This is the accepted version of this following article: Profiles of patients using emergency departments or hospitalized for suicidal behaviors **Suicide Life Threat Behav 2022 Jun 10. doi: 10.1111/sltb.12892. Online ahead of print.**

Profiles of patients using emergency departments or hospitalized for suicidal behaviors

Marie-Josée Fleury, PhD[1,2*]; Zhirong Cao, MSc[1]; Bahram Armoon, PhD[1,2]; Guy Grenier, PhD[1]; Alain Lesage, MD, Mphil[3,4]

[1] Douglas Hospital Research Centre, Montreal, Quebec, Canada

[2] Department of Psychiatry, McGill University, Montreal, Quebec, Canada

[3] Centre de recherche de l'Institut Universitaire en santé mentale de Montréal, Montreal, Quebec, Canada

[4] Department of Psychiatry, Université de Montréal, Montreal, Quebec, Canada

*Corresponding author:
Marie-Josée Fleury, PhD
Douglas Hospital Research Center
6875 LaSalle Blvd.
Montreal, Quebec, Canada, H4H 1R3
E-mail: flemar@douglas.mcgill.ca

Acknowledgments

We gratefully acknowledge the support of the Canadian Institutes of Health Research (CIHR). We would also like to thank Judith Sabetti for editorial assistance.

Data availability of data statement

In accordance with the applicable ethics regulations for the province of Quebec, the principal investigator is responsible for keeping data confidential.

Funding statement

This study was funded by the Canadian Institutes of Health Research (CIHR), grant number 8400997. We would like to thank this funding agency, and the Quebec Network on Suicide, Mood Disorders and Associated Disorders for their contributions to the support of this study.

Conflict of interest disclosure

The authors declare no conflicts of interest.

Ethics approval and consent to participate

A public health ethics committee in a mental health university organization and the Quebec Access to Information Commission evaluated and approved the study protocol.

Patient consent statement

As the study used administrative data from a provincial administrative health database, patient informed consent was not required. Access to the database was granted by the Quebec Access to Information Commission following all applicable laws and procedures.

Profiles of patients using emergency departments or hospitalized for suicidal behaviors

Abstract

Objectives: This study identified profiles of patients with suicidal behaviors, their sociodemographic and clinical correlates, and assessed risk of death within a 12-month follow-up period. **Methods:** Based on administrative databases, this 5-year study analyzed data on 5,064 patients in Quebec who used emergency departments (ED) or were hospitalized for suicidal behaviors over a 2-year period. Latent class analysis was used for patient profiles, bivariate analysis for patient correlates over 2 years, and survival analysis for risk of death within 12-month follow-up. **Results:** Four profiles were identified: high suicidal behaviors and high service use (Profile 1: 23%); low suicidal behaviors and moderate service use (Profile 2: 46%); low suicidal behaviors and low service use (Profile 3: 25%); and high suicidal behaviors and high acute care, but low outpatient care (Profile 4: 6%). Profiles 1 and 4 patients had more serious conditions, with higher risk of death in Profile 1 versus Profiles 2 and 3. Profile 2 patients had relatively more common mental disorders, and Profile 3 patients less severe conditions. Profiles 3 and 4 included more men and younger patients. **Conclusion:** Programs better adapted to patient profiles should be deployed after ED use and hospitalization in coordination with outpatient services.

Keywords: suicidal behaviors; service use; latent class analysis.

Profiles of patients using emergency departments or hospitalized for suicidal behaviors

Introduction

Suicidal behaviors, including suicide ideation and attempt, are an important reason for emergency department (ED) use and hospitalization, especially among patients with mental disorders (MD), including substance-related disorders (SRD) (Hjorthoj et al., 2014). A meta-analysis showed that one third of ED use for psychiatric reasons was due to suicidal behaviors (Barratt et al., 2016). More than one fifth of patients with MD required hospitalization following ED use for suicide attempt (Miret et al., 2011). Suicidal behaviors were especially frequent among patients with serious MD following hospital discharge (Edgcomb et al., 2021). Studies reported that 39-49% of patients who died by suicide had used ED in the previous year (Da Cruz et al., 2011; Vasiliadis et al., 2015). Another meta-analysis found that patients hospitalized for suicidal behaviors within 3 months of a prior discharge were nearly 200 times more likely to die by suicide than the general population (Chung et al., 2017). Although suicide prevention is a key public health issue, many patients with MD using acute care services (ED, hospitalization) for suicidal behaviors lack access to outpatient psychiatric care (Costemale-Lacoste et al., 2017; Piscopo et al., 2016; Routhier et al., 2012). ED are often the sole point of service contact for patients in crisis (Filippatos & Karasi, 2017). Acute care is very costly, however, and often reflects lack of appropriate outpatient services (Rassy et al., 2020). Knowledge of the various profiles of patients who use ED or are hospitalized for suicidal behaviors may help target those needing enhanced outpatient care, particularly vulnerable individuals requiring more proactive interventions to reduce suicide risk.

Person-centered methods like latent class analysis enable the systematic identification of distinct profiles for patients with suicidal behaviors. Yet, the few studies that assessed profiles for suicidal behaviors were conducted only among adolescents (Jiang et al., 2010; King et al., 2020;

Tairi et al., 2018), young adults (Hamza & Willoughby, 2013; Marraccini, 2021) or military personnel (Allan et al., 2020; Skopp et al., 2016). Even fewer studies investigated profiles of patients who used ED (King et al., 2020) or were hospitalized (King et al., 2020; Rapeli & Botega, 2005; Tairi et al., 2018) for suicidal behaviors. These studies produced profiles revealing higher rates of suicidal behaviors among women (Jiang et al., 2010; Marraccini, 2021; Xiao & Lindsey, 2021), sexual minority individuals (e.g., gays, lesbians) (Jiang et al., 2010; Xiao & Lindsey, 2021), and victims of prior physical or sexual abuse (Jiang et al., 2010; King et al., 2020). MD most often associated with higher incidence of suicidal behaviors were depressive disorders (Jiang et al., 2010; Marraccini, 2021; Rapeli & Botega, 2005), adjustment (Rapeli & Botega, 2005), mood (King et al., 2020; Tairi et al., 2018) and personality disorders (Tairi et al., 2018), as well as SRD (Allan et al., 2020; King et al., 2020; Marraccini, 2021). Patient profiles have also revealed that individuals with increased occurrence of suicidal behaviors had higher odds of ED use (King et al., 2020), hospitalization (King et al., 2020) longer hospital stay (Rapeli & Botega, 2005), use of medications (King et al., 2020) and therapy (King et al., 2020).

As far as we know, previous studies have not identified profiles of patients with suicidal behaviors among ED users and hospitalized patients, whether adults or adolescents. By including a wide range of patient characteristics and outpatient service use variables, results of this study may improve knowledge of acute care use for suicidal behaviors, while indicating the extent to which services respond appropriately to patient needs and how services may be improved. Moreover, no known study has investigated risk of death in such patients, another factor that may contribute to the development of prevention strategies. This study aimed to identify: (1) profiles of patients with suicidal behaviors based on their patterns of ED use and hospitalization, and outpatient service use; (2) sociodemographic and clinical correlates associated with each profile;

and (3) risk of death for any cause in these profiles within a 12-month follow-up period, controlling for sex and age.

Methods

Study context

The Canadian province of Quebec has a universal public healthcare insurance system that covers physician care and, for mental health, psychosocial interventions such as individual and group therapies provided in community healthcare centers. Primary mental health care is also offered by general practitioners (GP) who mainly work in family medicine groups. These are GP clinics with patient registration, offering enhanced continuity of patient care and extended medical coverage with additional nurses and social workers on staff. Specialized mental health services are provided in psychiatric departments of general or psychiatric hospitals. Community-based organizations (e.g., crisis centers, suicide prevention centers) and psychologists in private practice complement the Quebec mental health system.

Study design, sample and sources

The study was based on a cohort of 12,000 patients using six ED at university or psychiatric hospitals located in Quebec urban territories. Provincial medical administrative databases provided data for a 5-year period (April 1, 2012 to March 31, 2017, financial years). The inclusion criteria for this study aimed at identifying profiles of patients with suicidal behaviors were: membership in the Quebec Healthcare Insurance Plan (*Régie de l'assurance maladie du Québec,* RAMQ), age 12 years or older, ED use or hospitalization for suicidal behaviors within a 2-year period 2014-15 to 2015-16, and availability of patient data for a 2-year period prior to last ED use or hospitalization for suicidal behaviors for evaluation of patient health conditions (2012-13 to 2013-14). Outpatient service use was also measured for the 12-month period prior to last ED use or hospitalization for

suicidal behaviors. Patients were excluded if they were hospitalized 91+ days within this 12-month period, which would prohibit appropriate measurement of outpatient service use; or if the patient died before 2016-17, the year in which risk of death was measured.

RAMQ, the main medical administrative database used in the study, includes sub-databases providing sociodemographic data on patients, emergency department use, hospitalization, psychosocial interventions in community healthcare centers, and patient death (yes/no). RAMQ integrates billing systems for most physician services, excluding 6% of services occurring outside the public system (Régie de l'assurance maladie du Québec, 2017). Diagnostic codes from these databases were framed by the International Classification of Diseases (ICD) Ninth and Tenth Revisions (**Appendix 1**). Suicidal behaviors, both ideation or attempt, when diagnosed at hospitalization, were reported in the hospitalization database (ICD-10), or when given as reasons for ED use by ED triage nurses well-trained in identification of suicidal behaviors, were recorded in the ED database, providing reliable data (Rahme et al., 2016). **Figure 1**, the conceptual framework for the study, identifies all databases linked to each variable constructed for the study. Databases were linked using a unique patient identifier. The Quebec Commission of Access to Information and the ethics committee of a mental health organization approved the study protocol.

[Figure 1 near here]

Study variables

Variables were selected based on the literature related to service use profiles and suicidal behaviors (Díez-Gómez et al., 2020; King et al., 2020; Tairi et al., 2018), and the availability of these variables in the study databases. Variables included in the patient profiles related to acute and outpatient care. Acute care variables included: suicide ideation only, suicide attempt only, and both suicide ideation and attempt, based on ED use and hospitalization for suicidal behaviors; number

of episodes of suicidal behavior at ED use or hospitalization (1, 2, 3+); and hospitalization for suicidal behaviors (yes/no). Number of years with high ED use for reasons other than suicidal behaviors and frequency of hospitalization (0, 1-2, 3+) for diagnoses other than suicidal behaviors were also measured for intensity of acute care use. Variables related to outpatient service use by patients with suicidal behaviors were: having a family doctor, having a usual outpatient physician (usual GP only, usual psychiatrist only, both usual GP and psychiatrist), frequency of outpatient consultations with usual GP or psychiatrist, high continuity of physician care, and frequency of psychosocial interventions in community healthcare centers, excluding GP consultations.

