLL; this percentage was particularly high among patients with borderline personality disorder (27.2%), substance use disorder (12.1%), and bipolar disorder (11.5%) who also presented the highest suicide mortality rates. Suicide mortality rates were halved in female patients (MRR: 0.45 95 CI: 0.37–0.55), highest in patients aged 45–54 years (MRR: 1.56 95 CI: 1.09–2.23), and particularly elevated in the 2 months following first contact with CMHCs (MRR: 10.4 95 CI: 5.30–20.3). A sensitivity analysis restricted to patients first diagnosed in 2008 confirmed the results. The most common modalities of suicide were hanging (47%), jumping (18%), poisoning (13%), and drowning (10%), whereas suicide from firearm was rare (4%). Gender, age at death, and time since first contact with CMHCs influenced suicide modality. Conclusions. Suicide prevention strategies must be promptly initiated after patients' first contact with CMHCs. Patients diagnosed with borderline personality disorder, substance use disorder, and bipolar disorder may be at particularly high risk for suicide.

Title: **Suicide Mortality among Psychiatric Patients in Northeast Italy. A 10-year Cohort Study**

short title: **Suicide Mortality among Psychiatric Patients**

Abstract

Aims. The present study investigated the relationship between suicide mortality and contact with a community mental health center (CMHC) among the adult population in the Veneto Region (northeast Italy, population 4.9 million). Specifically, it estimated the effects of age, gender, time elapsed since the first contact with a CMHC, calendar year of diagnosis, and diagnostic category on suicide mortality and modality. **Methods.** The regional mortality archive was linked to electronic medical records for all residents aged 18–84 years who had been admitted to a CMHC in the Veneto Region in 2008. In total, 54,350 subjects diagnosed with a mental disorder were included in the cohort and followed up for a period of 10 years, ending in 2018. Years of life lost (YLL) were computed and suicide mortality was estimated as a mortality rate ratio (MRR). **Results.** During the follow-up period, 4.4% of all registered deaths were from suicide, but, given the premature age of death (mean 52.2 years), suicide death accounted for 8.7% of YLL; this percentage was particularly high among patients with borderline personality disorder (27.2%), substance use disorder (12.1%), and bipolar disorder (11.5%) who also presented the highest suicide mortality rates. Suicide mortality rates were halved in female patients (MRR: 0.45 95 CI: 0.37–0.55), highest in patients aged 45–54 years (MRR: 1.56 95 CI: 1.09–2.23), and particularly elevated in the 2 months following first contact with CMHCs (MRR: 10.4 95 CI: 5.30–20.3). A sensitivity analysis restricted to patients first diagnosed in 2008 confirmed the results. The most common modalities of suicide were hanging (47%), jumping (18%), poisoning (13%), and drowning (10%), whereas suicide from firearm was rare (4%). Gender, age at death, and time since first contact with CMHCs influenced suicide modality. **Conclusions.** Suicide prevention strategies must be promptly initiated after patients' first contact with CMHCs. Patients diagnosed with borderline personality disorder, substance use disorder, and bipolar disorder may be at particularly high risk for suicide.

Key words: suicide; suicide mortality; mental disorder; cohort study; record linkage study.

1. Introduction

Suicide is an important public health phenomenon, with a complex, multi-dimensional etiology (WHO, 2021a). Approximately 703,000 people died by suicide in 2019, and this cause of death presents a global annual mortality rate of 9 per 100,000 individuals, with different mortality time trends across countries (from fewer than 2 to more than 80 per 100,000) and age classes (WHO, 2021b). Moreover, suicide is one of the most important factors influencing risk of death and years of life lost among people affected by a mental disorder (Girardi et al., 2021; Harris & Barraclough, 1998; Nordentoft et al., 2013; Walker et al., 2015). In fact, psychopathology is strongly associated with suicidal thoughts and behaviors, and it can precede these outcomes and increase their likelihood (for recent reviews, see Franklin et al., 2017; Guzmán et al., 2019; Ribeiro et al., 2018; for a modeling of potential mechanisms underpinning the relationship between mental disorders and suicide, see Mishara and Chagnon 2016).

Research on the relationship between mental disorders and suicide is relevant, as it is widely assumed that estimates of suicide risk and definitions of high-risk patients according to individual characteristics may guide the clinical treatment of psychiatric patients. In this regard, a meta-review assessed the risks of all-cause and suicide mortality in people with mental disorders (Chesney et al., 2014), concluding that the highest suicide risk was associated with borderline personality disorder, which presented a 45-fold increase in risk relative to the general population level. Suicide risk was also found to be strongly associated with anorexia nervosa in women (31-fold increase), depression (20-fold increase), bipolar disorder (17-fold increase), opioid use (14-fold increase), and schizophrenia (13-fold increase).

Nevertheless, some scholars have argued that the risk conferred by mental disorders is over-rated, because most observed associations have arisen from psychological autopsy studies (Hjelmeland & Knizek, 2017; Pridmore, 2015). Such studies obtain information on decedents by suicide by interviewing individuals who were close to them, and they run the risk of introducing recall biases by priming informants to consider particular risk factors (e.g., mental disorders) that might

explain the suicide (Cavanagh et al., 2003). On the other hand, studies using record linkage data (whereby mental health service use data are linked with suicide data at the individual level) may offer a more objective window into the relationship (Goldney, 2015; Haw & Hawton, 2015).

A recent meta-analysis provided a conservative estimate of the association between mental disorders and suicide risk by restricting the inclusion criteria to record linkage studies, exclusively (Too et al., 2019). The association was confirmed by the pooled results, revealing an eight-fold increase in risk relative to the general population level. Notably, the time periods examined in the included studies ranged from 1973 (Webb et al., 2014) to 2012 (Høye et al., 2016); thus, more up-to-date evidence is urgently needed, also to determine whether recent advancements in psychiatric care can be linked to temporal variations in suicide mortality. Moreover, record linkage studies have only been conducted in six countries (i.e., Denmark, Sweden, Canada, Australia, the United Kingdom, Norway), and their results are hardly generalizable, since their overall high heterogeneity (93.8–97.9%) can be mainly (50.5%) explained by the country of study (Too et al., 2019). As several factors may explain differences between countries (e.g., selection criteria, national legal systems, specificities of mental health care), data from under-studied countries are needed to improve access to high-quality mental health care and thereby prevent suicide.

Based on these premises, the present record linkage study investigated the relationship between suicide mortality and contact with mental health services among a population-based cohort of adult patients with a diagnosed mental disorder, who were in the care of a community mental health center (CMHC) in Northeast Italy. Patients were observed over a 10-year period, from 2008–2018. Specifically, we aimed at estimating differences in suicide risk by age, gender, time elapsed since the first contact with the CMHC, calendar year of diagnosis, and diagnostic category. To assess the impact of suicide mortality, we estimated the amount of potential life years lost. Moreover, since access to lethal means is relatively manageable (especially in in-patient clinical settings), we also aimed at estimating patterns in suicide modality.

2. Methods

The study was conducted in the Veneto Region (Northeast Italy, population 4.9 million). Recruitment and follow-up methods were previously described (Girardi et al., 2021). Briefly, we recruited all patients aged 18–84 years cared by CMHC in Veneto in 2008, who had received a psychiatric diagnosis in or prior to the year 2008. CMHC data included demographics, date of first contact with the psychiatric service, and clinical diagnosis (according to the ICD-9CM). Diagnostic groups were defined as: schizophrenia and related disorders (ICD-9CM 295, 297, 298.1–298.9, 299); bipolar disorder (296.4–296.7); other affective disorders (296, 298.0, 300.4, 309.0, 309.1, 311); neurotic, stress-related, and somatoform disorders (300, 306, 307.4, 307.8–307.9, 308, 316); borderline personality disorder (301.83); other personality disorders (301, 302, 312); substance use disorders (291–292, 303–305); and all other diagnoses (e.g., eating disorders, dementia, etc.).

