



## Research paper

# Factors associated with emergency department use for mental health reasons among low, moderate and high users



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## ABSTRACT

**Objectives:** This study identified factors associated with frequency of emergency department (ED) use for mental health (MH) reasons in Quebec during 2015–2016.

**Methods:** Participants ( $n = 115,066$ ) were categorized as: 1) low (1 visit/year; 76%); 2) moderate (2 visits/year; 14%); and 3) high (3+ visits/year; 10%) ED users. Independent variables included predisposing, enabling and needs factors based on the Andersen Behavioral Model. Variables significantly associated with frequency of ED use were entered into a multinomial logistic regression.

**Results:** Patients with mental illness (MI), especially substance-related disorders (SRD) and schizophrenia spectrum disorders; bipolar, depressive, anxiety or personality disorders; and those with severe chronic physical illness (needs factors) were more likely to use ED for MH reasons, as were male participants 18–64 years old, and those living in metropolitan areas with high social or material deprivation (predisposing factors). Regarding enabling factors, consultations with outpatient psychiatrists and not seeing a general practitioner (GP) in the year prior to ED visit were associated with high ED use.

**Conclusion:** The severity of MI/SRD contributed most to frequent ED use, while social and material deprivation in metropolitan areas, and intensity of medical care also influenced ED use for MH reasons.

## 1. Introduction

Individuals with mental illness (MI), including substance related disorders (SRD), contribute substantially to overcrowding in emergency departments (ED) [1]. An estimated 93% of high ED users (3+ visits/year) [2] have at least one MI [3]; ED use among those with psychiatric comorbidity is five times higher [4,5]. While one study found that ED users with MI made 21% of all visits to a psychiatric ED between 1985 and 2000 [2], other research identified a number of factors other than diagnosis that drive ED use [2,6–8]. According to the Andersen Behavioral model [9], three factors should be considered: needs factors, including clinical variables such as diagnoses (e.g. schizophrenia, bipolar disorder); predisposing factors related to patient

sociodemographic characteristics (e.g. age, sex, social and material deprivation), and enabling factors including regular sources of care that are expected to facilitate access to health services and reduce ED use [10]. The Andersen model has become the dominant explanatory framework for the assessment of healthcare services, including overall ED use [11,12], and ED use among particular patient populations such as those with MI [13] or SRD [14].

Previous research has identified various needs factors associated with frequent ED use: psychiatric diagnoses such as schizophrenia [2,15,16] and other psychotic disorders [17–19], mood disorders [15,20,21], anxiety disorders [8,15,16,20], personality disorders [2,8,16,18,19,22], SRD [2,7,15,17], and co-occurring MI/SRD and/or chronic physical illness [1,2,4,23]. Regarding predisposing factors,

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studies have identified male patients with MI or SRD as more frequent ED users than females [1,7,13]. High ED use has usually occurred among younger individuals [7,20,21,24], but has also been reported among individuals in their forties, and older [25,26]. Economic disadvantage is a prevalent characteristic of very high users (12+ ED visits/year [2]) [2,7], as well as lack of family support [13]. Concerning enabling factors, such as regular use of health services, the associations with frequency of ED use were inconsistent, with some studies reporting high ED use among individuals who made substantial use of MH services [6,8,12,17,19], but others less so [7]. Moreover, a number of potentially relevant variables in ED use, such as severity of chronic physical illness, provision of ambulatory MH services, as well as neighborhood size, and social and material deprivation have rarely been examined.

Most studies on this topic emanate from the US or Europe, and have mainly focused on high ED users [6,8,17,22]; relatively little research has concerned subgroups with moderate or low ED use [2,7,24]. To our knowledge, no studies have compared patient subgroups based on their different frequencies of ED use for MH reasons. Distinguishing predictive factors for one or more ED visits among different patient subgroups would facilitate the development of measures for adapting ED interventions to specific needs. Using the Andersen model as a broad analytic framework, this study aimed to determine needs, predisposing, and enabling factors associated with frequency of ED use for MH reasons among low (1 visit/year), moderate (2 visits/year) and high ED users (3+ visits/year) in the Quebec (Canada) population for 2015–2016. Based on the literature, we hypothesized that needs factors would be more strongly associated with frequency of ED visits than predisposing or enabling factors.

## 2. Methods

### 2.1. Background and data sources

Canadian universal health insurance covers 99% of the population [27]. Data for this study were drawn from the “Institut national de santé publique du Québec” (the Quebec Public Health Institute), and the Quebec Integrated Chronic Disease Surveillance System (QICDSS) [28]. The QICDSS databank integrates medical administrative data for 98% of the population [29] including billing files for medical services provided by general practitioners (GP) and psychiatrists on a fee-for-service basis. Only 6% of physician billing occurred outside of the public system in 2016–17 [30]. QICDSS medical administrative data emanated from: 1) the health insurance registry (FIPA) including demographic information on individuals with valid health insurance numbers (HIN); 2) medical acts compensated by the Quebec Health Insurance Regime (RAMQ) (e.g., ED visits) [31]; and 3) the hospitalization/discharge database (MED-ECHO). The research ethics committee of a MH university institute approved the study protocol.