The definition of high ED use as 3+ visits/year was based on previous Quebec research (Chaput & Lebel, 2007; Fleury et al., 2019), and is viewed as a standard estimate (Brennan et al., 2014; Buhumaid et al., 2015; LaCalle & Rabin, 2010). Both high ED use and hospitalization are strong indicators of adverse patient outcomes, with 3+ hospitalizations reflecting very severe illness (Aaronson et al., 2015; Davies et al., 2017). Usual GP, a proxy for patient family doctor, was defined as having at least two consultations with the same GP or with at least two GP working in the same family medicine group (Rodriguez et al., 2008). The usual psychiatrist described one that followed any patient in outpatient care at least twice. Alternatively, individuals who made only one outpatient consultation with a psychiatrist had to have consulted their GP at least twice, considered a proxy for collaborative care (Dreiher et al., 2012). Frequency of outpatient consultations with usual GP or psychiatrist measured the intensity of patient care received, with the benchmark for minimal intensity identified as 4+ psychiatric consultations/year (Menear et al., 2014). Continuity of physician care was based on the Usual Provider Continuity Index (Breslau & Reeb, 1975), which describes the proportion of consultations with the usual GP or psychiatrist of

all GP and psychiatrists consulted in outpatient care (including walk-in clinics) (Breslau & Reeb, 1975). A score ≥0.61 is considered high continuity of care (Romaire et al., 2014).

Variables associated with patient profiles were classified as sociodemographic or clinical variables. Sociodemographic variables included: age groups, sex, and material and social deprivation indices based on the smallest dissemination areas established for the 2011 Canadian census (Pampalon et al., 2009). The Material Deprivation Index integrated population employment, average income, and number of individuals without a high school diploma; while the Social Deprivation Index included numbers of individuals living alone, single individuals and single-parent families (Pampalon et al., 2009). Both indices were divided into quintiles but were regrouped for this study into two categories: less deprived areas (1, 2, 3) and more deprived areas (4, 5 and not assigned). "Not assigned" related to individuals with a missing address, living in an area where index assignment was not feasible (e.g., homeless individuals).

Clinical variables included: type of MD, number of diagnosed MD-SRD, co-occurring MD-SRD, chronic physical illnesses and level of severity, co-occurring MD-SRD and chronic physical illnesses, all diagnosed by physicians. MD identified as the patient's principal MD were categorized as follows: serious MD, personality disorders (without serious MD), common MD (without serious MD or personality disorders), and SRD (without MD). Patients may also have had no MD or SRD, but suicidal behaviors only. Serious MD included bipolar, schizophrenia spectrum and other psychotic disorders; common MD: adjustment, anxiety and depressive disorders and attention deficit/hyperactivity disorder; SRD: alcohol- or drug-related disorders (use and induced disorders, intoxication, withdrawal). Chronic physical illnesses were measured using an adapted version of the Elixhauser Comorbidity Index, including number and level of severity from 0-3+ (Simard et al., 2019). Finally, death within 12 months after last ED use or hospitalization

for suicidal behaviors, the outcome variable for the study, included any cause of death for this period.

Statistical analyses

Latent class analysis (LCA) (Goodman, 1974; Lazarsfeld & Henry, 1968) was used to identify profiles of patients with suicidal behaviors. Compared with standard cluster analysis using an arbitrarily chosen distance measure, LCA allows for statistical testing of model fit and class membership probabilities are computed from the estimated model parameters (Vermunt & Magidson, 2002). The initial step in the analysis was to determine the optimal number of latent classes: a series of increasingly complex models (adding classes) was estimated. The empirical fit of the model was based on the Akaike Information Criterion (AIC) (Akaike, 1987), the Bayesian Information Criterion (BIC) (Schwarz, 1978), while entropy value (Celeux & Soromenho, 1996) was also used to examine how well the indicators establish subgroup membership, the closer to 1.0 the better the prediction. Bivariate analyses (chi-squared test) were also used to assess associations between patient profiles and sociodemographic and clinical variables, with p-values adjusted using the Holm–Bonferroni method (Vermunt & Magidson, 2002). Finally, survival analysis was produced to examine the relationship between profiles and risk of death within 12 months of last episode of suicidal behaviors. LCA was performed using SAS 9.4 (Lanza et al., 2007), and other analyses with Stata 17.

Results

Sample characteristics

Of the 12,000-patient cohort, 5,134 used ED or were hospitalized for suicidal behaviors during the 2-year period, 2014-15 to 2015-16. However, 70 patients hospitalized 91+ days during the assessment period for outpatient services were excluded, as were those who died before 2016-17.

Of the final sample including 5,064 patients with suicidal behaviors, 68% had suicide ideation only, 19% suicide attempt only, and 13% both suicide ideation and attempt; 68% experienced only one episode of suicidal behaviors; and 11% were hospitalized for this reason (**Table 1**). Fifty-two percent (52%) were high ED users for 1-2 years and 49% hospitalized for reasons or diagnoses other than suicidal behaviors. Most patients had a family doctor (73%), and 33% a GP as their usual physician; but nearly as many had no usual provider (32%); 49% had 4+ outpatient consultations with their usual GP or psychiatrist, or at least one intervention in community healthcare centers, and 63% enjoyed high continuity of physician care. The study included 52% women, 56% aged 30-64 years; 44% lived in more materially deprived areas and 64% in more socially deprived areas. Principal MD included serious MD (37%) or common MD (35%); 53% of patients were diagnosed with 3+ MD, while 37% had co-occurring MD-SRD, and 42% had chronic physical illnesses. In total, 2% of patients died within 12 months after their last ED use or hospitalization for suicidal behaviors.

[Table 1 near here]

Profiles of patients with suicidal behaviors

A four-class model was selected as the final analytical classification model, based on the largest entropy value (0.97), and smaller AIC and BIC criteria. Profile 1 (23% of sample) integrated the highest number of patients with both suicide ideation and attempt, or suicide attempt only (53%), with 3+ episodes of suicidal behaviors (50%); and those hospitalized for suicidal behaviors (27%). Profile 1 also included the highest number of ED users (42%) and patients hospitalized 1-2 (42%) or 3+ (30%) times for reasons other than suicidal behaviors. It comprised the most patients with a family doctor (85%), and both a GP and psychiatrist (46%), or a psychiatrist only (25%) as usual physicians, having received 4+ consultations with their usual GP or psychiatrist (79%), and 3+

psychosocial interventions in community healthcare centers (41%). Profile 1 integrated more patients with high continuity of physician care (89%) than in Profiles 3 and 4 (**Table 2**), and was labeled: “High suicidal behaviors and high service use”.

Profile 2 (46% of sample) included the highest number of patients with suicide ideation only (78%), those with a GP only as usual physician (59%), patients receiving 2-3 consultations with their usual GP or psychiatrist (33%), and with high continuity of physician care (95%). Almost all patients (95%) had only one episode of suicidal behavior. Compared to Profiles 1 and 4, Profile 2 had fewer patients hospitalized for both suicidal behaviors (5%) or other diagnoses (48%), and with high ED use (45%) for reasons other than suicidal behaviors. After Profile 1, Profile 2 had the most patients registered with a family doctor (76%), 4+ consultations with their usual GP or psychiatrist (67%), and 3+ psychosocial interventions in community healthcare centers (32%). Profile 2 was labeled: “Low suicidal behaviors and moderate service use”.

Profile 3 (25% of sample) included the most patients with suicide ideation only (74%) after Profile 2, with almost all with only one episode of suicidal behaviors (98%). These patients were the least likely to be hospitalized for suicidal behaviors (5%), and to be high ED users (30%) or hospitalized (30%) for reasons or diagnoses other than suicidal behaviors. Profile 3 had the fewest members with a family doctor (57%) and who received psychosocial interventions (67%) in community healthcare centers. No patients had a usual physician or high continuity of care. Profile 3 was labeled: “Low suicidal behaviors and low service use”.

Profile 4 (6% of sample) had more patients with both suicide ideation and attempt, or suicide attempt only (51%), more with 3+ episodes of suicidal behaviors (40%), high ED use for reasons other than suicidal behaviors (76%) and more hospitalized for suicidal behaviors or other diagnoses (17%, 52%), compared to Profiles 2 and 3. Profile 4 patients had no usual physician or

high continuity physician care, similar to Profile 3. However, 52% of Profile 4 patients received psychosocial interventions in community healthcare centers, like Profile 2 patients (50%) and somewhat fewer than Profile 1 patients (62%). Profile 4 was labeled: "High suicidal behaviors and high acute care, but low outpatient service use."

[Table 2 near here]

Sociodemographic and clinical correlates associated with each suicidal behavior profile

Profiles 3 and 4 included more men than other profiles, while Profile 3 had more younger patients (17-29 years old) than the others, especially Profile 1 (**Table 3**). More patients in Profiles 4 and 1 lived in the more materially and socially deprived areas, compared with Profile 2 and 3 patients. Concerning principal MD, Profile 1 mainly included patients with serious MD (60%), few with SRD (1%) or common MD (17%), but none without MD or SRD. The great majority of Profile 2 patients (87%) had either common (40%) or serious (37%) MD. Profile 3 patients had common MD (43%), SRD (11%) or no MD (17%). Profile 4 had the highest percentage of patients with personality disorders (25%) and second highest percentage of SRD (6%). The mean numbers of diagnosed MD-SRD per patient and co-occurring MD-SRD were higher in Profiles 4 and 1 than in Profiles 3 and 2. Chronic physical illnesses mainly affected Profile 1 patients (57%), with 17% falling in the highest severity level (index 3+), whereas Profile 3 patients had the lowest rate (21%) and least severity level (3+: 6%). Co-occurring MD-SRD-chronic physical illnesses also affected more Profile 1 patients (40%) than others, followed by Profiles 4 (28%), 2 (16%) and 3 (6%).

[Table 3 near here]

Comparisons of study outcome (death) among the four profiles of patients with suicidal behaviors

Compared to Profile 1, Profile 3 patients had 59% (HR=0.41, p=0.004; 95% CI=0.23-0.74), and Profile 2 patients 47% (HR=0.53, p=0.003; 95% CI=0.34-0.80), lower risk of death for any cause within 12 months after last ED use or hospitalization for suicidal behaviors. The risk increased by 6% (HR=1.06, p<0.001; 95% CI=1.05-1.07) for each year of increased age, and was 53% (HR=0.47, p<0.001; 95% CI=0.32-0.70) lower among women than men for the 12-month period (**Table 4**). **Appendix 2** presents survival probability estimates based on profiles for suicidal behaviors.