Record linkage between patient and mortality information was performed by a standardized anonymization process that assigned each subject a unique code and allowed record linkage between electronic records, with no possibility of retrieving patients' identities. Subjects were followed-up for overall mortality and cause of death from 2008 (year of recruitment of the cohort), until December 31, 2018. Cause of death was coded according to the ICD-10. Suicides (ICD10 X60–X84) were classified as poisoning (X60–X69); hanging, strangulation/suffocation (X70); drowning (X71); suicide by firearm (X72–X74); jumping (X80); or unspecified/other.

The study variables were summarized in frequency tables. Categorical variables were compared using a chi-squared test. Statistical significance was assumed at the 5% level. The cumulative mortality risk curves were estimated by Fine and Gray cumulative incidence estimator, considering suicide and other causes of death as competitive events; the estimation was performed by diagnostic group and equality across groups was tested by a log-rank test.

For all observed deaths—and separately for deaths from suicide—we computed years of life lost (YLL) as the difference between the subject's age at death and the current life (at the year of reference) expectancy for the general population, with respect to the subject's age and sex, as

provided by the National Institute of Statistics (ISTAT). For each diagnostic group, we also calculated the average YLL from suicide and all causes, and the relative percentage contribution of suicide to overall YLL.

The effects of age, gender, time elapsed since the first contact with a psychiatric service, calendar year of diagnosis, and diagnostic category on the suicide mortality rate were estimated as mortality rate ratios (MRR) with 95% confidence intervals (CI), obtained using Poisson regression. Since patients diagnosed before the start of the follow-up can be subjected to self-selection bias or other time-related dynamics, their influence in the analysis was assessed by means of a sensitivity analysis performed on the same Poisson regression model but including only subjects with a first diagnosis in the year 2008.

A multinomial logistic regression was estimated to assess differences in suicide modality, including suicide modality as the dependent variable and testing the significance of the covariates' effect using an analysis of variance (ANOVA) based on the likelihood ratio test (LRT). The results were reported in terms of odds ratios (OR) with 95% CIs with respect to the reference category.

The cohort data were built using SAS Enterprise Guide 6.1, and YLL was estimated via the "Epi" and "popEpi" packages in R (Carstensen & Plummer, 2011; Plummer & Carstensen, 2011). Since all analyses were carried out on routinely collected anonymized records, the study was exempt from approval by the local ethics committee.

3. Results

Overall, 54,350 CMHC patients were recruited (41,9% male, median age 48 years). Distribution by diagnostic group was as follows: 23.9% schizophrenia and related disorders; 3.6% bipolar syndrome; 30.2% other affective disorders; 17.8% neurotic, stress-related, and somatoform disorders; 0.8% borderline personality disorder; 8.4% other personality disorders; 2.1% substance use disorders; and 13.2% other diagnoses.

A total of 9,176 deaths were registered among the cohort subjects over the 10-year follow-up period (531,638 person-years). The overall mortality risk (both for suicide and other causes) differed by diagnostic group (log-rank test $p<0.001$) with a high mortality risk for non-suicidal causes among patients with a diagnosis of substance use disorders or bipolar disorders; patients with borderline personality disorders reported a mortality risk for suicide closed to that for other causes, while for the other groups the difference in risk was more marked (Figure 1).

Out of the entire deaths amount, 407 were from suicide (61.1% male, mean age at death 52.2 years). With respect to overall deaths, decedents from suicide were younger and more likely to be male and diagnosed with bipolar disorder, other affective disorder, or a personality disorder (Table 1).

< Figure 1 about here >

< Table 1 about here >

Despite representing only 4.4% of all registered deaths, deaths from suicide accounted for 8.7% of all YLL, amounting to 12,845 YLL with a mean of 31.5 YYL per decedent. The share of all YLL represented by suicide was larger among patients with bipolar disorder (11.5%), borderline personality disorder (27.2%), and a substance use disorder (12.1%) (Table 2).

< Table 2 about here >

The Poisson regression determined that the female suicide mortality rate was half that of males (MRR: 0.45; 95%CI: 0.37–0.55). Overall, the suicide mortality rate also peaked among subjects aged 45–54 years (MRR: 1.56; 95%CI: 1.09–2.23) and in the 2 months following first contact with the psychiatric service (MRR:10.4; 95%CI: 5.30–20.3). However, the rate decreased as further time elapsed since first contact. In addition, patients with more recent diagnoses had a lower mortality risk. Patients affected by neurotic/stress-related and somatoform disorders showed the lowest suicide rates;

the highest rates were registered by subjects diagnosed with bipolar disorder, borderline personality disorder, and a substance use disorder (Table 3). The sensitivity analysis based on patients diagnosed during the year 2008 broadly confirmed the previous results (Table S2), showing only a slight reduction in the suicidal risk in the first 2 months following first contact with the psychiatric service.

< Table 3 about here >

The most common suicide modality was hanging (47%), followed by jumping (18%), poisoning (13%), and drowning (10%); suicide from a firearm was rare (4%). Table S2 shows that suicide modality was influenced by gender, age at death, and time since first contact with the psychiatric service. In fact, as reported in Table S4, females were more likely to engage in poisoning (OR: 4.75; 95% CI: 2.43–9.29), jumping (OR: 3.11; 95% CI: 1.73–5.61), drowning (OR: 3.18; 95% CI: 1.55–6.52), and other methods (OR: 2.54; 95% CI: 1.21–5.32), rather than hanging. In addition, after 10 years had elapsed since the first contact with the psychiatric service, patients reported an increased frequency of jumping (OR: 3.23; 95% CI: 1.70–6.15) and other methods for suicide (OR: 4.40; 95% CI: 2.00–9.68), relative to hanging. Younger people (< 45 years) showed a higher frequency of poisoning (OR: 3.39; 95% CI: 1.67–6.87) and jumping (OR: 2.14; 95% CI: 1.09–4.19) than patients aged 45–65 years; a significantly higher frequency of jumping also was observed among older patients (OR: 3.18; 95% CI: 1.54–6.57). The predicted probabilities by suicide modality, gender, age at death, and time since first contact were shown in Figure 2 highlighting the previously reported differences in terms of probability: hanging, strangulation, and suffocation were the most common modalities of suicide for both genders. They significantly decreased with the time since first contact, while the probability related to the "jump" modality increased with the age at death, especially among females.

< Figure 2 about here >

4. Discussion

The present 10-year cohort study showed that, in Northeast Italy, the suicide mortality crude rate for CMHC patients was approximately 7.66 per 10,000, representing a 10-fold higher rate than that of the general Italian population (WHO, 2021b). Overall, the observed mortality rate that accounted for 8.7% of all YLL among subjects deserves close attention.

The risk of suicide was also associated with sociodemographic and clinical factors. Specifically, suicide mortality was highest among patients aged 45–54 years, in line with global estimations, which show that more than half of global suicides (58%) occur before the age of 50 years (WHO, 2021b). Moreover, our data showed that the suicide mortality rate was significantly higher in male patients, relative to female patients. Within the context of suicide research, gender differences in suicidal behavior rates are referred to as the "gender paradox" (Canetto & Sakinofsky, 1998), which describes the general phenomenon that, in most Western countries, females have a higher rate of suicidal ideation, yet a lower rate of suicide mortality, relative to males. While the gender paradox may seem to be a mere artifact of data collection driven by cultural expectations about gender (e.g., under-reporting of non-fatal suicide behaviors in males), it has been repeatedly confirmed by meta-analytic studies (Miranda-Mendizabal et al., 2019) and the global age-standardized suicide rate (12.6 and 5.4 per 100,000 for males and females, respectively; (WHO, 2021b). A putative explanation for this holds that males may use or have easier access to more violent and lethal means for suicide (Windfuhr & Kapur, 2011). While data on suicide attempts were not available in the present study, our results confirm gender differences in suicide mortality in the clinical population, as well.