### 2.2. Sample

Participants included patients 12 years old and over who used ED for MH reasons during the April 1 2015 to March 31 2016 fiscal year. Diagnoses designated by RAMQ were based on the *International Classification of Diseases, Ninth Revision (ICD-9)* while those from MED-ECHO used the *Tenth Revision (ICD-10)* (Table 1). MI included: anxiety disorders, depressive disorders, personality disorders, schizophrenia spectrum disorders, bipolar disorder, attention deficit disorder with or without hyperactivity (AD/HD), and other MI (e.g. senile dementia simple form, non-organic psychosis) [32]. SRD included: alcohol disorder (abuse and/or dependence, intoxication-induced conditions), drug disorder (abuse and/or dependence, intoxication-induced conditions), and co-occurring alcohol/drug abuse and/or dependence. Co-occurring disorders such as MI/SRD, MI/chronic physical illness, or MI-SRD/chronic physical illness (e.g. cancer, diabetes) were included. As

MI and SRD often occur over a two to three-year period, data for these conditions were extracted for the years 2012–2015 [33–36]. Data on co-occurring MI or SRD and physical illness were extracted for 2014–2015 only. The final sample consisted of 115,066 individuals using ED for MH reasons; they represented 1.6% of the Quebec population 12 years or older, and 7.3% of ED users for 2015–16.

### 2.3. Variables

The dependent variable measured patients who used the ED for MH reasons at least once during 2015–16, and was categorized in terms of: low users (1 visit/year); moderate users (2 visits/year); and high users (3+ visits/year). While no consensus exists in the literature on the definition of high ED use, a minimum of 3 or 4 visits/year is fairly standard [7,37], and was chosen (3+) for this study in line with a previous Quebec study [2]. The group with two visits was an intermediate group considered at possible risk of becoming high ED users. Finally, ED users making a single ED visit were more “accidental” users, who may have had recourse to ED for crisis management due to a lack of alternative health resources. This group served as the case control for comparisons with the high and intermediate groups. According to international research, from 20 to 23% of adults visit ED yearly for any reason [37,38].

Independent variables [13,24,39], organized according to the Andersen Behavioral Model (Fig. 1), included needs factors: MI or SRD diagnoses, co-occurring MI or SRD and chronic physical illness, and severity of chronic physical illness based on the Combined Comorbidity Index (see Appendix) [40]. Calculation of this index did not include chronic physical illness (e.g. hypertension, diabetes) with a Charlson weight of 0 [40]. Predisposing factors included: gender (male, female), age (12–17, 18–24, 25–44, 45–64, and 65+ age brackets), community size (metropolitan areas: >1,000,000 inhabitants, urban areas: 100,000–999,999, semi-urban areas: 10,000–99,999 and rural areas: <10,000), and a geographical proxy index for material deprivation and social deprivation [41] based on the 2011 Canadian Census data. Material deprivation included: proportion of individuals without a high school diploma, proportion of employed individuals, and average individual income. Social deprivation included: proportion of individuals living alone; proportions of separated, divorced or widowed individuals; and proportion of single-parent families [41]. Both variables were classified in quintiles, with the fifth quintile representing highest deprivation. Enabling factors included: consultation with a GP in private clinic (0, 1–2, 3–4, 5+ consultations) and outpatient psychiatrist consultation (0, 1, 2 to 4, 5+ consultations) within one year prior to first 2015–2016 ED visit, as well as outpatient GP or psychiatrist consultation for MH reasons within seven days before 2015–2016 ED visits (yes/no question).

### 2.4. Data analysis

Descriptive analyses were performed, producing two-way frequency tables for each independent variable listed in Fig. 1 in association with the dependent variables measuring frequency of ED visits. Significant independent variables were entered sequentially into the multinomial logistic regression, from needs factors, to predisposing factors and enabling factors, in that order. The reference category for the multinomial model was low users. Two odds ratios were calculated for each independent variable: moderate users vs. low users, and high users vs. low users, with 95% confidence intervals. Independent variables found to be highly inter-correlated were eliminated to avoid inducing collinearity.

## 3. Results

Table 2 presents sample characteristics by frequency of ED visit. Of the total 115,066 individuals who used ED for MH reasons, 76% were