[Table 4 near here]

Discussion

This study identified profiles of patients using ED or hospitalized for suicidal behaviors, as well as their sociodemographic and clinical correlates, and risk of death for any cause within a 12-month follow-up period. One third of patients with suicidal behaviors had made suicide attempts over the 2-year period, a rate similar to that identified in a national US survey for 2015 (14%/year) (Piscopo et al., 2016). Patients in our study were quite vulnerable: roughly 92% were diagnosed with MD, including some 40% with serious MD, co-occurring MD-SRD or chronic physical illnesses, and most lived in more materially or socially deprived areas. Despite the seriousness of their conditions, roughly one third of study patients did not have a family doctor or usual physician, a more elevated percentage than that identified in the 2014 Quebec general population (25%) (Statistics Canada, 2015), and half had not received psychosocial interventions in community healthcare centers within the 12 months prior to their last ED use or hospitalization for suicidal behaviors. These findings mirror other results from population surveys. In the above-cited national US survey, 60% of patients received medical attention for suicide attempt, and 40% presented at

hospitals (Piscopo et al., 2016). These results suggest difficulties in accessing outpatient care and a great need to improve the capacity of these services to respond to these most vulnerable patients.

Four original profiles of patients with suicidal behaviors were identified in this study. Patients in Profiles 1 and 4 made about 50% more suicide attempts than those in Profiles 2 and 3, and they all had multiple episodes of suicidal behaviors. In Profile 1, patients had 5 times more hospitalizations for suicidal behaviors, and in Profile 4, 3 times more hospitalizations, compared with results for Profiles 3 and 2. Profiles 1 and 4 also included from 3 to 7 times more high recurrent ED users over 2 years, and patients from 2 to 7 times more frequently hospitalized (3+ times) for reasons or diagnoses other than suicidal behaviors, compared with results for Profiles 3 and 2. This high use of acute care among Profile 1 patients, closely followed by Profile 4, was associated with the more serious and multiple MD and co-occurring MD-SRD, personality disorders, as well as severity of chronic physical illnesses faced by these patients, compared with patients in Profiles 2 and 3. Previous studies have shown an association between suicidal behaviors and being diagnosed with serious MD (Baldessarini & Tondo, 2020), severe chronic physical illnesses (Pompili et al., 2012) and co-occurring MD-SRD (Lee et al., 2017). Numbers of suicide attempts and suicides were also identified in previous studies in association with greater numbers of MD and co-occurring MD-SRD per person (Cavanagh et al., 2003; Da Cruz et al., 2011; Nichter et al., 2021). Patients in profiles 4 and 1 also tended to reside in more materially and socially deprived areas relative to Profile 3 and 2 patients, confirming previous findings suggesting that poverty, financial difficulties and weaker social networks may drive suicidal behaviors (Burrows et al., 2011; Classen & Dunn, 2012; Saunders et al., 2019). Further deployment of programs like assertive community treatment (Moe et al., 2017) for Profile 1, or integrated care in MD-SRD (Ramanuj et al., 2019) for Profile 4, is needed in Quebec, while increased collaborative care

between clinicians from the mental and physical health systems including crisis resolution services for Profiles 1 and 4 should be encouraged to reduce both suicidal behaviors and acute care use.

Profile 1 patients received important support in the form of outpatient physician care, compared with those in Profile 4. All profile 1 patients had at least a usual physician, with nearly 80% receiving relatively high intensity care, while half were followed by both a usual GP and psychiatrist, which provided high continuity care for most (89%). Just over half (52%) of Profile 4 patients received psychosocial interventions in community healthcare centers, somewhat fewer than in Profile 1 (62%). Compared with Profile 1, more Profile 4 patients were men and younger than 30, the age group widely known to underutilized outpatient care, compared with women and older patients (Hansen & Hoye, 2015; Rice et al., 2018).

As opposed to Profiles 1 and 4, about 75% of Profile 2 and 3 patients experienced suicide ideation only, and nearly all reported only one episode of suicidal behaviors. Patterns of suicidal behaviors among Profiles 2 and 3 patients may have been more related to adverse situations like bereavement, separation, or job loss. Compared to Profiles 1 and 4 patients, those in Profiles 2 and 3 used much less acute care, although patterns of outpatient care use in Profile 2 were more similar to those of Profile 1 patients than in Profiles 3 and 4. Profile 2 included more patients with common MD, fewer with co-occurring MD-SRD and severe chronic physical illnesses, and more older patients than in Profiles 1 and 4. This may explain why most Profile 2 patients were followed by a GP only, rather than both GP and psychiatrist, and why they received more moderate intensity of care than patients in Profile 1. Not surprisingly, Profile 2 showed the highest rating on continuity of care, as GP are considered the main healthcare providers for the general population, even for individuals with MD (Verhaak et al., 2012; Wildeboer et al., 2016). GP are often gatekeepers to psychiatric care, as well (Dezetter et al., 2013; Tatlow-Golden et al., 2016).

Although they revealed opposite patterns of suicidal behaviors, lower rates in Profile 3 and higher in Profile 4, patients in these two profiles made similar use of outpatient care, with patients in both profiles lacking a usual physician. Moreover, only 17% of Profile 3 patients received 3+ psychosocial interventions in community healthcare centers, accounting for less than half of patients receiving such interventions in Profiles 4 and 2 at 32% each. This low level of overall outpatient care in Profiles 3 and 4 may be explained by the composition of these groups, with more men, younger patients and more with SRD, all populations known to underutilize outpatient services (Ellis et al., 2013; Grace et al., 2018; Urbanoski et al., 2017). Insufficient knowledge of mental health resources (Miles et al., 2020), a preference for self-treatment of MD (Plaistow et al., 2014), forced abstinence in treatment of patients with SRD (Amaro & Black, 2017), and stigma associated with MD and SRD (Latalova et al., 2014; Rice et al., 2018) may also have driven down service use in these profiles. For Profile 3 patients, low overall service use in both outpatient and acute care may also be explained by inclusion of the fewest numbers of patients with serious MD, personality disorders and chronic physical illnesses, compared to Profile 4. For both Profiles 3 and 4, community outreach services (Wahlbeck et al., 2017), as well as screening, brief intervention and referral to treatment appropriate outpatient services (Bray et al., 2017), including GP, may be promoted.

Not surprisingly, 46% of the sample fit with Profile 2, which included patients with low suicidal behaviors, more moderate service use, especially GP consultations, and a preponderance of patients with common MD. Profile 3, the second largest group (25%), also reported low rates of suicidal behaviors, low service use, the least serious health and social conditions as well as younger cohorts, suggesting lower risk of death in the follow-up period for Profiles 2 and 3 compared with Profile 1. Risk of death was highest in Profile 1 (23% of the sample), likely due to

more severe health conditions among these patients despite their intensive and continuous use of services (Bruckner et al., 2017; DeLorenze et al., 2010). Profile 4, the smallest group at 6% of the sample, represented patients with high rates of suicidal behaviors, serious health conditions and substantial material and social deprivation, even while these patients received little or no outpatient care, relying essentially on acute care services as a safety net.

Limitations

Some limitations of this study should be considered. First, variables that may have played a key role in patterns or prevention of suicidal behaviors, such as lifetime suicidal behaviors, history of physical or sexual abuse, use of suicide prevention or crisis centers, and other psychosocial services, whether provided in hospital settings or by psychologists in private practice, were missing from the study database. Second, while risk of death was reported for any cause, data on suicide were unavailable in the database; data on patients who died before 2016-17 were also excluded, both of which may have influenced the study results. Finally, the profiles identified in this study represented only patients who used ED or were hospitalized for suicidal behaviors within a 2-year period, without information on prior suicidal behaviors. As such, these results may not be generalized to all ED or hospitalized patients with suicidal behaviors, or to the general population reporting suicidal behaviors without ED use or hospitalization for such reasons, especially in countries with healthcare systems too unlike that of Canada.

Conclusion

This study identified four profiles of patients seeking acute care treatment for suicidal behaviors. Profiles 2 and 3 represented the great majority of patients, most of whom had only one episode of suicidal behaviors, mainly suicide ideation. Compared to Profile 1, these patients had lower risk of death. Profile 1 patients showed the worst health conditions, and presented the greatest risk of

death, even though these patients used the most services, contrary to Profile 3. Profile 4 represented a small group of patients with high rates of suicidal behaviors and no follow-up in outpatient care, although they were high users of acute care. To reduce suicidal behaviors, the quality, integration and appropriateness of treatments responding to the complex and diverse needs of Profile 1 patients requires better scrutiny, and an increase in best practices like assertive community treatment. Profile 4 patients may benefit from programs like home treatment teams or crisis resolution to decrease suicidal behaviors (Carpenter et al., 2013), with appropriate referral to outpatient services as needed and provision of usual physicians. For Profile 3 patients, the promotion of motivational and outreach interventions, including brief case management (Hengartner et al., 2017; Virgolesi et al., 2017), or screening, brief intervention and referrals to outpatient treatments at patient ED or hospital discharge, may improve outpatient service use and help prevent suicidal behaviors. Finally, profile 2 patients may benefit from flexible case management programs. More effective discharge planning after ED use and hospitalization, including close coordination of acute and outpatient care services with usual physicians, community-based organizations and all other social and healthcare providers needs significant improvement for patients in all profiles to prevent or reduce suicidal behaviors.

References:

Aaronson, E. L., Marsh, R. H., Guha, M., Schuur, J. D., & Rouhani, S. A. (2015). Emergency department quality and safety indicators in resource-limited settings: an environmental survey. *International Journal of Emergency Medicine, 8*(1), 39. https://doi.org/10.1186/s12245-015-0088-x

Akaike, H. (1987). Factor analysis and AIC. *Psychometrika, 52*(3), 317-322.