Regarding the type of diagnosis, patients with borderline personality disorder, bipolar disorder, and substance use disorders displayed the highest risk of suicide and lost the greatest number of life years. Surprisingly, the suicide rate for psychosis spectrum disorders did not differ from the overall rate (7.21 vs. 7.66 per 10,000) and the rate ratio for suicide mortality showed less than a 2-fold increase over the reference category (i.e., neurotic, stress-related disorders). While this moderate

increase is in line with some reports (Lawrence et al., 2000), further attention is needed, since high heterogeneity between previous studies of suicide risk among psychosis spectrum patients has been reported, also due to the type of comparison group, the mental disorder classification, and the inclusion of older people (Too et al., 2019). Notably, the mental disorder classification applied in the present study (i.e., ICD-9) involves broader diagnostic criteria for psychosis spectrum disorders than the current ones (e.g., ICD-11; DSM-5). For example, ICD-9 included "latent schizophrenia", a relatively less severe diagnosis that today would be recorded as a personality disorder (borderline and/or schizotypal) or, in younger individuals, as an attenuated psychotic syndrome (Lingiardi & Boldrini, 2019).

Conversely, subjects with substance use disorders reported a higher suicide risk and the highest crude mortality rate. Numerous biopsychosocial mechanisms may contribute to the increased risk of suicide amongst these patients, including: (i) the influence of substance use on cognition and behavior, which may result in disinhibition and impulsivity; (ii) pain, distress, and psychiatric conditions, which increase the likelihood of both substance use disorders and suicide; and (iii) unemployment, social isolation, and marginalization as a result of a substance use disorder (Bohnert & Ilgen, 2019; Esang & Ahmed, 2018; Pompili et al., 2010; Shustov et al., 2016). With respect to the latter, the social isolation and marginalization of individuals with a substance use disorder may be strongly related to the laws and policies applied to condemn and/or pursue consumers of psychoactive substances. The environment in which individuals with a substance use disorder purchase illegal substances can be highly traumatic, and the frequency of traumatic experiences (e.g., violence, detention, usury, social isolation) in a given substance market is likely to be closely related to the laws that govern that market (Perrone et al., 2020). In turn, traumatic experiences are well-known as both distal (Zatti et al., 2017) and proximal (O'Connor & Kirtley, 2018) risk factors for suicide. Notably, in Italy, during the analyzed time period, strong prohibitionist national policies were applied regarding the use and possession of psychoactive substances (Ronconi & Camposeragna, 2021). Legislation and collective regulations may exert a significant influence on psychopathology (with

respect to suicide, see, e.g., (Cai et al., 2021; Kim et al., 2019; Knipe et al., 2014), and more research is needed to estimate the potential impact of different drug policies on clinical outcomes (including suicide) among individuals with a substance use disorder. Researchers working in the growing field of legal epidemiology (Burris et al., 2020) are particularly well positioned to address this issue.

On the other hand, in the present study, patients with borderline and other personality disorders lost more life years by suicide than by any other disease category, suggesting that they tended to commit suicide at an earlier age. This finding is not surprising, since personality disorders typically onset during adolescence (Newton-Howes et al., 2015)—several years earlier than most other mental disorders (e.g., schizophrenia, bipolar disorder, depressive disorders), which typically onset by mean age 24 years (de la Fuente-Tomas et al., 2019). Specific efforts to reduce early suicidality in individuals with a personality disorder are strongly needed. Treatments for personality disorders are usually offered relatively late in the course of the disorder, and are often characterized by therapeutic nihilism (Sheehan et al., 2016; Snowden & Kane, 2003). In contrast, intervention during the early stages of a personality disorder (i.e., in adolescence) might help to decrease the persistence and/or severity of the personality disorder and prevent the cascading of secondary psychopathology, psychosocial disability, and suicidality (Chanen & Thompson, 2018).

The World Health Organization (WHO, 2021a) recently recommended measures to "identify, assess, manage, and follow-up anyone affected by suicidal behaviors, from an early stage". In line with this recommendation, the present results may also help to inform clinicians and policymakers on *when* to increase efforts to prevent suicide in help-seeking individuals. Specifically, we found that suicide mortality was highest within the 2 months following the first contact with a CMHS, and decreased as further time elapsed. This finding can be interpreted in at least two ways: 1) contact with a CMHS and psychosocial and/or pharmacological treatments are effective in reducing suicidality, and their effect increases over time; and 2) some help-seeking individuals make first contact with a CMHS when their clinical condition is already so severe as to lead to suicide soon thereafter (Cosci & Fava, 2013; de la Fuente-Tomas et al., 2019), and clinical treatments at this stage may be

insufficient to prevent this dramatic outcome. With respect to the latter explanation, meta-analytic data have shown that a great number of individuals experience years of untreated mental illness before seeking treatment from mental health services, though they often seek help in a different context (Ghio et al., 2014; Penttilä et al., 2014; Perkins et al., 2005; Souaiby et al., 2016). For example, a systematic review of the pathways to care for patients with first-episode psychosis showed that, for the vast majority, first contact was with a physician, and frequently within a hospital emergency department (ED) (Anderson et al., 2010). Recent findings from the same geographical area of the present study showed that approximately half of all patients who went on to develop a mental disorder between the ages of 15–24 contacted an ED three to four times on average, before contacting a CMHS (Solmi et al., 2020). Regarding suicide behaviors, a review of more than 40 studies (Luoma et al., 2002) found that up to 3–4 suicide victims had contact with a primary care provider in the year of their suicide; in contrast, only about 2 out of every 10 suicide victims had contact with an in-patient or out-patient mental health clinic in the year before death (Walby et al., 2018). Several reasons might account for the apparent barriers to mental healthcare, directing subjects at risk of (or already presenting with) a mental disorder towards a general physician or ED, instead of a CMHS. First, self-stigma, overall stigma, and discrimination, in particular, have been shown to correlate with a longer duration of untreated illness (Kular et al., 2019). Subjects may be prone to avoiding clinical contexts associated with "mental health," they may minimize their functional impairment or unspecific symptoms, and they may wait to seek help until they manifest acute signs or symptoms. Thus, specific efforts are urgently needed to destigmatize mental health settings, in order to meet international recommendations aimed at reducing the duration of untreated illness to a maximum of 3 months (Bertolote & McGorry, 2005). Moreover, the adoption of early intervention approaches integrating primary (e.g., general practitioners and EDs) and secondary (e.g., CMHS and psychiatric wards) care settings (Arango et al., 2018; Fusar-Poli et al., 2017) may be necessary to prevent suicide outcomes among individuals with a mental disorder.