**Table 1**  
Mental illness codes 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 (ICD-10)
Schizophrenia and psychotic disorders (schizophrenic-spectrum disorders)	295, 297, 298	F20, F21, F22, F23, F24, F25, F28, F29, F32.3, F33.3, F44.89
Bipolar disorder	296.0, 296.1, 296.4, 296.5, 296.6, 296.8	F30.1, F30.2, F30.3, F30.4, F30.8, F31.1, F31.6, F31.2, F31.73-F31.78, F31.81, F31.9, F38
Depressive disorder	296.2, 296.3, 296.9, 300.4, 311.9	F32.0, F32.1, F32.2, F32.3, F32.4, F32.5, F32.9, F33.0, F33.1, F33.2, F33.3, F33.9, F33.41, F33.42, F39, F34.8, F34.1, F32.9
Anxiety disorders	300 (except 300.4)	F40-F48, F68
Personality disorders	301	F60, F070, F340, F341, F488, F61
Alcohol related disorder	291, 303.9, 305.0 (alcohol abuse or dependence); 357.5, 425.5, 535.3, 571.0–571.3 (alcohol-induced conditions); 980.0, 980.1, 980.8, 980.9 (alcohol intoxication)	F10.1, F10.2 (alcohol abuse or dependence); F10.3-F10–9, K70.0-K70.4, K70.9, G62.1, 142.6, K29.2, K85.2, K86.0, E24.4, E52, G31.2, G72.1, O35.4 (alcohol-induced conditions); F10.0, T51.0, T51.1, T51.8, T51.9 (alcohol intoxication)
Drug related disorders	292 (drug-induced mental disorder); 304.0–304.9, 305.2–305.7, 305.9 (drug abuse or dependence); 965.0, 965.8, 967.0, 967.6, 967.8, 967.9, 969.4–969.9, 970.8, 982.0, 982.8 (drug intoxication);	F11.1, F12.1, F13.1, F14.1, F15.1, F16.1, F18.1, F19.1, F11.2, F12.2, F13.2, F14.2, F15.2, F16.2, F18.2, F19.2 (drug abuse or dependence); F11.3-F11.9, F12.3-F12.9, F13.3-F13.9, F14.3-F14.9, F15.3-F15.9, F16.3-F16.9, F18.3-F18.9, F19.3-F19.9 (drug-induced mental disorder); F11.0, F12.0, F13.0, F14.0, F15.0, F16.0, F18.0, F19.0, T40, T42.3, T42.4, T42.6, T42.7, T43.5, T43.7-T43.9, T50.9, T52.8, T52.9 (drug intoxication)
Adaptation disorders	308, 309, 311, 313	F43.2; F93.0; F94.0
Attention deficit disorder with or without hyperactivity	314	F90.0
Other mental illness	290, 291, 293, 294, 302, 307, 310, 312, 315, 317–319, 571.0–571.3	F00 to F09, F17, F38, F39, F50-F59, F61-F69, F70-F79, F80–89, F90–99

low users, 14% moderate users and 10% high users. Concerning predisposing factors, high ED users disproportionately represented the 25–44 and 45–64 age brackets. Males, individuals living in the most materially deprived areas, individuals living in the most socially deprived area, or in areas with unassigned deprivation indexes, were also identified as high ED users. Regarding community size, high users were most present in metropolitan areas (> 1,000,000 residents).

Concerning enabling factors, few ED patients consulted GPs or psychiatrists (outpatient consultations) in the 12 months previous to a first 2015–2016 ED visit for MH reasons. Patients who made 5+ consultations with outpatient psychiatrists or GPs over the year were most likely to be high ED users. While the number of psychiatrist consultations was far greater for high ED users than for intermediate or low users, group differences in terms of GP consultations were less pronounced. Those who consulted an outpatient psychiatrist within 7 days prior to ED visits were also more likely to be high users, unlike individuals who consulted a GP in the same period.

Concerning needs factors, MI/SRD were more prevalent among high users. Compared with the other groups, high ED users were significantly more affected by anxiety, schizophrenic-spectrum disorders, personality, depressive, and bipolar disorders, or by SRD. More high ED users were also affected by co-occurring MI/SRD, co-occurring MI/chronic physical illness, and co-occurring MI/SRD and physical illness. Frequencies of ED use based on the combined physical comorbidity index suggested that ED use was higher in individuals with, versus without, chronic physical illness.

Table 3 presents results for the multinomial logistic regression. Needs factors showed higher odds ratios for frequency of ED use than enabling or predisposing factors. All MI disorders (schizophrenic-spectrum disorders, anxiety, depressive, personality, bipolar disorders) and SRD were strongly associated with higher ED use. More specifically, higher odds ratios were observed for SRD (moderate users: 1.50 CI: 1.42–1.56, high users: 2.23 CI: 2.12–2.35) and for schizophrenia spectrum disorders (moderate users: 1.52 CI: 1.44–1.60, high users: 2.20 CI: 2.09–2.33). Yet group differences were more modest with respect to the severity of chronic physical illness. Regarding predisposing factors, male gender, age 18–64 years, living in geographical areas with higher social deprivation (indexes 4 and 5), the highest level of material

deprivation (index 5), or in areas with unassigned deprivation index, as well as larger community size (i.e. metropolitan area) were all associated with higher ED use. Moderate social deprivation (indexes 3, 4, 5) was associated with moderate ED use. After including needs and predisposing factors, however, the only enabling factors strongly associated with moderate and/or high ED use were: number of psychiatrist consultations within the past year (moderate users for 5+ visits: 1.26 CI: 1.17–1.36; high users for 5+ visits: 1.55 CI: 1.44–1.68), and no GP consultation within past year (significant only for high users). Needs factors accounted for 82% of the total variance explained in the model, while predisposing and enabling factors contributed 9% each.