Allan, N. P., Holm-Denoma, J., Conner, K. R., Zuromski, K. L., Saulnier, K. G., & Stecker, T. (2020). Profiles of Risk for Suicidal Behavior in Past and Current United States Military Personnel: Latent Profile Analysis of Current Risk Factors. *Archives of Suicide Research, 24*(1), 1-17. https://doi.org/10.1080/13811118.2018.1506843

Amaro, H., & Black, D. S. (2017). Moment-by-Moment in Women's Recovery: Randomized controlled trial protocol to test the efficacy of a mindfulness-based intervention on treatment retention and relapse prevention among women in residential treatment for substance use disorder. *Contemporary Clinical Trials, 62*, 146-152. https://doi.org/10.1016/j.cct.2017.09.004

Baldessarini, R. J., & Tondo, L. (2020). Suicidal Risks in 12 DSM-5 Psychiatric Disorders. *Contemporary Clinical Trials, 271*, 66-73. https://doi.org/10.1016/j.jad.2020.03.083

Barratt, H., Rojas-Garcia, A., Clarke, K., Moore, A., Whittington, C., Stockton, S., Thomas, J., Pilling, S., & Raine, R. (2016). Epidemiology of Mental Health Attendances at Emergency Departments: Systematic Review and Meta-Analysis. *Plos One, 11*(4), e0154449. https://doi.org/10.1371/journal.pone.0154449

Bray, J. W., Del Boca, F. K., McRee, B. G., Hayashi, S. W., & Babor, T. F. (2017). Screening, Brief Intervention and Referral to Treatment (SBIRT): rationale, program overview and cross-site evaluation. *Addiction, 112 Suppl 2*, 3-11. https://doi.org/10.1111/add.13676

Brennan, J. J., Chan, T. C., Hsia, R. Y., Wilson, M. P., & Castillo, E. M. (2014). Emergency department utilization among frequent users with psychiatric visits. *Academic Emergency Medicine, 21*(9), 1015-1022. https://doi.org/10.1111/acem.12453

Breslau, N., & Reeb, K. G. (1975). Continuity of care in a university-based practice. *Journal of Medical Education, 50*(10), 965-969. https://doi.org/10.1097/00001888-197510000-00006

Bruckner, T. A., Yoon, J., & Gonzales, M. (2017). Cardiovascular Disease Mortality of Medicaid Clients with Severe Mental Illness and a Co-occurring Substance Use Disorder. *Administration and Policy in Mental Health, 44*(2), 284-292. https://doi.org/10.1007/s10488-016-0722-9

Buhumaid, R., Riley, J., Sattarian, M., Bregman, B., & Blanchard, J. (2015). Characteristics of Frequent Users of the Emergency Department with Psychiatric Conditions. *Journal of Health Care for the Poor and Underserved, 26*(3), 941-950. https://doi.org/10.1353/hpu.2015.0079

Burrows, S., Auger, N., Gamache, P., St-Laurent, D., & Hamel, D. (2011). Influence of social and material individual and area deprivation on suicide mortality among 2.7 million Canadians: a prospective study. *BMC Public Health, 11*, 577. https://doi.org/10.1186/1471-2458-11-577

Carpenter, R. A., Falkenburg, J., White, T. P., & Tracy, D. K. (2013). Crisis teams: systematic review of their effectiveness in practice. *The Psychiatrist, 37*(7), 232-237.

Cavanagh, J. T., 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

Celeux, G., & Soromenho, G. (1996). An entropy criterion for assessing the number of clusters in a mixture model. *Journal of Classification, 13*(2), 195-212.

Chaput, Y. J. A., & Lebel, M.-J. (2007). Demographic and Clinical Profiles of Patients Who Make Multiple Visits to Psychiatric Emergency Services. *Psychiatric Services, 58*(3), 335-341. https://doi.org/10.1176/appi.ps.58.3.335

Chung, D. T., Ryan, C. J., Hadzi-Pavlovic, D., Singh, S. P., Stanton, C., & Large, M. M. (2017). Suicide Rates After Discharge From Psychiatric Facilities: A Systematic Review and Meta-analysis. *JAMA Psychiatry, 74*(7), 694-702. https://doi.org/10.1001/jamapsychiatry.2017.1044

Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Heath Economics, 21*(3), 338-350. https://doi.org/10.1002/hec.1719

Costemale-Lacoste, J. F., Balaguer, E., Boniface, B., Ivascu, E. B., Bernardini, C., Metton, J. P., Bouhlal, A., Ghanem, T., Corruble, E., Hardy, P., Hozer, F., & Dtrf Paris-Sud group. (2017). Outpatient treatment engagement after suicidal attempt: A multisite prospective study. *Psychiatry Research, 258*, 21-23. https://doi.org/10.1016/j.psychres.2017.09.062

Da Cruz, D., Pearson, A., Saini, P., Miles, C., While, D., Swinson, N., Williams, A., Shaw, J., Appleby, L., & Kapur, N. (2011). Emergency department contact prior to suicide in mental health patients. *Emergency Medicine Journal, 28*(6), 467-471. https://doi.org/10.1136/emj.2009.081869

Davies, S., Schultz, E., Raven, M., Wang, N. E., Stocks, C. L., Delgado, M. K., & McDonald, K. M. (2017). Development and Validation of the Agency for Healthcare Research and Quality Measures of Potentially Preventable Emergency Department (ED) Visits: The ED Prevention Quality Indicators for General Health Conditions. *Addiction Science & Clinical Practice, 52*(5), 1667-1684. https://doi.org/10.1111/1475-6773.12687

DeLorenze, G. N., Satre, D. D., Quesenberry, C. P., Tsai, A. L., & Weisner, C. M. (2010). Mortality after diagnosis of psychiatric disorders and co-occurring substance use disorders among HIV-infected patients. *AIDS Patient Care STDS, 24*(11), 705-712. https://doi.org/10.1089/apc.2010.0139

Dezetter, A., Briffault, X., Bruffaerts, R., De Graaf, R., Alonso, J., König, H. H., Haro, J. M., De Girolamo, G., Vilagut, G., & Kovess-Masféty, V. (2013). Use of general practitioners versus mental health professionals in six Europeans countries: the decisive role of the organization of mental health-care systems. *Social Psychiatry and Psychiatric Epidemiology, 48*, 137-149.

Díez-Gómez, A., Pérez-Albéniz, A., Sebastián-Enesco, C., & Fonseca-Pedrero, E. (2020). Suicidal Behavior in Adolescents: A Latent Class Analysis. *International Journal of Environmental Research and Public Health, 17*(8). https://doi.org/10.3390/ijerph17082820

Dreiher, J., Comaneshter, D. S., Rosenbluth, Y., Battat, E., Bitterman, H., & Cohen, A. D. (2012). The association between continuity of care in the community and health outcomes: a population-based study. *Israel Journal of Health Policy Research, 1*(1), 21. https://doi.org/10.1186/2045-4015-1-21

Edgcomb, J. B., Shaddox, T., Hellemann, G., & Brooks, J. O., 3rd. (2021). Predicting suicidal behavior and self-harm after general hospitalization of adults with serious mental illness. *Journal of Psychiatric Research, 136*, 515-521. https://doi.org/10.1016/j.jpsychires.2020.10.024

Ellis, L. A., Collin, P., Hurley, P. J., Davenport, T. A., Burns, J. M., & Hickie, I. B. (2013). Young men's attitudes and behaviour in relation to mental health and technology: implications for the development of online mental health services. *BMC Psychiatry, 13*, 119. https://doi.org/10.1186/1471-244X-13-119

Filippatos, G., & Karasi, E. (2017). Characteristics of attempted suicide patients presenting to a Greek emergency department. *Health Science Journal, 11*(3), 503. https://doi.org/DOI: 10.21767/809X.10000503

Fleury, M. J., Rochette, L., Grenier, G., Huynh, C., Vasiliadis, H. M., Pelletier, E., & Lesage, A. (2019). Factors associated with emergency department use for mental health reasons among low, moderate and high users. *General Hospital Psychiatry, 60*, 111-119. https://doi.org/10.1016/j.genhosppsych.2019.07.006

Goodman, L. A. (1974). Exploratory latent structure analysis using both identifiable and unidentifiable models. *Biometrika, 61*, 215-231.

Grace, B., Richardson, N., & Carroll, P. (2018). ". . . If You're Not Part of the Institution You Fall by the Wayside": Service Providers' Perspectives on Moving Young Men From Disconnection and Isolation to Connection and Belonging. *American Journal of Men's Health, 12*(2), 252-264. https://doi.org/10.1177/1557988316634088

Hamza, C. A., & Willoughby, T. (2013). Nonsuicidal self-injury and suicidal behavior: a latent class analysis among young adults. *PLoS One, 8*(3), e59955. https://doi.org/10.1371/journal.pone.0059955

Hansen, A. H., & Hoye, A. (2015). Gender differences in the use of psychiatric outpatient specialist services in Tromso, Norway are dependent on age: a population-based cross-sectional survey. *BMC Health Services Research, 15*, 477. https://doi.org/10.1186/s12913-015-1146-z

Hengartner, M. P., Klauser, M., Heim, G., Passalacqua, S., Andreae, A., Rossler, W., & von Wyl, A. (2017). Introduction of a Psychosocial Post-Discharge Intervention Program Aimed at Reducing Psychiatric Rehospitalization Rates and at Improving Mental Health and Functioning. *Perspectives in Psychiatric Care, 53*(1), 10-15. https://doi.org/10.1111/ppc.12131

Hjorthoj, C. R., Madsen, T., Agerbo, E., & Nordentoft, M. (2014). Risk of suicide according to level of psychiatric treatment: a nationwide nested case-control study. *Social Psychiatry and Psychiatric Epidemiology, 49*(9), 1357-1365. https://doi.org/10.1007/s00127-014-0860-x

Jiang, Y., Perry, D. K., & Hesser, J. E. (2010). Suicide patterns and association with predictors among Rhode Island public high school students: a latent class analysis. *American journal of public health, 100*(9), 1701-1707. https://doi.org/10.2105/ajph.2009.183483

King, C. A., Brent, D., Grupp-Phelan, J., Shenoi, R., Page, K., Mahabee-Gittens, E. M., Chernick, L. S., Melzer-Lange, M., Rea, M., McGuire, T. C., Littlefield, A., & Casper, T. C. (2020). Five Profiles of Adolescents at Elevated Risk for Suicide Attempts: Differences in Mental Health Service Use. *als, 59*(9), 1058-1068.e1055. https://doi.org/10.1016/j.jaac.2019.10.015

LaCalle, E., & Rabin, E. (2010). Frequent users of emergency departments: the myths, the data, and the policy implications. *Annals of Emergency Medicine, 56*(1), 42-48. https://doi.org/10.1016/j.annemergmed.2010.01.032

Lanza, S. T., Collins, L. M., Lemmon, D. R., & Schafer, J. L. (2007). PROC LCA: A SAS Procedure for Latent Class Analysis. *Structural Equation Modeling, 14*(4), 671-694. https://doi.org/10.1080/10705510701575602

Latalova, K., Kamaradova, D., & Prasko, J. (2014). Perspectives on perceived stigma and self-stigma in adult male patients with depression. *Neuropsychiatric Disease and Treatment, 10*, 1399-1405. https://doi.org/10.2147/NDT.S54081

Lazarsfeld, P. F., & Henry, N. W. (1968). *Latent Structure Analysis*. Hougton Miffilin.