Finally, regarding suicide modality, the present study found that the majority of suicidal patients ended their life via hanging (47%), whereas suicide from a firearm was rare (4%). This trend contradicts the findings of studies from the United States, showing that the most common suicide modality is by firearm (44.6%)—usually involving a handgun (61.3% of firearm suicides) (Persons et al., 2019). Notably, the laws regulating access and exposure to firearms are extremely severe in Italy, compared to those in the United States. In Italy, there are 11.9 guns per 100 people; in the United States, this figure rises to 88.8 guns per 100 inhabitants (King, 2010). Interestingly, studies aimed at comparing more versus less severe firearm state legislations in the United States have shown that legislations that limit access and exposure to handguns significantly reduce not only the rate of suicide by firearm, but also the overall suicide rate (Anestis & Anestis, 2015; Kaufman et al., 2018). Although we cannot compare the overall suicide mortality rate registered in the present study to those of countries with more relaxed firearm legislation, our data on suicide modality suggest that national legislation that limits access and exposure to handguns may play a vital role in preventing suicides. Furthermore, limiting access to means of suicide is one of the strongest recommendations provided by the World Health Organization for suicide prevention (WHO, 2021a). Accordingly, and based on the results of the present study, clinicians should also maintain particular caution with respect to poisoning in both female and younger patients, and for jumping amongst both elderly patients and those with long-lasting contact with mental health services.

5. Limitations and Future Directions

The present study suffered from some limitations due to the nature of the data collected. First, a dilution effect of the observed suicide risk may have been present. Specifically, the cohort included subjects diagnosed by CMHC before the data linkage with the regional mortality database in 2008. Consequently, all individuals who had accessed a CMHC prior to 2008 and committed suicide prior to 2008 were lost, and this may have increased the risk of underestimation. However, a sensitivity analysis including only patients who made first contact with a CMHC in 2008 confirmed, with a

reduced power, the results. Second, fatal suicide attempt was the only suicide-related variable considered, providing no room for suicidal ideation and non-fatal suicide attempts, which are clearly important risk factors for suicide mortality (Hubers et al., 2018; Organization., 2015). Third, we did not consider other relevant suicide predictors, such as socioeconomic status at the time of diagnosis (Arensman et al., 2019); work history (Azevedo Da Silva et al., 2019; Milner et al., 2013); financial, legal, or acute stressful life events; and psychosocial disability (Erlangsen et al., 2021). Expanding the analyses to include these factors would increase the precision of the estimates and be strongly recommended for future studies. Fourth, our estimates were necessarily conservative, given that individuals with a mental disorder who did not seek support from public mental health services were not included in the record linkage. Moreover, the analyzed data were exclusively collected in CMHCs; therefore, individuals who received a diagnosis of mental disorder in inpatient facilities were not included in the cohort. However, in Italy, a percentage between 93% and 97% of patients accessing inpatient facilities also accessed CMHCs (Lora, 2009). For this reason, we are confident that such limitation has little or no impact on the generalizability of our findings. Fifth, due to the nature of the data collected, we could not estimate the comorbidity between different mental disorders, and thus future cohort studies may benefit from stratifying suicidal risk according to comorbidity profiles. As clinicians apply categorical diagnosis as part of their routine practice, further investigation of the relationship between different or comorbid mental disorders and suicide mortality is important. However, comorbidity is more often a diagnostic tool than a clinical reality, and future research may benefit from an emphasis on transdiagnostic dimensions (e.g., early traumatic experiences, common etiological factors) (Zatti et al., 2019). Moreover, the observed diagnoses of mental disorders were limited to those registered at baseline. These diagnoses may have changed over time, and we were unable to determine whether the individuals included in this study had any symptoms at the time of their death or had different symptoms than those diagnosed when they were included in the cohort. In addition, we were unable to determine what type of treatments the patients included in the cohort received during the follow-up period. These are limitations that commonly

affect the broad field of suicide risk factor studies. As argued by Franklin et al. (2017), most studies test whether single isolated factors measured at one moment predict suicide-related outcomes over the course of years or even decades. They suggest that, to provide more relevant clinical evidence, future studies should include short follow-up intervals (in the order of minutes, hours, or days), with repeated analysis or continuous measurement of constructs (e.g., rapid increases or decreases in depressive symptoms, rather than major depressive disorders), a focus on novel risk factors, and the application of risk algorithms to combine risk factors in a complex but replicable manner (Franklin et al., 2017). Finally, the presented results derived from a population of a wealthy and catholic Italian region, with historically low unemployment rates and a public health system integrated with local health units (ISTAT, 2020; Toniolo et al., 2012). Therefore, the generalization of the results can be limited to similar populations, since socio-demographic characteristics modified the suicidal risk (Agerbo et al., 2007). However, some of the present findings, especially those related to the time since first contact with mental health services (Chung et al., 2019) and to the different risk ratios according to different mental disorders diagnoses, are in line with evidence from other Western countries (Qin & Nordentoft, 2005).

6. Conclusions

The present estimates could not confirm the direct causal mechanisms of heightened suicide risk, but it identified patterns that suggest opportunities for the development of suicide prevention strategies (for reviews, see: Doupnik et al., 2020; Milner et al., 2017; Pirkis et al., 2015). As the suicide mortality rates were found to be higher in the first 2 months following first contact with a CHMS, suicide preventive interventions should be promptly implemented for help-seeking individuals at their very first contact with mental health services. Special attention is also needed for males, patients aged 45–54 years, and patients diagnosed with borderline personality disorder, a substance use disorder, and bipolar disorder. Finally, when seeking to limit access to means of suicide, clinicians should give particular attention to the modalities of hanging, poisoning

(particularly among both female and younger patients), and jumping (particularly among both elderly patients and patients with long-lasting contact with mental health services).

Availability of Data and Materials

Raw data supporting the conclusions of this article will be made available by the authors upon request without undue reservation.

Financial Support

This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Conflicts of Interest

None.

Ethical Standards

Since all analyses were carried out on routinely collected anonymized records, the study was exempt from approval by the local ethics committee.

References

Agerbo, E., Gunnell, D., Bonde, J. P., Mortensen, P. B., & Nordentoft, M. (2007). Suicide and occupation: the impact of socio-economic, demographic and psychiatric differences. *Psychological Medicine*, *37*(8), 1131–1140.

Anderson, K. K., Fuhrer, R., & Malla, A. K. (2010). The pathways to mental health care of first-episode psychosis patients: a systematic review. *Psychological Medicine*, *40*(10), 1585–1597.

Anestis, M. D., & Anestis, J. C. (2015). Suicide rates and state laws regulating access and exposure to handguns. *American Journal of Public Health*, *105*(10), 2049–2058.

Arango, C., Díaz-Caneja, C. M., McGorry, P. D., Rapoport, J., Sommer, I. E., Vorstman, J. A., McDaid, D., Marín, O., Serrano-Drozdowskyj, E., & Freedman, R. (2018). Preventive strategies for mental health. *The Lancet Psychiatry*, *5*(7), 591–604.

Arensman, E., Larkin, C., McCarthy, J., Leitao, S., Corcoran, P., Williamson, E., McAuliffe, C., Perry, I. J., Griffin, E., & Cassidy, E. M. (2019). Psychosocial, psychiatric and work-related risk factors associated with suicide in Ireland: optimised methodological approach of a case-control psychological autopsy study. *BMC Psychiatry*, *19*(1), 1–11.

Azevedo Da Silva, M., Younès, N., Leroyer, A., Plancke, L., Lemogne, C., Goldberg, M., Rivière, M., & Melchior, M. (2019). Long-term occupational trajectories and suicide: a 22-year follow-up of the GAZEL cohort study. *Scandinavian Journal of Work, Environment & Health*, *45*(2), 158–165. https://doi.org/10.5271/sjweh.3767

Bertolote, J., & McGorry, P. (2005). Early intervention and recovery for young people with early psychosis: consensus statement. *The British Journal of Psychiatry. Supplement*, *48*, s116-9. https://doi.org/10.1192/bjp.187.48.s116

Bohnert, A. S. B., & Ilgen, M. A. (2019). Understanding links among opioid use, overdose, and suicide. *New England Journal of Medicine*, *380*(1), 71–79.