#### 4. Discussion

This study identified factors associated with frequency of ED use for MH reasons among patient subgroups classified as low users, moderate users, and high users. Findings confirmed our hypothesis that needs factors would be more strongly associated with frequency of ED use for MH reasons than would predisposing or enabling factors. These results align with, and support, previous research findings [14,24].

The results of this study were highly consistent with a recent report from the Quebec Commissioner of Health and Welfare (QCHW) for 2016–2017 [42], which found that 76% of patients made one ED visit, and 14% two visits. In our study, 10% of participants made three or more ED visits vs. 9% in the QCHW study. This slight difference between the two studies in levels of high users may be attributed to the use of a different database for the QCHW study (the “Banque de données communes des urgences”, BDCU). As well, the QCHW study included all ages as opposed to the inclusion of patients 12 years old and over in the present study. Yet the results of both reports confirm that most Quebec patients with MI, including SRD, visited ED only once during fiscal year 2015–2016. Moreover, the rate for high ED users identified at 10% in this study approximates the international average [5]. According to a systematic review, from 0.3% to 18% of patients with MI, including SRD, were high users, largely depending upon how the term “high user” was defined [5].

Regarding needs factors, all MI were associated with frequent ED use, as also reported in previous studies [2,7,14,19]. Other risk factors

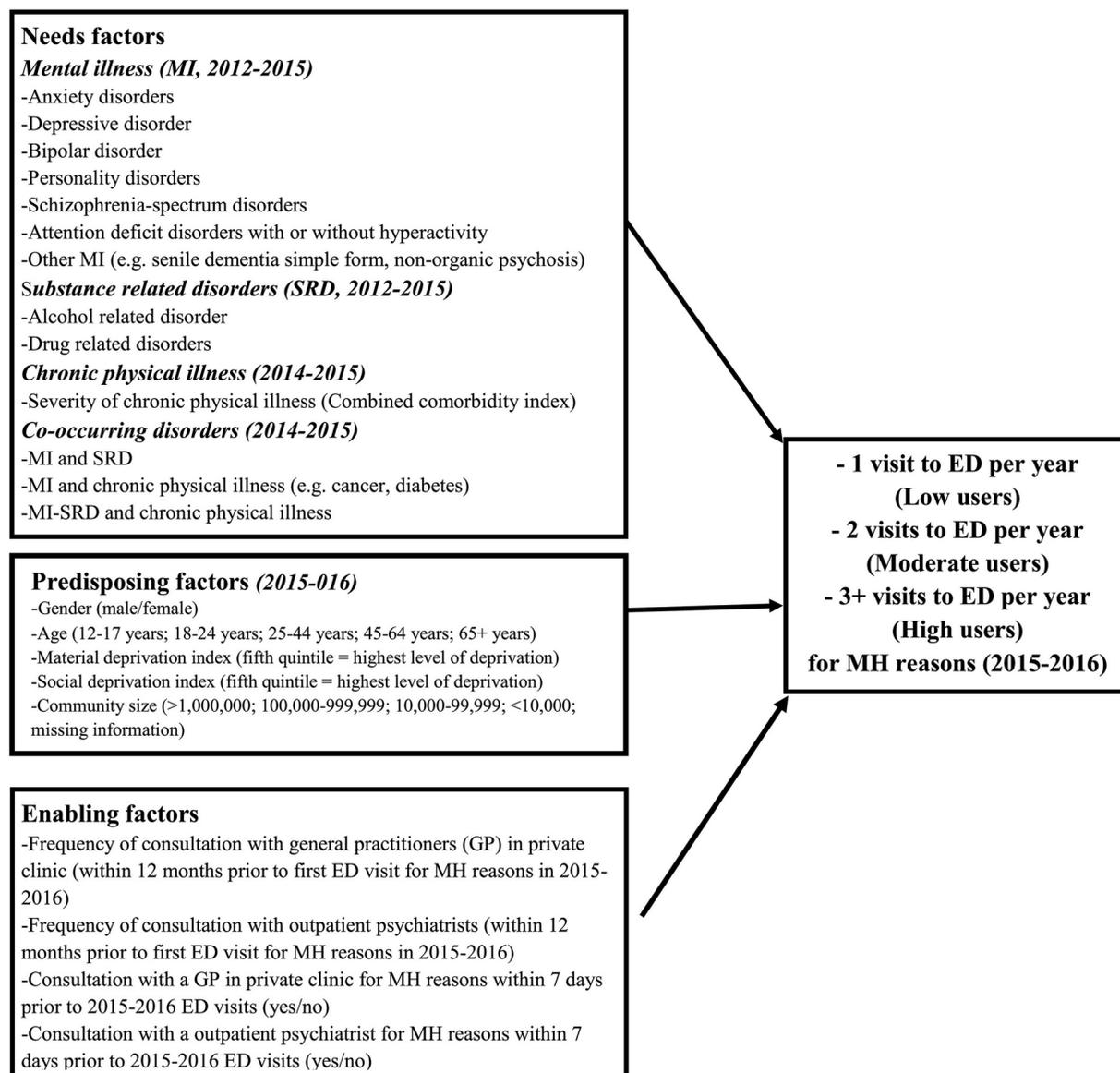


Fig. 1. Conceptual framework of variables; tested for associations with low, moderate, and high levels of emergency department (ED) visits for mental health (MH) reasons (2015–2016).