Lee, K. H., Jun, J. S., Kim, Y. J., Roh, S., Moon, S. S., Bukonda, N., & Hines, L. (2017). Mental Health, Substance Abuse, and Suicide Among Homeless Adults. *Journal of Evidence-Informed Social Work, 14*(4), 229-242. https://doi.org/10.1080/23761407.2017.1316221

Marraccini, M. E. (2021). Self-Injurious Thoughts and Behaviors Among College Students: A Latent Class Analysis. *Archives of Suicide Research, 25*(4), 731-750. https://doi.org/10.1080/13811118.2020.1746942

Menear, M., Duhoux, A., Roberge, P., & Fournier, L. (2014). Primary care practice characteristics associated with the quality of care received by patients with depression and comorbid chronic conditions. *General Hospital Psychiatry, 36*(3), 302-309. https://doi.org/10.1016/j.genhosppsych.2014.01.013

Miles, R., Rabin, L., Krishnan, A., Grandoit, E., & Kloskowski, K. (2020). Mental health literacy in a diverse sample of undergraduate students: demographic, psychological, and academic correlates. *BMC Public Health, 20*(1), 1699. https://doi.org/10.1186/s12889-020-09696-0

Miret, M., Nuevo, R., Morant, C., Sainz-Corton, E., Jimenez-Arriero, M. A., Lopez-Ibor, J. J., Reneses, B., Saiz-Ruiz, J., Baca-Garcia, E., & Ayuso-Mateos, J. L. (2011). The role of suicide risk in the decision for psychiatric hospitalization after a suicide attempt. *Crisis, 32*(2), 65-73. https://doi.org/10.1027/0227-5910/a000050

Moe, J., Kirkland, S. W., Rawe, E., Ospina, M. B., Vandermeer, B., Campbell, S., & Rowe, B. H. (2017). Effectiveness of Interventions to Decrease Emergency Department Visits by Adult Frequent Users: A Systematic Review. *Academic Emergency Medicine, 24*(1), 40-52. https://doi.org/10.1111/acem.13060

Nichter, B., Maguen, S., Monteith, L. L., Kachadourian, L., Norman, S. B., Hill, M. L., Herzog, S., & Pietrzak, R. H. (2021). Factors associated with multiple suicide attempts in a nationally representative study of U.S. military veterans. *Journal of Psychiatric Research, 140*, 295-300. https://doi.org/10.1016/j.jpsychires.2021.06.012

Pampalon, R., Hamel, D., Gamache, P., & Raymond, G. (2009). A deprivation index for health planning in Canada. *Chronic Diseases in Canada, 29*(4), 178-191. http://www.ncbi.nlm.nih.gov/pubmed/19804682

Piscopo, K., Lipari, R. N., Cooney, J., & Glasheen, C. (2016). Suicidal thoughts and behavior among adults: results from the 2015 national survey on drug use and health. *SAHMSA*.

Plaistow, J., Masson, K., Koch, D., Wilson, J., Stark, R. M., Jones, P. B., & Lennox, B. R. (2014). Young people's views of UK mental health services. *Early Intervention in Psychiatry, 8*(1), 12-23. https://doi.org/10.1111/eip.12060

Pompili, M., Forte, A., Palermo, M., Stefani, H., Lamis, D. A., Serafini, G., Amore, M., & Girardi, P. (2012). Suicide risk in multiple sclerosis: a systematic review of current literature. *Journal of Psychosomatic Research, 73*(6), 411-417. https://doi.org/10.1016/j.jpsychores.2012.09.011

Rahme, E., Low, N. C. P., Lamarre, S., Daneau, D., Habel, Y., Turecki, G., Bonin, J. P., Morin, S., Szkrumelak, N., Singh, S., & Lesage, A. (2016). Correlates of Attempted Suicide from the Emergency Room of 2 General Hospitals in Montreal, Canada. *Canadian Journal of Psychiatry, 61*(7), 382-393.

Ramanuj, P., Ferenchik, E., Docherty, M., Spaeth-Rublee, B., & Pincus, H. A. (2019). Evolving Models of Integrated Behavioral Health and Primary Care. *Current Psychiatry Reports, 21*(1), 4. https://doi.org/10.1007/s11920-019-0985-4

Rapeli, C. B., & Botega, N. J. (2005). Clinical profiles of serious suicide attempters consecutively admitted to a university-based hospital: a cluster analysis study. *Brazilian Journal of Psychiatry, 27*(4), 285-289. https://doi.org/10.1590/s1516-44462005000400006

Rassy, J., Daneau, D., Larue, C., Rahme, E., Low, N., Lamarre, S., Turecki, G., Bonin, J. P., Racine, H., Morin, S., Dasgupta, K., Renaud, J., & Lesage, A. (2020). Measuring Quality of Care Received by Suicide Attempters in the Emergency Department. *Archives of Suicice Research*, 1-10. https://doi.org/10.1080/13811118.2020.1793043

Régie de l'assurance maladie du Québec. (2017). *Rapport annuel de gestion, 2016-2017*. Régie de l'assurance maladie du Québec.

Rice, S. M., Purcell, R., & McGorry, P. D. (2018). Adolescent and Young Adult Male Mental Health: Transforming System Failures Into Proactive Models of Engagement. *Journal of Adolescenct Health, 62*(3S), S9-S17. https://doi.org/10.1016/j.jadohealth.2017.07.024

Rodriguez, H. P., Marshall, R. E., Rogers, W. H., & Safran, D. G. (2008). Primary care physician visit continuity: a comparison of patient-reported and administratively derived measures. *Journal of General Internal Medicine, 23*(9), 1499-1502. https://doi.org/10.1007/s11606-008-0692-z

Romaire, M. A., Haber, S. G., Wensky, S. G., & McCall, N. (2014). Primary care and specialty providers: an assessment of continuity of care, utilization, and expenditures. *Medical Care, 52*(12), 1042-1049. https://doi.org/10.1097/MLR.0000000000000246

Routhier, D., Leduc, N., Lesage, A., & Benigeri, M. (2012). Service utilization by hospitalized suicide attempters with schizophrenia or depression in Montreal. *Psychiatric Services, 63*(4), 364-369. https://doi.org/10.1176/appi.ps.201000405

Saunders, N. R., Chiu, M., Lebenbaum, M., Chen, S., Kurdyak, P., Guttmann, A., & Vigod, S. (2019). Suicide and Self-Harm in Recent Immigrants in Ontario, Canada: A Population-Based Study. *Canadian Journal of Psychiatry, 64*(11), 777-788. https://doi.org/10.1177/0706743719856851

Schwarz, G. (1978). Estimating the dimension of a model. *Annals of Statistics, 6*(2), 461-464.

Simard, M., Dubé, M., Myles, G., & Sirois, C. (2019). *La prévalence de la multimorbidité au Québec : portrait pour l'année 2016-2017*. Institut national de santé publique du Québec.

Skopp, N. A., Smolenski, D. J., Sheppard, S. C., Bush, N. E., & Luxton, D. D. (2016). Comparison of Suicide Attempters and Decedents in the U.S. Army: A Latent Class Analysis. *Suicide and Life-Threatening Behavior, 46*(4), 413-426. https://doi.org/10.1111/sltb.12227

Statistics Canada. (2015). *Access to a regular medical doctor, 2014. Canadian Community Health Survey (CCHS) 2013-2014*. Statistic Canada.

Tairi, T., Milojev, P., & Zilikis, N. (2018). Clinical Profiles Among Greek Adolescent Suicide Attempters. *Crisis, 39*(5), 335-343. https://doi.org/10.1027/0227-5910/a000506

Tatlow-Golden, M., Prihodova, L., Gavin, B., Cullen, W., & McNicholas, F. (2016). What do general practitioners know about ADHD? Attitudes and knowledge among first-contact gatekeepers: systematic narrative review. *BMC Family Practice, 17*(1), 129. https://doi.org/10.1186/s12875-016-0516-x

Urbanoski, K., Inglis, D., & Veldhuizen, S. (2017). Service Use and Unmet Needs for Substance Use and Mental Disorders in Canada. *Canadian Journal of Psychiatry, 62*(8), 551-559. https://doi.org/10.1177/0706743717714467

Vasiliadis, H. M., Ngamini-Ngui, A., & Lesage, A. (2015). Factors associated with suicide in the month following contact with different types of health services in Quebec. *Psychatric Services, 66*(2), 121-126. https://doi.org/10.1176/appi.ps.201400133

Verhaak, P. F., van Dijk, C. E., Nuijen, J., Verheij, R. A., & Schellevis, F. G. (2012). Mental health care as delivered by Dutch general practitioners between 2004 and 2008. *Scandinavian Journal of Primary Health Care, 30*(3), 156-162. https://doi.org/10.3109/02813432.2012.688707

Vermunt, J. K., & Magidson, J. (2002). Latent class cluster analysis. In J. A. Hagenaars & A. L. Mccutcheon (Eds.), *Advances in Latent Class Analysis* (pp. 89–106). Cambridge University Press.