Burris, S., Cloud, L. K., & Penn, M. (2020). The Growing Field of Legal Epidemiology. In *Journal of public health management and practice : JPHMP: Vol. 26 Suppl 2* (pp. S4–S9). https://doi.org/10.1097/PHH.0000000000001133

Cai, Z., Canetto, S. S., Chang, Q., & Yip, P. S. F. (2021). Women's suicide in low-, middle-, and high-income countries: Do laws discriminating against women matter? *Social Science & Medicine (1982)*, *282*, 114035. https://doi.org/10.1016/j.socscimed.2021.114035

Canetto, S. S., & Sakinofsky, I. (1998). The gender paradox in suicide. *Suicide & Life-Threatening Behavior*, *28*(1), 1–23. https://doi.org/10.1111/j.1943-278X.1998.tb00622.x

Carstensen, B., & Plummer, M. (2011). Using Lexis objects for multi-state models in R. *Journal of Statistical Software*, *38*(1), 1–18.

Cavanagh, J. T. O., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychological Medicine*, *33*(3), 395–405. https://doi.org/10.1017/s0033291702006943

Chanen, A. M., & Thompson, K. N. (2018). Early intervention for personality disorder. *Current Opinion in Psychology*, *21*, 132–135.

Chesney, E., Goodwin, G. M., & Fazel, S. (2014). Risks of all-cause and suicide mortality in mental disorders: a meta-review. *World Psychiatry*, *13*(2), 153–160.

Chung, D., Hadzi-Pavlovic, D., Wang, M., Swaraj, S., Olfson, M., & Large, M. (2019). Meta-analysis of suicide rates in the first week and the first month after psychiatric hospitalisation. *BMJ Open*, *9*(3), e023883. https://doi.org/10.1136/bmjopen-2018-023883

Cosci, F., & Fava, G. A. (2013). Staging of mental disorders: systematic review. *Psychotherapy and Psychosomatics*, *82*(1), 20–34.

de la Fuente-Tomas, L., Sánchez-Autet, M., García-Álvarez, L., González-Blanco, L., Velasco, Á., Martínez, P. A. S., Garcia-Portilla, M. P., & Bobes, J. (2019). Clinical staging in severe mental disorders: Bipolar disorder, depression and schizophrenia. *Revista de Psiquiatría y Salud Mental (English Edition)*, *12*(2), 106–115.

Doupnik, S. K., Rudd, B., Schmutte, T., Worsley, D., Bowden, C. F., McCarthy, E., Eggan, E., Bridge, J. A., & Marcus, S. C. (2020). Association of Suicide Prevention Interventions With Subsequent Suicide Attempts, Linkage to Follow-up Care, and Depression Symptoms for Acute Care Settings: A Systematic Review and Meta-analysis. *JAMA Psychiatry*, *77*(10), 1021–1030. https://doi.org/10.1001/jamapsychiatry.2020.1586

Erlangsen, A., Banks, E., Joshy, G., Calear, A. L., Welsh, J., Batterham, P. J., & Salvador-Carulla, L. (2021). Measures of mental, physical, and social wellbeing and their association with death by suicide and self-harm in a cohort of 266,324 persons aged 45 years and over. *Social Psychiatry and Psychiatric Epidemiology*, *56*(2), 295–303. https://doi.org/10.1007/s00127-020-01929-2

Esang, M., & Ahmed, S. (2018). A closer look at substance use and suicide. *American Journal of Psychiatry Residents' Journal*.

Franklin, J. C., Ribeiro, J. D., Fox, K. R., Bentley, K. H., Kleiman, E. M., Huang, X., Musacchio, K. M., Jaroszewski, A. C., Chang, B. P., & Nock, M. K. (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. *Psychological Bulletin*, *143*(2), 187–232. https://doi.org/10.1037/bul0000084

Fusar-Poli, P., McGorry, P. D., & Kane, J. M. (2017). Improving outcomes of first-episode psychosis: an overview. *World Psychiatry*, *16*(3), 251–265.

Ghio, L., Gotelli, S., Marcenaro, M., Amore, M., & Natta, W. (2014). Duration of untreated illness and outcomes in unipolar depression: a systematic review and meta-analysis. *Journal of Affective Disorders*, *152–154*, 45–51. https://doi.org/10.1016/j.jad.2013.10.002

Girardi, P., Schievano, E., Fedeli, U., Braggion, M., Nuti, M., & Amaddeo, F. (2021). Causes of mortality in a large population-based cohort of psychiatric patients in Southern Europe. *Journal of Psychiatric Research*, *136*, 167–172.

Goldney, R. D. (2015). The importance of mental disorders in suicide. *Australian & New Zealand Journal of Psychiatry*, *49*(1), 21–23.

Guzmán, E. M., Cha, C. B., Ribeiro, J. D., & Franklin, J. C. (2019). Suicide risk around the world: a meta-analysis of longitudinal studies. *Social Psychiatry and Psychiatric Epidemiology*, *54*(12), 1459–1470. https://doi.org/10.1007/s00127-019-01759-x

Harris, C., & Barraclough, B. (1998). Excess mortality of mental disorder. *The British Journal of Psychiatry*, *173*(1), 11–53.

Haw, C., & Hawton, K. (2015). Suicide is a complex behaviour in which mental disorder usually plays a central role. *Australian & New Zealand Journal of Psychiatry*, *49*(1), 13–15.

Hjelmeland, H., & Knizek, B. L. (2017). Suicide and mental disorders: A discourse of politics, power, and vested interests. *Death Studies*, *41*(8), 481–492.

Høye, A., Nesvåg, R., Reichborn-Kjennerud, T., & Jacobsen, B. K. (2016). Sex differences in mortality among patients admitted with affective disorders in North Norway: a 33-year prospective register study. *Bipolar Disorders*, *18*(3), 272–281.

Hubers, A. A. M., Moaddine, S., Peersmann, S. H. M., Stijnen, T., van Duijn, E., van der Mast, R. C., Dekkers, O. M., & Giltay, E. J. (2018). Suicidal ideation and subsequent completed suicide in both psychiatric and non-psychiatric populations: a meta-analysis. *Epidemiology and Psychiatric Sciences*, *27*(2), 186–198. https://doi.org/10.1017/S2045796016001049

ISTAT. (2020). *Conti economici regionali [Regional accounts]*.

Kaufman, E. J., Morrison, C. N., Branas, C. C., & Wiebe, D. J. (2018). State firearm laws and interstate firearm deaths from homicide and suicide in the United States: a cross-sectional analysis of data by county. *JAMA Internal Medicine*, *178*(5), 692–700.

Kim, I., Koo, M. J., Lee, H.-E., Won, Y. L., & Song, J. (2019). Overwork-related disorders and recent improvement of national policy in South Korea. *Journal of Occupational Health*, *61*(4), 288–296. https://doi.org/10.1002/1348-9585.12060

King, B. (2010). *Surveying Europe's Production and Procurement of Small Arms and Light Weapons Ammunition. The Cases of Italy, France, and the Russian Federation*.

Knipe, D. W., Metcalfe, C., Fernando, R., Pearson, M., Konradsen, F., Eddleston, M., & Gunnell, D. (2014). Suicide in Sri Lanka 1975-2012: age, period and cohort analysis of police and hospital data. *BMC Public Health*, *14*, 839. https://doi.org/10.1186/1471-2458-14-839

Kular, A., Perry, B. I., Brown, L., Gajwani, R., Jasini, R., Islam, Z., Birchwood, M., & Singh, S. P. (2019). Stigma and access to care in first-episode psychosis. *Early Intervention in Psychiatry*, *13*(5), 1208–1213.