for ED use, including suicidal ideation and attempt [43–46], weak medication adherence [47] and co-occurring physical illness [1,48], were also prevalent among individuals with MI/SRD. Two psychiatric diagnoses, schizophrenia spectrum disorders and SRD, stood out in this connection. Patients with schizophrenia spectrum disorders, who tend to report numerous unmet needs [49], are often identified as very high ED users [2,16,19,50]. They experience frequent hospitalization and use of healthcare professionals [32,51,52]. These patients also require expedited access to care and intensive follow-up [53] in order to avoid recurring ED visits. Concerning patients with SRD, one explanation for their high ED use concerned problems in accessing health services due to stigmatization [54]. Many patients with SRD also deny their addiction, preferring to use ED rather than addiction services more appropriate to their needs [55,56]. Others use ED for reasons related to MI or physical illness [57].

Results also confirmed the associations between moderate or high ED use for MH reasons and severity of chronic physical illness. Another recent study using the QICDSS identified physical illness as the most common reason for ED use among patients with MI/SRD [58]. Few differences emerged, however, in severity of chronic physical illness

between moderate and high ED users for MI reasons. This suggests that higher ED use may actually have been prompted by MI/SRD rather than physical illness. It is also possible that patients with multiple and severe physical comorbidities received more support from specialized home-care services [14]. Most public service delivery systems give priority to patients with chronic physical illness, particularly those with multiple and severe conditions [59].

Regarding predisposing factors, results confirmed that age predicted frequency of ED use, except among the youngest (12–17) and oldest (65 years+) age groups. Previous studies found that younger patients used fewer MH services due to fears of stigma or the desire to solve their own problems [60,61]; this may also explain low ED use. By contrast, low ED use in the 65+ age cohort may have related to their higher rates of chronic physical illness [14], or to the under-diagnosis of MH problems among the elderly. Previous studies have reported the disproportionate use of ED by males [1,7,62], which may be explained by their lower use of primary care and other MH services relative to females [62]. Greater material and social deprivation associated with higher ED use also emerged as an important determinant of illness and health service use even in a public system with universal healthcare

**Table 2**  
 Characteristics of study participants according to frequency of emergency department (ED) visits for mental health (MH) reasons in 2015–2016.