Virgolesi, M., Pucciarelli, G., Colantoni, A. M., D'Andrea, F., Di Donato, B., Giorgi, F., Landi, L., Salustri, E., Turci, C., & Proietti, M. G. (2017). The effectiveness of a nursing discharge programme to improve medication adherence and patient satisfaction in the psychiatric intensive care unit. *Journal of Clinical Nursing, 26*(23-24), 4456-4466. https://doi.org/10.1111/jocn.13776

Wahlbeck, K., Cresswell-Smith, J., Haaramo, P., & Parkkonen, J. (2017). Interventions to mitigate the effects of poverty and inequality on mental health. *Social Psychiatry and Psychiatric Epidemiology, 52*(5), 505-514. https://doi.org/10.1007/s00127-017-1370-4

Wildeboer, R. M., van der Hoek, L., & Verhaak, P. F. (2016). Use of general practice services 5 years after an episode of mental illness: case-control study using electronic records. *British Journal of General Practice, 66*(646), e347-353. https://doi.org/10.3399/bjgp16X684973

Xiao, Y., & Lindsey, M. A. (2021). Adolescent social networks matter for suicidal trajectories: disparities across race/ethnicity, sex, sexual identity, and socioeconomic status. *Psychological Medicine*, 1-12. https://doi.org/10.1017/s0033291721000465

Table 1. Characteristics of patients with suicidal behaviors (n=5,064)

	n	%
Emergency department (ED) use and hospitalization (acute care) (from 2014-15 to 2015-16, April 1 to March 31)		
Suicidal behaviors		
Suicide ideation only	3,454	68.21
Suicide attempt only	962	19.00
Suicidal behaviors (both suicide ideation and attempt)	648	12.79
Number of episodes of suicidal behaviors (at ED use or hospitalization)		
1	3,451	68.15
2	912	18.01
3+	701	13.84
Hospitalization for suicidal behaviors	544	10.74
Number of years with high ED use (3+/year) for reasons other than suicidal behaviors		
0	2,446	48.30
1	1,683	33.23
2	935	18.46
Frequency of hospitalizations for diagnoses other than suicidal behaviors		
0	2,582	50.99
1-2	1,786	35.27
3+	696	13.74
Outpatient service use (within 12 months before last ED use or hospitalization for suicidal behaviors from 2014-15 to 2015-16)		
Having a family doctor	3,675	72.57
Usual outpatient physician[a]		
No usual physician	1,610	31.79
Usual general practitioner (GP) only	1,689	33.35
Usual psychiatrist only	626	12.36
Both usual GP and psychiatrist	1,139	22.49
Frequency of outpatient consultations with GP or psychiatrist[a]		
0-1	1,610	31.79
2-3	988	19.51
4+	2,466	48.70
High continuity of physician care, integrating both outpatient GP and psychiatrist (>0.61)[b]	3,205	63.29
Frequency of psychosocial interventions in community healthcare centers, excluding GP consultations[c]		
0	2,606	51.46
1-2	926	18.29
3+	1,532	30.25
Sociodemographic variables (at last ED use or hospitalization for suicidal behaviors from 2014-15 to 2015-16)		
Men	2,422	47.83

Age group		
12-17 years	416	8.21
18-29 years	1,494	29.50
30-64 years	2,836	56.00
65+ years	318	6.28
Living in more materially deprived areas[d]	2,224	43.92
Living in more socially deprived areas[d]	3,216	63.51
Clinical variables (within 2 years before last ED use or hospitalization for suicidal behaviors from 2014-15 to 2015-16)		
Principal mental disorder (MD) and substance-related disorder (SRD)[e]		
Serious MD	1,887	37.26
Personality disorders	800	15.80
Common MD	1,782	35.19
SRD	238	4.70
No MD-SRD	357	7.05
Number of MD-SRD[f]		
0	357	7.05
1-2	2,030	40.09
3-4	1,176	23.22
5+	1,501	29.64
Co-occurring MD-SRD	1,896	37.44
Chronic physical illnesses[g]	2,116	41.79
Severity of chronic physical illnesses (adapted version of Elixhauser Comorbidity Index)[g]		
0	3,794	74.92
1	399	7.88
2	227	4.48
3+	644	12.72
Co-occurring MD-SRD-chronic physical illnesses	986	19.47
Death (outcome) (within 12 months after last ED use or hospitalization for suicidal behaviors from 2014-15 to 2015-16)[h]	111	2.19

[a] Usual GP is a proxy for "patient family physician", defined as having at least two consultations with the same GP or with at least two GP working in the same family medicine group. Family medicine groups provide patient registration, and greater access and continuity of care. Usual psychiatrist was defined as one that followed a given patient in outpatient care at least twice. Alternatively, patients who made only one outpatient consultation with a psychiatrist had to have consulted their GP at least twice, which was considered a proxy for collaborative care (see references in method section).

[b] This was measured with the Usual Provider Continuity Index, describing the proportion of consultations with the usual GP or psychiatrist of all GP and psychiatrists consulted in outpatient care (including walk-in clinics) (see references in method section).

[c] They mainly provide psychosocial interventions delivered through multidisciplinary teams (e.g., social workers, nurses, psychologists). The care they provide is thus complementary to that provided by GP, while both are considered primary care (or first line) services.

[d] Material and social deprivation indices, for patient areas of resident, are divided in quintiles, but were regrouped for this study into two categories: less deprived areas (1, 2, 3) and more deprived areas (4, 5 and not assigned). "Not assigned" includes patients with missing addresses or those living in an area where index assignment is not feasible (e.g., homeless individuals).

[e] If a patient had more than one MD, the most severe MD was identified as her/his "principal MD". We also considered "validity" of the diagnosis, by selecting MD diagnosed more than once, or during a hospitalization or by the patient's usual physician, especially the psychiatrist. Serious MD included: schizophrenia spectrum and other psychotic disorders, and bipolar disorders. Patients with personality disorders as a principal MD were without serious MD, while patients with common MD as their

principal MD were without serious MD or personality disorders. Common MD included: anxiety, depressive and adjustment disorders, and attention deficit/hyperactivity disorder. SRD were without MD, and included alcohol and drug-related disorders (use and induced disorders, intoxication, withdrawal). Details on the diagnostic codes are presented in Appendix 1.

[f] Number of MD and SRD was calculated based of the sum of diagnostic categories identified per patient (MD-SRD diagnostic categories are identified in Appendix 1; e.g. bipolar disorders, depressive disorders and cannabis-related disorders, n=3).

[g] Chronic physical illnesses included: renal failure, cerebrovascular illnesses, neurological illnesses, endocrine illnesses, tumor without or with metastasis, chronic pulmonary illnesses, diabetes complicated and uncomplicated, cardiovascular illnesses, and other chronic illness categories (e.g., blood loss anemia) (see Appendix 1).

[h] The outcome "death" included death for any cause. In the database, data on causes for death were not available. The percentage on mortality in the study was also quite small.

Table 2. Profiles of patients with suicidal behaviors based on acute and outpatient service use (n=5,064)

	Profile 1 High suicidal behaviors and high service use	Profile 2 Low suicidal behaviors and moderate service use	Profile 3 Low suicidal behaviors and low service use	Profile 4 High suicidal behaviors and high acute care, but low outpatient service use
Group size: n (%)	1,146 (22.63)	2,308 (45.58)	1,283 (25.34)	327 (6.46)
	%	**%**	**%**	**%**
Emergency department (ED) use and hospitalization (acute care) (from 2014-15 to 2015-16, April 1 to March 31)				
Suicidal behaviors				
Suicide ideation only	46.77	78.08	74.43	49.24
Suicide attempt only	8.73	21.92	25.57	8.56
Suicidal behaviors (both suicide ideation and attempt)	44.50	0.00	0.00	42.20
Number of episodes of suicidal behaviors (at ED or hospitalization)				
1	0.00	94.97	98.13	0.00
2	50.26	5.03	1.87	59.94
3+	49.74	0.00	0.00	40.06
Hospitalization for suicidal behaviors	26.61	5.37	4.60	17.13
Number of years with high ED use (3+/year) for reasons other than suicidal behaviors				
0	17.45	55.03	69.84	24.46
1	41.27	33.10	24.24	41.28
2	41.27	11.87	5.92	34.25
Frequency of hospitalizations for diagnoses other than suicidal behaviors				
0	28.45	51.82	70.46	47.71
1-2	41.97	37.65	25.57	33.03
3+	29.58	10.53	3.98	19.27
Outpatient service use (within 12 months before last ED use or hospitalization for suicidal behaviors from 2014-15 to 2015-16)				
Having a family doctor	84.55	76.26	56.98	65.75
Usual outpatient physician[a]				
No usual physician	0.00	0.00	100.00	100.00
Usual general practitioner (GP) only	28.80	58.88	0.00	0.00
Usual psychiatrist only	25.04	14.69	0.00	0.00
Both usual GP and psychiatrist	46.16	26.43	0.00	0.00
Frequency of outpatient consultations with usual GP or psychiatrist[a]				
0-1	0.00	0.00	100.00	100.00

2-3	20.59	32.58	0.00	0.00
4+	79.41	67.42	0.00	0.00
High continuity of physician care, integrating both outpatient GP and psychiatrist (>0.61)[b]	89.35	94.50	0.00	0.00
Frequency of psychosocial interventions in community healthcare centers, excluding GP consultations[c]				
0	38.13	49.87	67.19	47.71
1-2	20.86	17.94	16.06	20.49
3+	41.01	32.19	16.76	31.80

[a] See note a below Table 1.

[b] See note b below Table 1.

[c] See note c below Table 1.

Table 3: Sociodemographic and clinical correlates associated with suicidal behavior profiles (n=5,064)

	Profile 1 High suicidal behaviors and high service use	Profile 2 Low suicidal behaviors and moderate service use	Profile 3 Low suicidal behaviors and low service use	Profile 4 High suicidal behaviors and high acute care, but low outpatient service use
Group size: n (%)	1,146 (22.63)	2,308 (45.58)	1,283 (25.34)	327 (6.46)
	%	**%**	**%**	**%**
Sociodemographic variables (at last ED use or hospitalization for suicidal behaviors from 2014-15 to 2015-16, April 1 to March 31)				
Men	43.02[3,4]	43.50[3,4]	56.98[1,2]	59.33[1,2]
Age group				
12-17 years	6.72[2,3]	6.98[1,3,4]	11.77[1,2,4]	8.26[2,3]
18-29 years	28.10	24.91	38.19	32.72
30-64 years	60.47	59.58	46.45	52.60
65+ years	4.71	8.54	3.59	6.42
Living in more materially deprived areas[a]	48.25[2,3]	40.77[1,4]	43.02[1,4]	54.43[2,3]
Living in more socially deprived areas[a]	67.89[2,3]	62.00[1,4]	60.41[1,4]	70.95[2,3]
Clinical variables (within 2 years before last ED use or hospitalization for suicidal behaviors from 2014-15 to 2015-16)				
Principal mental disorder (MD) and substance-related disorder (SRD)[b]				
Serious MD	59.69[2,3,4]	37.22[1,3,4]	16.99[1,2,4]	38.53[1,2,3]
Personality disorders	21.99	14.25	10.68	25.08
Common MD	17.45	40.42	43.49	27.83
SRD	0.87	2.60	11.46	6.42
No MD-SRD	0.00	5.50	17.38	2.14
Number of diagnosed MD-SRD per patient[c]				
0	0.00[2,3,4]	5.50[1,3,4]	17.38[1,2,4]	2.14[1,2,3]
1-2	11.95	45.36	59.39	25.69
3-4	23.39	26.08	16.60	28.44
5+	64.66	23.05	6.63	43.73
Co-occurring MD-SRD	63.26[2,3]	31.02[1,3,4]	20.73[1,2,4]	57.80[2,3]
Chronic physical illnesses[d]	57.33[2,3,4]	45.75[1,3]	21.04[1,2,4]	40.67[1,3]
Severity of chronic physical illnesses (adapted version of Elixhauser Comorbidity Index)[d]				
0	65.79[2,3]	72.79[1,3]	86.98[1,2,4]	74.62[3]
1	10.65	8.80	3.90	7.34
2	6.28	4.64	2.73	3.98
3+	17.28	13.78	6.39	14.07

Co-occurring MD-SRD-chronic physical illnesses	39.27[2,3,4]	15.81[1,3,4]	6.31[1,2,4]	27.52[1,2,3]

Superscript numbers indicate significant differences between groups at p-value <0.05 adjusted by the Holm-Bonferroni method from chi-square test.