Lawrence, D., Almeida, O. P., Hulse, G. K., Jablensky, A. V, & HOLMAN, C. J. (2000). Suicide and attempted suicide among older adults in Western Australia. *Psychological Medicine*, *30*(4), 813–821.

Lingiardi, V., & Boldrini, T. (2019). The Diagnostic Dilemma of Psychosis: Reviewing the Historical Case of Pseudoneurotic Schizophrenia. *Journal of Nervous and Mental Disease*, *207*(7), 577–584. https://doi.org/10.1097/NMD.0000000000001008

Luoma, J. B., Martin, C. E., & Pearson, J. L. (2002). Contact with mental health and primary care providers before suicide: a review of the evidence. *American Journal of Psychiatry*, *159*(6), 909–916.

Milner, A., Spittal, M. J., Pirkis, J., & LaMontagne, A. D. (2013). Suicide by occupation: systematic review and meta-analysis. *The British Journal of Psychiatry : The Journal of Mental Science*, *203*(6), 409–416. https://doi.org/10.1192/bjp.bp.113.128405

Milner, A., Witt, K., Pirkis, J., Hetrick, S., Robinson, J., Currier, D., Spittal, M. J., Page, A., & Carter, G. L. (2017). The effectiveness of suicide prevention delivered by GPs: A systematic review and meta-analysis. *Journal of Affective Disorders*, *210*, 294–302. https://doi.org/10.1016/j.jad.2016.12.035

Miranda-Mendizabal, A., Castellví, P., Parés-Badell, O., Alayo, I., Almenara, J., Alonso, I., Blasco, M. J., Cebrià, A., Gabilondo, A., Gili, M., Lagares, C., Piqueras, J. A., Rodríguez-Jiménez, T., Rodríguez-Marín, J., Roca, M., Soto-Sanz, V., Vilagut, G., & Alonso, J. (2019). Gender differences in suicidal behavior in adolescents and young adults: systematic review and meta-analysis of longitudinal studies. *International Journal of Public Health*, *64*(2), 265–283. https://doi.org/10.1007/s00038-018-1196-1

Newton-Howes, G., Clark, L. A., & Chanen, A. (2015). Personality disorder across the life course. *The Lancet*, *385*(9969), 727–734.

Nordentoft, M., Wahlbeck, K., Hällgren, J., Westman, J., Ösby, U., Alinaghizadeh, H., Gissler, M., & Laursen, T. M. (2013). Excess mortality, causes of death and life expectancy in 270,770 patients with recent onset of mental disorders in Denmark, Finland and Sweden. *PloS One*, *8*(1), e55176.

O'Connor, R. C., & Kirtley, O. J. (2018). The integrated motivational–volitional model of suicidal behaviour. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *373*(1754), 20170268.

Organization., W. H. (2015). *Suicide*. http://www.who.int/mediacentre/factsheets/fs398/en/

Organization, W. H. (2021a). *Live life: an implementation guide for suicide prevention in countries*.

Organization, W. H. (2021b). *Suicide worldwide in 2019: global health estimates*.

Penttilä, M., Jääskeläinen, E., Hirvonen, N., Isohanni, M., & Miettunen, J. (2014). Duration of untreated psychosis as predictor of long-term outcome in schizophrenia: systematic review and meta-analysis. *The British Journal of Psychiatry : The Journal of Mental Science*, *205*(2), 88–94. https://doi.org/10.1192/bjp.bp.113.127753

Perkins, D. O., Gu, H., Boteva, K., & Lieberman, J. A. (2005). Relationship between duration of untreated psychosis and outcome in first-episode schizophrenia: A critical review and meta-analysis. *American Journal of Psychiatry*, *162*(10), 1785–1804. https://doi.org/10.1176/appi.ajp.162.10.1785

Perrone, E., De Bei, F., & Cristofari, G. (2020). Law and mental health: A bridge between individual neurobiology and the collective organization of behaviors. *Medical Hypotheses*, *144*, 110004.

Persons, J. E., Hefti, M. M., & Nashelsky, M. B. (2019). Epidemiology of suicide in an Iowa cohort. *Public Health*, *177*, 128–134. https://doi.org/10.1016/j.puhe.2019.08.005

Pirkis, J., Too, L. S., Spittal, M. J., Krysinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet. Psychiatry*, *2*(11), 994–1001. https://doi.org/10.1016/S2215-0366(15)00266-7

Plummer, M., & Carstensen, B. (2011). Lexis: An R class for epidemiological studies with long-term follow-up. *Journal of Statistical Software*, *38*(1), 1–12.

Pompili, M., Serafini, G., Innamorati, M., Dominici, G., Ferracuti, S., Kotzalidis, G. D., Serra, G., Girardi, P., Janiri, L., Tatarelli, R., Sher, L., & Lester, D. (2010). Suicidal behavior and alcohol

abuse. *International Journal of Environmental Research and Public Health*, *7*(4), 1392–1431. https://doi.org/10.3390/ijerph7041392

Pridmore, S. (2015). Mental disorder and suicide: A faulty connection. *Australian & New Zealand Journal of Psychiatry*, *49*(1), 18–20.

Qin, P., & Nordentoft, M. (2005). Suicide risk in relation to psychiatric hospitalization: evidence based on longitudinal registers. *Archives of General Psychiatry*, *62*(4), 427–432.

Ribeiro, J. D., Huang, X., Fox, K. R., & Franklin, J. C. (2018). Depression and hopelessness as risk factors for suicide ideation, attempts and death: meta-analysis of longitudinal studies. *The British Journal of Psychiatry*, *212*(5), 279–286.

Ronconi, S., & Camposeragna, A. (2021). *The EU Action Plan on Drugs 2017- 2020 and the national drug policies in 8 european States. States. Divergences, convergences, gaps and areas for developments.*

Sheehan, L., Nieweglowski, K., & Corrigan, P. (2016). The stigma of personality disorders. *Current Psychiatry Reports*, *18*(1), 11.

Shustov, D. I., Tuchina, O. D., Fedotov, I. A., & Novikov, S. A. (2016). Self-destructive alcoholic personality. *Counseling Psychology and Psychotherapy*, *24*(3), 89–109.

Snowden, P., & Kane, E. (2003). Personality disorder: no longer a diagnosis of exclusion. *Psychiatric Bulletin*, *27*(11), 401–403.

Solmi, M., Della Rocca, F., Cianci, V., Giacometti, A., Alexopulos, C., Granziol, U., Favaro, A., Fusar-Poli, P., Zoleo, M., & Cremonese, C. (2020). Emergency department and early detection of adolescents and young adults at risk of developing mental disorders: an exploratory study. *Research in Psychotherapy (Milano)*, *23*(2), 459. https://doi.org/10.4081/ripppo.2020.459

Souaiby, L., Gaillard, R., & Krebs, M.-O. (2016). [Duration of untreated psychosis: A state-of-the-art review and critical analysis]. *L'Encephale*, *42*(4), 361–366. https://doi.org/10.1016/j.encep.2015.09.007

Toniolo, F., Mantoan, D., Maresso, A., & Organization, W. H. (2012). *Veneto region, Italy: health system review*.