Characteristics	Total		Low users: 1 ED visit		Moderate users: 2–3 ED visits		High users: 3+ ED visits		P-value
	N	%	N	%	N	%	N	%	
Overall	115,066	100	87,494	76.0	16,603	14.4	10,969	9.5	
<b>Predisposing factors</b>									
<b>Age</b>									
12–17 years	6706	5.8	5556	6.4	875	5.3	275	2.5	<0.0001
18–24 years	14,879	12.9	11,384	13.0	2130	12.8	1365	12.4	<0.0001
25–44 years	34,556	30.0	25,130	28.7	5298	31.9	4128	37.6	<0.0001
45–64 years	29,309	25.5	21,479	24.5	4412	26.6	3418	31.2	<0.0001
65+ years	29,616	25.7	23,945	27.4	3888	23.4	1783	16.3	<0.0001
<b>Gender</b>									
Male	54,973	47.8	40,910	46.8	8224	49.5	5839	53.2	
Female	60,093	52.2	46,584	53.2	8379	50.5	5130	46.8	<0.0001
<b>Material deprivation index</b>									
1: Least deprived	16,033	13.9	12,204	14.0	2353	14.2	1476	13.5	
2	18,238	15.9	14,117	16.1	2538	15.3	1583	14.4	<0.0001
3	20,729	18.0	15,942	18.2	2950	17.8	1837	16.8	<0.0001
4	23,047	20.0	17,452	20.0	3397	20.5	2198	20.0	<0.0001
5: Most deprived	26,385	22.9	19,882	22.7	3841	23.1	2662	24.3	<0.0001
Not assigned <sup>1</sup>	10,634	9.2	7897	9.0	1524	9.2	1213	11.1	<0.0001
<b>Social deprivation index</b>									
1: Least deprived	14,764	12.8	11,771	13.5	1924	11.6	1069	9.8	
2	16,962	14.7	13,415	15.3	2309	13.9	1238	11.3	<0.0001
3	19,021	16.5	14,877	17.0	2638	15.9	1506	13.7	<0.0001
4	235,98	20.5	17,807	20.4	3454	20.8	2337	21.3	<0.0001
5: Most deprived	30,087	26.2	21,727	24.8	4754	28.6	3606	32.9	<0.0001
Not assigned <sup>1</sup>	10,634	9.2	7897	9.0	1524	9.2	1213	11.1	<0.0001
<b>Community size</b>									
>1,000,000	51,086	44.4	38,194	43.7	7474	45.0	5418	49.4	<0.0001
100,000–999,999	24,572	21.4	18,362	21.0	3685	22.2	2525	23.0	<0.0001
10,000–99,999	15,677	13.6	12,337	14.1	2154	13.0	1186	10.9	<0.0001
<10,000	23,039	20.0	18,111	20.7	31,80	19.2	1748	15.9	<0.0001
Missing Information	692	0.6	490	0.6	110	0.7	92	0.8	<0.0001
<b>Enabling factors</b>									
<b>Number of GP<sup>2</sup> visits within one year</b>									
0 visit	82,268	71.5	63,717	72.8	11,321	68.2	7230	65.9	<0.0001
1–2 visits	21,755	18.9	15,946	18.2	3408	20.5	2401	21.9	<0.0001
3–4 visits	6245	5.4	4456	5.1	1043	6.3	746	6.8	<0.0001
5+ visits	4798	4.2	3375	3.9	831	5.0	592	5.4	<0.0001
<b>Number of outpatient psychiatrist visits within one year</b>									
0 visit	98,418	85.5	77,639	88.7	13,335	80.3	7444	67.9	<0.0001
1 visit	3798	3.3	2402	2.7	695	4.2	701	6.4	<0.0001
2–4 visits	4942	4.3	3049	3.5	988	6.0	905	8.3	<0.0001
5+ visits	7908	6.9	4404	5.0	15,85	9.5	1919	17.5	<0.0001
GP visit within 7 days (yes/no)	3754	3.3	2781	3.2	597	3.6	376	3.4	<0.0013
Outpatient Psychiatrist visit within 7 days (yes/no)	2705	2.6	1537	1.8	539	3.2	629	5.7	<0.0001
<b>Needs factors</b>									
Anxiety disorders <sup>3</sup>	37,695	32.8	25,746	29.4	6440	38.8	5509	50.2	<0.0001
Depressive disorder <sup>3</sup>	30,100	26.2	19,725	22.5	5429	32.7	4946	45.1	<0.0001
Personality disorders <sup>3</sup>	10,359	9.0	5858	6.7	2000	12.0	2501	22.8	<0.0001
Schizophrenia spectrum disorders <sup>3</sup>	16,026	13.9	9032	10.3	3229	19.4	3765	34.3	<0.0001
Bipolar disorder <sup>3</sup>	7754	6.7	4382	5.0	1524	9.2	1848	16.8	<0.0001
Alcohol related disorder <sup>3</sup>	11,188	9.7	6242	7.1	2217	19.8	2729	24.4	<0.0001
Drug related disorders <sup>3</sup>	9264	8.1	5007	5.7	1864	13.4	2393	21.8	<0.0001
Substance related disorders (SRD) (drug and alcohol) <sup>3</sup>	16,581	14.4	9564	10.9	3261	19.6	3756	34.2	<0.0001
Co-occurring MI <sup>4</sup> and SRD	12,620	11.0	6717	7.7	25,89	20.5	3314	26.3	<0.0001
Co-occurring MI and chronic physical illness <sup>5</sup>	18,156	16.1	12,029	13.7	3265	19.7	2862	26.1	<0.0001
Co-occurring MI-SRD and chronic physical illness <sup>5</sup>	4533	3.9	2308	2.6	923	5.6	1302	11.9	<0.0001
<b>Combined comorbidity index score<sup>5</sup></b>									
0	78,694	68.4	60,587	69.2	10,954	66.0	7153	65.2	<0.0001
1	5815	5.1	4124	4.7	926	5.6	765	7.0	<0.0001
2	8671	7.5	6262	7.2	1402	8.4	1007	9.2	<0.0001
3+	21,886	19.0	16,521	18.9	3321	20.0	2044	18.6	<0.0001

<sup>1</sup> Missing address, or living in an area where index assignment is not feasible. An index cannot usually be assigned to residents of long-term health care units.

<sup>2</sup> GP: general practitioners.

<sup>3</sup> In the three years (2012–2015) before the first 2015–2016 ED visit.

<sup>4</sup> MI: mental illness.

<sup>5</sup> Chronic physical illness: chronic pulmonary disease, cardiac arrhythmias, tumor w/o metastasis, renal disease, fluid electrolyte disorders, myocardial infarction, congestive heart failure, metastatic cancer, dementia, stroke, Neurological disorders, liver disease, pulmonary circulation disorders, coagulopathy, weight loss, paralysis, AIDS/HIV. See appendix (collected in 2014–2015).

**Table 3**

Estimations of regression coefficients and odds ratios on emergency department (ED) visits for mental health (MH) reasons in 2015–16, from the multinomial logistic regression model. Reference group of the model is low ED users.