[a] See note d below Table 1.

[b] See note e below Table 1.

[c] See note f below Table 1.

[d] See note g below Table 1.

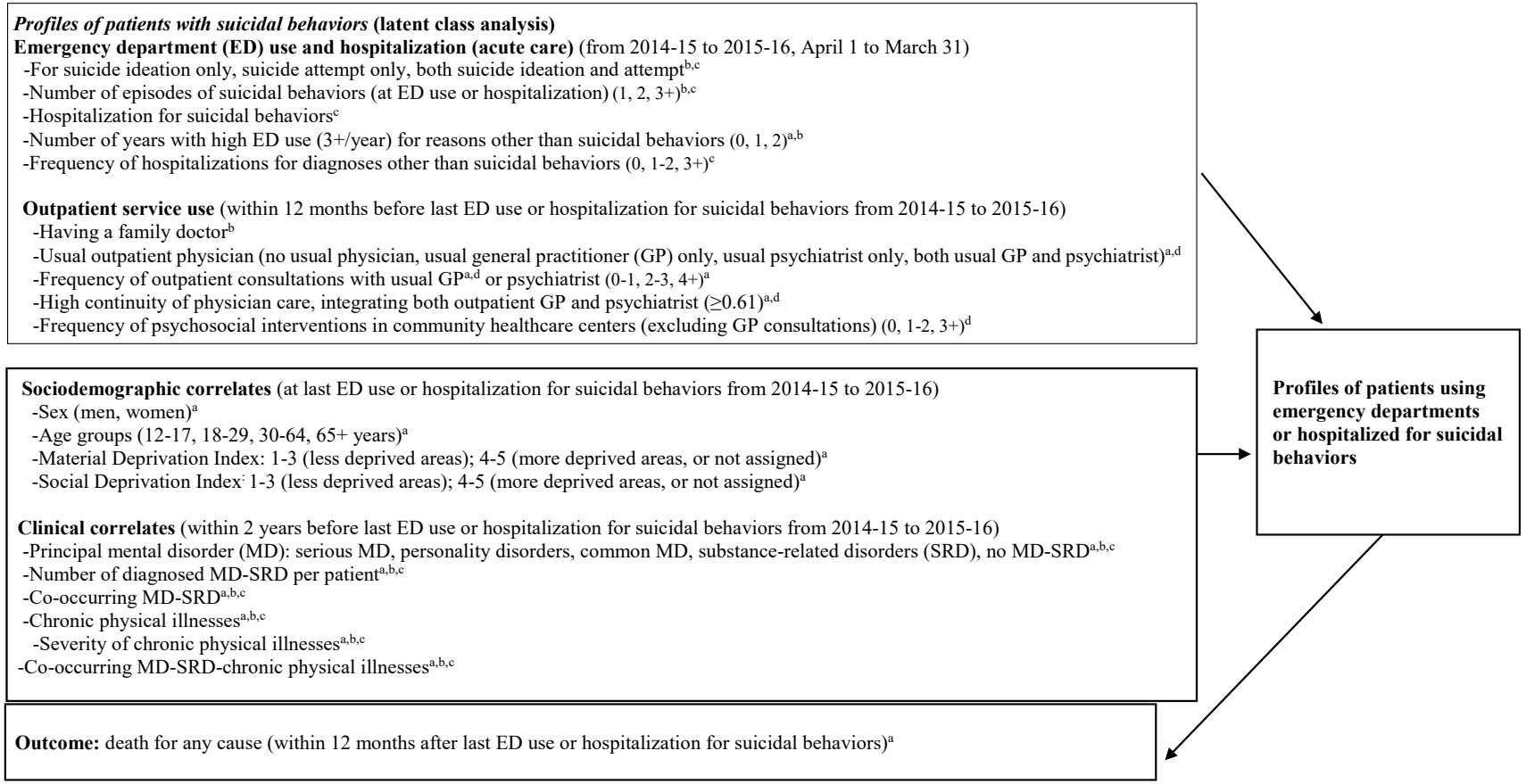
Table 4. Cox proportional hazards regression analysis measuring relationship between patient profiles and death[a] adjusted by age and sex (n=5,064)

	HR	p_value	95%CI	
Patient profiles[b]				
Profile 2 vs. Profile 1	0.53	0.003	0.34	0.80
Profile 3 vs. Profile 1	0.41	0.004	0.23	0.75
Profile 4 vs. Profile 1	0.69	0.309	0.33	1.42
Profile 3 vs. Profile 2	0.78	0.417	0.43	1.41
Profile 4 vs. Profile 2	1.30	0.467	0.64	2.67
Profile 4 vs. Profile 3	1.67	0.228	0.73	3.82
Age	1.06	<0.001	1.05	1.07
Women vs. Men	0.47	<0.001	0.32	0.70

[a] Profile 1: High suicidal behaviors and high service use; Profile 2: Low suicidal behaviors and moderate service use; Profile 3: Low suicidal behaviors and low service use; Profile 4: High suicidal behaviors and high acute care, but low outpatient service use.

[b] Outcome included any cause for death within a 12-month period after last emergency department use or hospitalization for suicidal behaviors. In the study database, data on causes for death were not available. The study percentage of mortality was also quite small.

Figure 1. Conceptual framework: Profiles, correlates and risk of death among patients using emergency departments or hospitalized for suicidal behaviors



[a] *Régie de l'assurance maladie du Québec* (RAMQ, physician database); [b] *Banque de données communes des urgences* (BDCU, ED database); [c] *Maintenance et exploitation des données pour l'étude de la clientèle hospitalière* (MED-ECHO, hospitalization database); [d] *Système d'information permettant la gestion de l'information clinique et administrative dans le domaine de la santé et des services sociaux* (I-CLSC, community healthcare center database). For definitions of variables included in the study, see footnotes of Table 1 or methods section. Details on diagnostic codes are presented in Appendix 1.

Appendix 1: Codes for mental disorders including substance-related disorders and chronic physical illnesses according to the International Classification of Diseases, Ninth and Tenth revisions

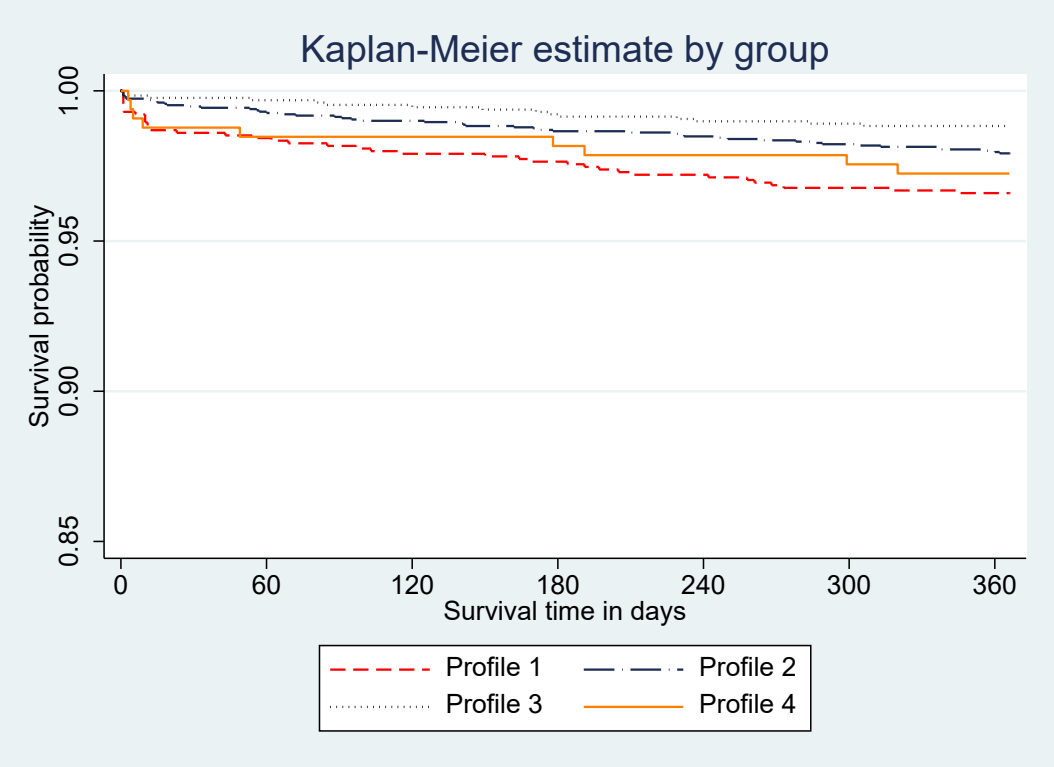
Diagnoses	*International Classification of Diseases, Ninth Revision (ICD-9)*	*International Classification of Diseases, Tenth Revision, Canada (ICD-10-CA)*
Suicide attempt[a, b]		X60-Y09, Y870, Y871, Y35-Y36, Y890, Y891
Mental disorders (MD)[b]		
Serious MD		
Schizophrenia spectrum and other psychotic disorders	295* (schizophrenic disorders); 297* (paranoid states); 298* (other nonorganic psychoses)	F20* (schizophrenic disorders); F22* (persistent delusional disorders); F23 (acute and transient psychotic disorders); F24* (induced delusional disorder); F25* (schizoaffective disorders); F28* (other psychotic disorder not due to a substance or known physiological condition); F29* (unspecified psychosis not due to a substance or known physiological condition); F448 (other dissociative and conversion disorders); F481 (depersonalization - derealization syndrome)
Bipolar disorders	2960-2966 (manic disorders); 2968 (other affective psychoses); 2969 (unspecified affective psychoses)	F300-F302, F308, F309 (manic episode); F310-F317, F318, 319 (bipolar episode)
Personality disorders	3010 (paranoid personality disorder); 3011 (affective personality disorder); 3012 (schizoid disorder); 3013, 3014 (obsessive-compulsive personality disorder); 3015 (histrionic personality disorder); 3016 (dependent personality disorder); 3017 (antisocial personality disorder); 3018 (other personality disorders); 3019 (unspecified personality disorder)	F600 (paranoid personality disorder); F61 (mixed and other personality disorders); F340 (cyclothymic disorder); F341 (dysthymic disorder); F601 (schizoid personality); F603 (borderline personality disorder); F605 (obsessive-compulsive personality disorder); F604 (histrionic personality disorder); F607 (dependent personality disorder); F602 (antisocial personality disorder); F609 (unspecified personality disorder); F21 (schizotypal personality); F606 (avoidant personality disorder); F608 (other specified personality disorders); F681 (factitious disorder); F688 (other specified disorders of adult personality and behaviour); F69 (unspecified disorder of adult personality and behaviour)
Common MD		
Depressive disorders	3004 (neurotic depression)*; 311, 3119* (depressive disorder, not classified elsewhere)	F320- F323 (major depressive disorder, single episode); F328 (other depressive episodes); F329 (depressive episode, unspecified); F330-F334 (major depressive disorder, recurrent); F338 (other recurrent depressive disorders); F339 (recurrent depressive disorder, unspecified); F348 (other persistent mood [affective] disorders); F380, F381 (persistent mood [affective] disorder, unspecified); F388 (other specified mood [affective] disorders); F39 (unspecified mood [affective] disorders); F412* (mixed anxiety and depressive disorder)*
Anxiety disorders	300 (except 3004); 3000 (anxiety states); 3002 (phobic anxiety disorders); 3003 (obsessive-compulsive disorder); 3001 (hysteria); 3006 (other anxiety disorder); 313	F40 (phobic anxiety disorders); F41(other anxiety disorders); F42 (obsessive-compulsive disorder); F45 (somatoform disorders); F48 (other neurotic disorders); F93, F94 (disturbance of emotions specific to childhood and adolescence)