Too, L. S., Spittal, M. J., Bugeja, L., Reifels, L., Butterworth, P., & Pirkis, J. (2019). The association between mental disorders and suicide: A systematic review and meta-analysis of record linkage studies. *Journal of Affective Disorders*, *259*, 302–313. https://doi.org/10.1016/j.jad.2019.08.054

Walby, F. A., Myhre, M. Ø., & Kildahl, A. T. (2018). Contact With Mental Health Services Prior to Suicide: A Systematic Review and Meta-Analysis. *Psychiatric Services (Washington, D.C.)*, *69*(7), 751–759. https://doi.org/10.1176/appi.ps.201700475

Walker, E. R., McGee, R. E., & Druss, B. G. (2015). Mortality in mental disorders and global disease burden implications: a systematic review and meta-analysis. *JAMA Psychiatry*, *72*(4), 334–341.

Webb, R. T., Lichtenstein, P., Larsson, H., Geddes, J. R., & Fazel, S. (2014). Suicide, hospital-presenting suicide attempts, and criminality in bipolar disorder: examination of risk for multiple adverse outcomes. *The Journal of Clinical Psychiatry*, *75*(8), 0.

Windfuhr, K., & Kapur, N. (2011). International perspectives on the epidemiology and aetiology of suicide and self-harm. *International Handbook of Suicide Prevention: Research, Policy and Practice. Oxford: John Wiley & Sons, Oxford*, 27–58.

Zatti, C., Rosa, V., Barros, A., Valdivia, L., Calegaro, V. C., Freitas, L. H., Ceresér, K. M. M., Rocha, N. S. da, Bastos, A. G., & Schuch, F. B. (2017). Childhood trauma and suicide attempt: A meta-analysis of longitudinal studies from the last decade. *Psychiatry Research*, *256*, 353–358. https://doi.org/10.1016/j.psychres.2017.06.082

Zatti, C., Rosa, V., Barros, A., Valdivia, L., Calegaro, V. C., Freitas, L. H., Ceresér, K. M. M., Rocha, N. S. da, Bastos, A. G., Schuch, F. B., Yates, K., Lång, U., Cederlöf, M., Boland, F., Taylor, P., Cannon, M., McNicholas, F., DeVylder, J., Kelleher, I., … Carrà, G. (2019). Understanding suicide risk within the Research Domain Criteria (RDoC) framework: A meta-

analytic review. *Journal of Affective Disorders*, *11*(3), 14–20.

https://doi.org/10.1136/bmj.m575

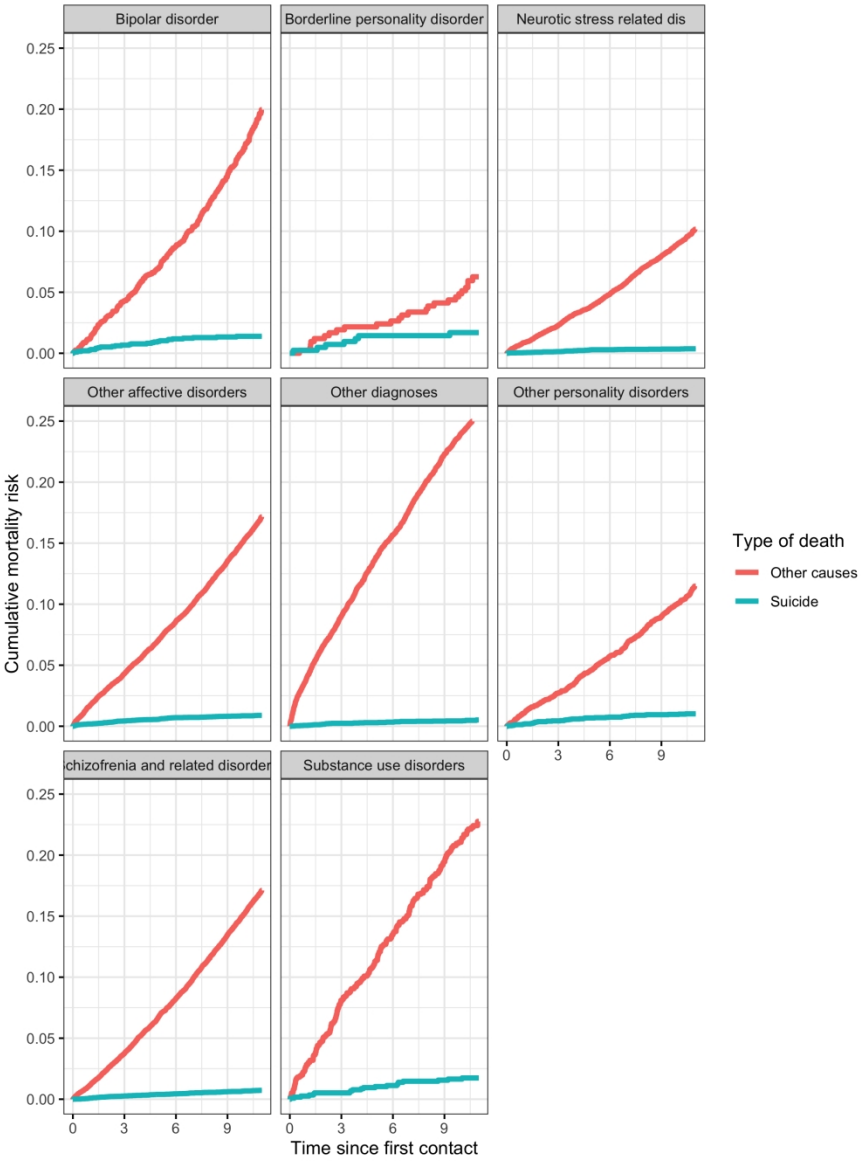

Figure 1. Cumulative mortality risk estimated by Fine and Gray cumulative incidence estimator by diagnostic group for suicide mortality and other causes.

776x1058mm (72 x 72 DPI)