Variables <sup>1</sup>	Moderate users: 2–3 ED visits				High users: 3 + ED visits			
	Coefficients	P-value	OR	95% CI	Coefficients	P-value	OR	95% CI
<b>Needs factors</b>								
Anxiety disorders <sup>2</sup>	0.20	<0.0001	1.23	1.18–1.28	0.39	<0.0001	1.48	1.42–1.56
Depressive disorder <sup>2</sup>	0.24	<0.0001	1.27	1.22–1.32	0.39	<0.0001	1.48	1.41–1.56
Personality disorders <sup>2</sup>	0.18	<0.0001	1.20	1.13–1.27	0.48	<0.0001	1.62	1.52–1.72
Schizophrenia spectrum disorders <sup>2</sup>	0.42	<0.0001	1.52	1.44–1.60	0.79	<0.0001	2.20	2.09–2.33
Bipolar disorder <sup>2</sup>	0.15	<0.0001	1.16	1.09–1.24	0.32	<0.0001	1.37	1.28–1.47
Substance-related disorders (drug and alcohol) <sup>2</sup>	0.40	<0.0001	1.49	1.42–1.56	0.80	<0.0001	2.23	2.12–2.35
Combined comorbidity index score <sup>3</sup>	0.03	<0.0001	1.03	1.02–1.04	0.04	<0.0001	1.05	1.04–1.06
<b>Predisposing factors</b>								
Age 18–24 years	0.05	0.24	1.05	0.97–1.15	0.55	<0.0001	1.74	1.52–2.00
Age 25–44 years	0.07	0.09	1.07	0.99–1.16	0.65	<0.0001	1.92	1.69–2.18
Age 45–64 years	–0.0002	0.99	1.00	0.92–1.08	0.57	<0.0001	1.76	1.55–2.01
Age 65+ years	–0.16	0.0002	0.85	0.78–0.93	0.02	0.74	1.02	0.89–1.18
Female	–0.08	<0.0001	0.92	0.89–0.95	–0.16	<0.0001	0.86	0.82–0.90
Material deprivation index 2: somewhat less deprived	–0.05	0.13	0.95	0.90–1.01	–0.02	0.70	0.99	0.91–1.07
Material deprivation index 3	–0.03	0.40	0.97	0.92–1.04	–0.01	0.88	0.99	0.92–1.07
Material deprivation index 4	0.01	0.17	1.01	0.95–1.08	0.05	0.16	1.06	0.98–1.14
Material Deprivation Index 5: most deprived	0.001	0.97	1.00	0.94–1.06	0.10	0.006	1.11	1.03–1.20
Social deprivation index 2: somewhat less deprived	0.04	0.19	1.05	0.98–1.12	–0.01	0.78	0.99	0.90–1.08
Social deprivation index 3:	0.07	0.04	1.07	1.00–1.14	0.05	0.27	1.05	0.96–1.14
Social deprivation index 4:	0.12	0.0002	1.13	1.06–1.20	0.20	<0.0001	1.22	1.13–1.32
Social deprivation index 5: most deprived	0.19	<0.0001	1.21	1.14–1.29	0.30	<0.0001	1.36	1.25–1.46
Deprivation index: missing	0.07	0.09	1.08	0.99–1.18	0.33	<0.0001	1.40	1.25–1.56
Community size: 100,000–999,999	0.01	0.67	1.01	0.97–1.06	–0.07	0.02	0.94	0.89–0.99
Community size: 10,000–99,999	–0.12	<0.0001	0.89	0.85–0.94	–0.42	<0.0001	0.66	0.62–0.71
Community size: <10,000	–0.02	0.43	0.98	0.93–1.03	–0.18	<0.0001	0.83	0.78–0.89
Community size: missing	0.08	0.45	1.09	0.88–1.35	–0.01	0.93	0.99	0.77–1.26
<b>Enabling factors</b>								
GP <sup>4</sup> visit within 7 days	0.02	0.63	1.02	0.93–1.13	0.01	0.86	1.01	0.90–1.14
1–2 GP visits within one year	–0.01	0.73	0.99	0.95–1.04	–0.08	0.0045	0.92	0.87–0.98
3–4 GP visits within one year	0.04	0.34	1.04	0.96–1.12	–0.05	0.24	0.95	0.87–1.04
5+ GP visits within one year	0.03	0.44	1.03	0.95–1.13	–0.11	0.03	0.90	0.81–0.99
Outpatient psychiatrist visit within 7 days (yes/no)	0.01	0.85	1.01	0.90–1.13	0.02	0.67	1.03	0.95–1.13
1 outpatient psychiatrist visit within one year	0.17	0.0002	1.18	1.08–1.30	0.37	<0.0001	1.44	1.31–1.59
2–4 outpatient psychiatrist visits within one year	0.23	<0.0001	1.26	1.16–1.37	0.27	<0.0001	1.31	1.20–1.43
5+ outpatient psychiatrist visits within one year	0.23	<0.0001	1.26	1.17–1.36	0.44	<0.0001	1.55	1.44–1.68

<sup>1</sup>Reference groups for independent variables with multiple categories are: age 12–17 years, gender male, deprivation index 1: least deprived, community size over 1 million, 0 general practitioner (GP) visit within one year, 0 psychiatrist visit within one year.

<sup>2</sup>In the three years (2012–2015) before the first 2015–2016 ED visit.