	(disturbance of emotions specific to childhood and adolescence)	
Adjustment disorders	3090 (brief depressive reaction); 3092 (adjustment reaction with predominant disturbance of other emotions, include: abnormal separation anxiety); 3093 (adjustment reaction with predominant disturbance of conduct); 3094 (adjustment reaction with predominant disturbance of other emotions and conduct); 3098 (other specified adjustment reactions); 3099 (unspecified adjustment reaction)	F430 (acute stress reaction); F431 (post-traumatic stress disorder); F432 (adjustment disorders); F438 (other reactions to severe stress); F439 (reaction to severe stress, unspecified)
Attention deficit/hyperactivity disorder	314	F900; F901; F908; F909
Substance-related disorders[b]		
Alcohol-related disorders	3030*, 3039*, 3050* (alcohol abuse or dependence); 2910*, 2918* (alcohol withdrawal), 2911*-2915*, 2919*, 3575, 4255, 5353, 5710-5713 (alcohol-induced disorders); 9800, 9801, 9808, 9809 (alcohol intoxication)	F101*, F102* (alcohol abuse or dependence); F103, F104* (alcohol withdrawal); F105-F109, K700*-K704*, K709*, G621*, I426, K292*, K852, K860, E244, G312, G721, O354 (alcohol-induced disorders); F100*, T510, T511*, T518, T519 (alcohol intoxication)
Cannabis-related disorder	3043, 3052 (cannabis abuse or dependence)	F121, F122 (cannabis abuse or dependence); F123-F129 (cannabis-induced disorders); F120, T407 (cannabis intoxication)
Other drug-related disorders than cannabis	3040-3042, 3044-3049, 3053-3057, 3059 (drug abuse or dependence); 292.0 (drug withdrawal); 2921, 2922, 2928, 2929 (drug-induced disorders); 9650, 9658, 9670, 9676, 9678, 9679, 9694-9699, 9708, 9820, 9828 (drug intoxication)	F111, F131, F141, F151, F161, F181, F191, F112, F132, F142, F152, F162, F182, F192 (drug abuse or dependence); F113-F114, F133-F134, F143-F144, F153-F154, F163-F164, F183-F184, F193-F194 (drug withdrawal) F115-F119, F135-F139, F145-F149, F155-F159, F165-F169, F185-F189, F195-F199 (drug-induced disorders); F110, F130, F140, F150, F160, F180, F190, T400-T406, T408, T409, T423, T424, T426, T427, T435, T436, T438, T439, T509, T528, T529 (drug intoxication)
Chronic physical illnesses[c]		
Renal failure	4030, 4031, 4039, 4040, 4041, 4049, 585, 586, 5880, V420, V451, V56	I120, I131, N18, N19, N250, Z49, Z940, Z992
Cerebrovascular illnesses	430-438	G45, G46, I60-I69
Neurological illnesses	3319, 3320, 3321, 3334, 3335, 3339, 334–335, 3362, 340, 341, 345, 3481, 3483, 7803, 7843	G10–G12, G13, G20, G21–G22, G254, G255, G312, G318, G319, G32, G35, G36, G37, G40, G41, G931, G934, R470, R56
Endocrine illnesses (hypothyroidism; fluid electrolyte disorders and obesity)	2409, 243, 244, 2461, 2468; 2536, 276; 2780	E00, E01, E02, E03, E890; E222, E86, E87; E66
Any tumor without or with metastasis (solid tumor without metastasis; lymphoma)	140-172, 174, 175, 179-195, 196–199; 200, 201, 202, 2030, 2386, 2733	C00–C26, C30–C34, C37–C41, C43, C45-C58, C60–C76, C77-C79, C80; C81-C85, C88, C900, C902, C96
Chronic pulmonary illnesses	490–505, 5064, 5081, 5088	I278, I279, J40-J47, J60-J64, J65, J66, J67, J684, J701, J703

Diabetes complicated and uncomplicated	2500-2502, 2503; 2504-2509	E102-E108, E112-E118, E132-E138, E142-E148; E100, E101, E109, E110, E111, E119, E130, E131, E139, E140, E141, E149
Cardiovascular illnesses (congestive heart failure; cardiac arrhythmias; valvular illnesses; peripheral vascular illnesses; myocardial infarction; hypertension and pulmonary circulation illnesses)	4021, 4041, 428; 4260, 4267, 4269,4270–4274,4276–4279, 7850, V450, V533; 394–397, 424,7463–7466, V422, V433; 093, 440, 441, 4431– 4439, 4471, 5571, 5579, V434; 4109, 4129; 4010, 4011, 4019, 4020, 4021, 4029, 4050, 405,4051, 4059, 4372; 4150, 4151, 416; 4170, 4178, 4179	I099, I110, I130, I132, I255, I420, I425–I429, I43, I50, P290; I441–I443, I456, I459, I47–I49, R000, R001, R008, T821, Z450, Z950; A520, I70-I72, I730, I731, I738, I739, I771, I790, K551, K558, K559, Z958, Z959; I05–I08, I091, I098, I34–I39, Q230–Q233, Q238, Q239, Z952, Z953, Z954I210-I214, I219, I220, I221, I228, I229, I252; I101, I100, I11, I1500, I1501, I1510, I1511, I1521, I1581, I1590, I1591, I674; I26, I27, I280, I288, I289
Other chronic physical illness categories (blood loss anemia; ulcer illnesses; liver illnesses; AIDS/HIV; rheumatoid arthritis/collagen vascular illnesses, coagulopathy; weight loss, paralysis; deficiency anemia)	2800, 2809; 286, 2871, 2873-2875; 5317, 5319, 5327, 5329, 5337, 5339, 5347, 5349; 0702, 0703, 0704, 0705, 4560–4562, 5723, 5728, 5733, 5734, 5739, V427; 042–044; 1361, 446; 7010, 7100–7104, 7105, 7108, 7109, 7112, 714, 7193, 720, 725, 7285, 7288, 7293; 260–263, 7832, 7994; 3341, 342, 343, 3440-3446, 3448, 3449; 2801, 2809, 281, 2859	D500; K257, K259, K267, K269, K277, K279, K287, K289; B20-B24; D65–D68, D691, D693-D696; B18, I85, I864, I982, K700- K703, K709 K711, K713–K715, K716, K717, K721, K729, K73, K74, K754, K760, K761, K763, K764, K765, K766, K768, K769, Z944; L900, L940, L941, L943, M05, M06, M08, M120, M123, M30, M31, M32–M35, M45, M460, M461, M468, M469; G041, G114, G80, G81, G82, G83; E40–E46, R634, R64, D51–D53, D63, D649; D501, D508; D509

[a] Diagnostic codes for suicide attempt were registered in MED-ECHO database (*Maintenance et exploitation des données pour l'étude de la clientèle hospitalière*, hospitalization database). Emergency department (ED) use for reasons of suicide ideation or attempt was reported by ED triage nurses and registered in BDCU database (Banque de données communes des urgencies, ED database); as they are not diagnostic codes, they were not reported in this table. [b] All diagnoses identified in RAMQ (*Régie de l'assurance maladie du Québec,* Quebec Health Insurance Plan database) for the full study period (from financial year: April 1 to March 31) were based on the International Classification of Diseases Ninth Revision (ICD-9), which included a 4-digit code. The Canadian Tenth Revision (ICD-10-CA) was used in MED-ECHO (in 2006-07+) and in BDCU. Diagnoses related to all the above databases were considered, and all data integrated each year, for each patient. MED-ECHO is the only database that includes several diagnoses: principal diagnostic and numerous secondary diagnoses. In this study database, MD were considered only as principal diagnoses, but substance-related disorders (SRD) as principal and secondary diagnoses, considering that SRD are often underdiagnosed. [c] The list of chronic physical illnesses is based on an adapted and validated version of the Elixhauser Comorbidity Index, integrating the Charlson Index, which consists of 32 major categories of physical illnesses (see reference in the method section). In this list of chronic physical illnesses, three categories of MD and two of SRD (identified with an asterisk (*)) were also included in the list of MD-SRD, thus appearing twice.

Appendix 2. Survival probability according to patient profiles and risk of death



Profile 1: High suicidal behaviors and high service use; Profile 2: Low suicidal behaviors and moderate service use; Profile 3: Low suicidal behaviors and low service use; Profile 4: High suicidal behaviors and high acute care, but low outpatient service use. Risk of mortality, for any cause of death, is measured within a 12-month period after the last emergency department use or hospitalization for suicides behaviors.