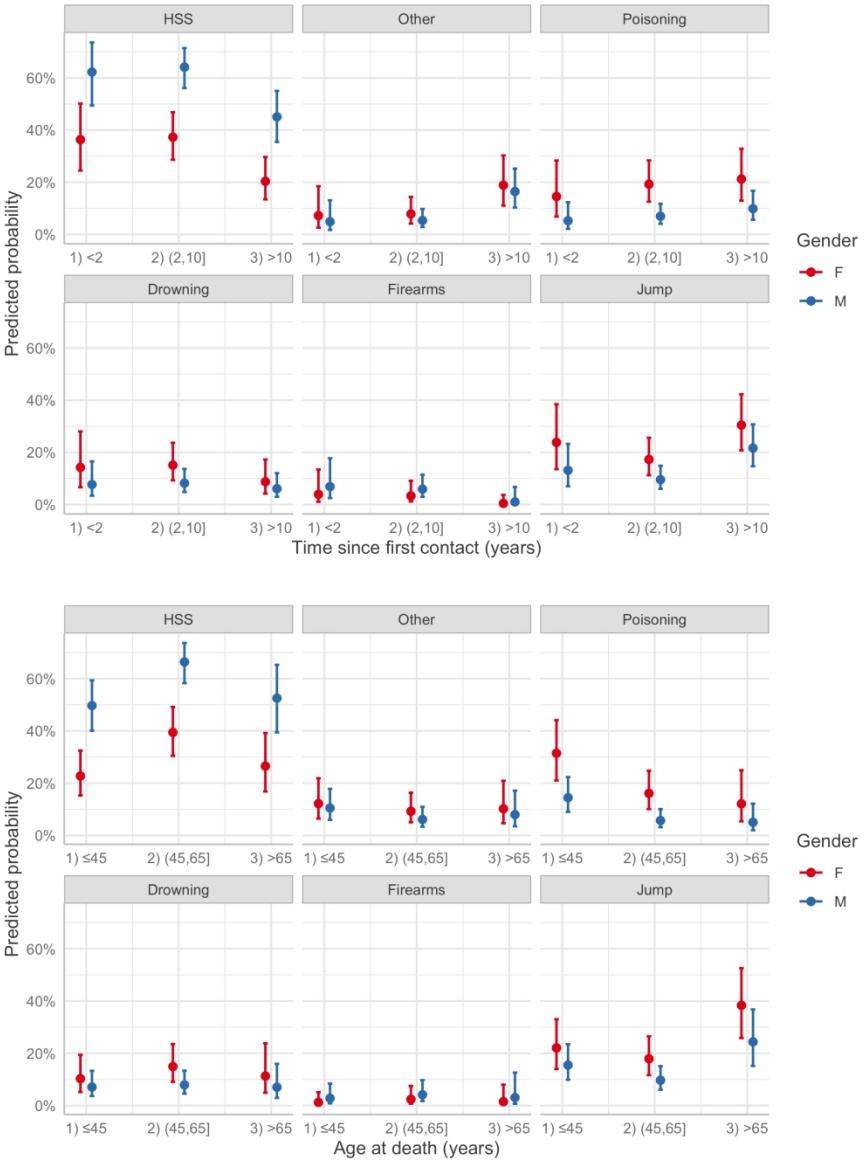

Figure 2. Predicted probability of suicidal modality* estimated by multinomial regression model for combinations of age of death, gender, and time since first contact.

*HSS=hanging, strangulation and suffocation.

776x1058mm (72 x 72 DPI)

Table 1. Main characteristics of decedents from suicide and other causes in a cohort of 54,350 community mental health center patients in the Veneto Region (Italy)

			Deaths		
	Overall (n=54350)	**Alive (*n* = 45174)**	**Non-suicide (*n* = 8769)**	**Suicide (*n* = 407)**	***p*-value***
Gender, *n* (%)					<0.001
Male	22767 (41.9)	18497 (40.9)	4021 (45.9)	249 (61.2)	
Female	31583 (58.1)	26677 (59.1)	4748 (54.1)	158 (38.8)	
Age at death, *n* (%)					<0.001
<35 years	-	-	54 (0.6)	42 (10.3)	
[35, 44) years	-	-	221 (2.5)	75 (18.4)	
[45, 54) years	-	-	666 (7.6)	124 (30.5)	
[55, 64) years	-	-	1231 (14.0)	84 (20.6)	
≥65 years	-	-	6597 (75.2)	82 (20.1)	
Diagnostic group, *n* (%)					<0.001
Schizophrenia and related disorders	12996 (23.9)	10728 (23.7)	2175 (24.8)	93 (22.9)	
Other affective disorders	16434 (30.2)	13582 (30.1)	2708 (30.9)	144 (35.4)	
Neurotic, stress-related disorder	9689 (17.8)	8716 (19.3)	938 (10.7)	35 (8.6)	
Other personality disorders	4552 (8.4)	4000 (8.9)	506 (5.8)	46 (11.3)	
Bipolar disorder	1950 (3.6)	1549 (3.4)	374 (4.3)	27 (6.6)	
Borderline personality disorder	416 (0.8)	384 (0.9)	25 (0.3)	7 (1.7)	
Substance use disorders	1160 (2.1)	884 (2.0)	256 (2.9)	20 (4.9)	
Other diagnoses	7153 (13.2)	5331 (11.8)	1787 (20.4)	35 (8.6)	
Year of first contact, *n* (%)					0.05
<2000	9235 (17.0)	7318 (16.2)	1847 (21.1)	70 (17.2)	
[2000, 2003)	8487 (15.6)	7048 (15.6)	1365 (15.6)	74 (18.2)	
[2004, 2007)	18676 (34.4)	15971 (35.4)	2569 (29.3)	136 (33.4)	
2008	17952 (33.0)	14837 (32.8)	2988 (34.1)	127 (31.2)	

**p-value related to the chi-squared test between comparison among deaths amount due to suicide and non-suicide.*

Table 2. Total number (YLL) and average number of years of life lost (mYLL) for the entire cohort and for suicide by diagnostic group. For the suicide group, the median age (mAge) at death and the percentage of years of life lost due to suicide (%YLL) is reported.

	Overall			Suicide				
Diagnostic group	***n***	**YLL**	**mYLL±*SD***	***n***	**mAge at death±*SD***	**YLL**	**mYLL±*SD***	**% YLL**
Schizophrenia and related disorders	2268	41136.5	18.1±10.0	93	51.8±13.3	2950.7	31.7±11.7	7.2
Other affective disorders	2852	41152.8	14.4±9.51	144	56.1±13.2	4056.0	28.2±11.7	9.9
Neurotic, stress-related disorders	973	14935.7	15.4±10.7	35	50.3±15.9	1171.7	33.5±14.0	7.8
Other personality disorders	552	12267.3	22.2±11.6	46	48.2±12.0	1621.3	35.3±10.7	13.2
Bipolar disorder	401	6597.8	16.5±9.82	27	55.8±11.3	756.9	28.0±10.2	11.5
Borderline personality disorder	32	1118.0	34.9±12.5	7	39.3±16.1	303.5	43.4±15.2	27.2
Substance use disorders	276	6219.5	22.5±11.9	20	44.9±8.53	750.6	37.5±8.90	12.1
Other diagnoses	1822	23989.6	13.2±9.90	35	48.5±16.8	1234.3	35.3±15.5	5.2
Total	9176	147417.1	16.1±10.1	407	52.2±13.9	12845.1	31.6±12.0	8.7

Table 3. Mortality rates and mortality rate ratios (MRR) for suicide estimated by the Poisson regression model and relative 95% confidence interval (95%CI).

	Deaths	Rate (x10^4)	MRR	95%CI	*p*-value
Gender					
Male (reference)	249	11.35	1.00	-	-
Female	158	5.06	**0.45**	0.37–0.55	<0.001
Age (years)					
<35 (reference)	42	6.77	1.00	-	-
[35, 45)	75	7.18	1.10	0.75–1.61	0.617
[45, 55)	124	9.77	**1.56**	1.09–2.23	0.014
[55, 65)	84	8.28	1.34	0.91–1.96	0.136
≥65	82	6.00	1.02	0.70–1.51	0.904
Time since first contact					
<2 months	12	40.0	**10.4**	5.30–20.3	<0.001
[2 months, 2 years)	58	13.1	**3.19**	2.10–4.84	<0.001
[2, 5) years	78	7.91	**1.79**	1.22–2.62	0.003
[5, 10) years	128	6.45	1.27	0.93–1.74	0.132
≥10 years (reference)	131	7.00	1.00	-	-
First diagnosis (period)					
<2000	70	7.73	**1.67**	1.08–2.59	0.021
[2000, 2004)	73	8.63	**1.74**	1.21–2.51	0.003
[2004, 2008)	137	7.31	1.20	0.92–1.55	0.174
[2008, 2009) (reference)	127	7.51	1.00	-	-
Diagnostic group					
Neurotic, stress-related disorders (reference)	35	3.58	1.00	-	-
Schizophrenia and related disorders	93	7.21	**1.84**	1.22–2.75	0.003
Other affective disorders	144	8.99	**2.64**	1.82–3.83	<0.001
Other personality disorders	46	10.01	**2.45**	1.56–3.82	<0.001
Bipolar disorder	27	14.22	**3.97**	2.39–6.59	<0.001
Borderline personality disorder	7	16.42	**4.90**	2.17–11.1	<0.001
Substance use disorders	20	18.79	**4.10**	2.36–7.11	<0.001
Other diagnoses	35	5.39	1.48	0.93–2.36	0.102