<sup>3</sup>Chronic physical illness: chronic pulmonary disease, cardiac arrhythmias, tumor w/o metastasis, renal disease, fluid electrolyte disorders, myocardial infarction, congestive heart failure, metastatic cancer, dementia, stroke, neurological disorders, liver disease, pulmonary circulation disorders, coagulopathy, weight loss, paralysis, AIDS/HIV. See appendix.

<sup>4</sup>GP: general practitioners.

[1,22,63,64]. Moreover, high ED use was more strongly associated with social deprivation than material deprivation, which underscores the isolation experienced by high, but also moderate, ED users living in neighborhoods where social relations are weak. Social and material deprivations have also been associated with increased risk of depression, suicidal ideation and, in turn, with ED use [64]. As well, low income and weak social networks, coupled with transportation problems, lack of information about health resources and stigmatization by primary care providers, commonly occur among patients with complex MI/SRD [65]. Individuals living in areas with unassigned deprivation indexes, many of whom were likely residents of long-term care facilities, were also over-represented among high ED users. High ED users may have included homeless individuals affected by co-occurring MI/SRD and chronic physical illness as well [66]. Finally, the association between living in larger communities and higher ED use was logical, as numerous individuals affected by complex MI/SRD tend to settle near specialized services [67,68].

Regarding enabling factors, the association between frequency of outpatient consultations in psychiatry and higher frequency of ED visits may be explained by the fact that psychiatrists tend to treat mainly patients with severe illness. Yet, in contrast to previous research

[1,6,62], this study found that access to an outpatient psychiatrist provided insufficient protection against ED use. This finding further suggests that the intensity of MH service provision in Quebec may be inadequate to meet the needs of high ED users, exacerbating their use of ED as a viable alternative in difficult moments [17]. The negative association between high ED use for MH reasons and GP consultations seems to confirm a lack of access to primary care services and weak continuity of care. Overall, the great majority of patients in our sample did not consult both a GP and a psychiatrist in the 12 month period preceding ED use. Studies on follow-up care have recommended a minimum of 3 annual GP visits for individuals with common MI (depressive disorder, anxiety disorders) [69,70] and at least 4 visits for those with serious MI (e.g. schizophrenia spectrum disorders) [71]. The fact that about 21% of the Quebec population does not have a family physician [72], and quite the double for patients with MI/SRD that have use ED according to a recent study [73], poses a serious obstacle to such directives. Moreover, research has found that most GPs have limited ability to treat MI/SRD [74,75], making ED a more reliable alternative for many.

Among the strategies proven to reduce high ED use for MH reasons are assertive community treatment [53,76], intensive case management

[53,76], home treatment teams [77], and care planning [76,78]. These best practices improve access and continuity of care, reducing ED use among patients with schizophrenia spectrum disorders. The integration of addiction liaison nurses in ED may improve SRD screening and facilitate referrals to addiction services [79,80]. Formal liaison mechanisms between addiction services and primary care may also reduce ED visits among SRD patients [81]. Other needs among patients affected by MI/SRD and/or co-occurring chronic physical conditions call for greater support from specialized services and better access to GP. Outreach services and community-based resources (e.g. self-help groups, day centers, work integration programs) may lead to improved social integration among patients living in more deprived areas, and help reduce ED use. Strategies such as shared-care [82] or case management [76,83] are other promising preventive measures for moderate ED users. Finally, decision-makers should consider the establishment of brief intervention units [84], collaboration with crisis centers [85], and extended hours of operation in primary care and community-based resources [86] as remedies for accidental ED use.

A number of limitations in this study should be acknowledged. First, the use of administrative databases not originally designed for epidemiological research led to the omission of key variables such as homelessness [22] and race/ethnicity [1] that were associated with ED use in previous research. Second, our study focused on medical services as documented in the selected databases, but did not include psychosocial services or community-based resources. Third, results from the QICDSS were slightly underestimated due to a few percentages of missing data on MI/SRD diagnoses for ED patients. Finally, administrative data had limited capacity to provide meaningful information related to the development of targeted interventions.

### 5. Conclusions

To our knowledge, this study is the first to identify and compare factors associated with low, moderate and high ED use for MH reasons,

using the Andersen Behavioral Model. Needs factors explained most of the variation in frequency of ED use, with high ED users more affected by MI, particularly schizophrenia spectrum disorders and SRD, and by more severe chronic physical illness as compared with moderate or low users. Some predisposing and enabling factors also emerged as important. In particular, high ED use was predicted by more psychiatric consultations and not having consulted a GP during the year preceding an ED visit. This suggests the importance of increasing specialized care provision, as well as access to primary care services and continuity of care. Social and material deprivation, mainly occurring in large communities, were both identified as strongly related to high ED use, but also affected moderate ED users. These results support the need to implement prevention strategies in poor neighborhoods with considerable social and material deprivation.

### Declaration of Competing Interest

The authors declare no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Appendix. Combined index of medical conditions and ICD-9 and ICD-10 codes for Charlson comorbidities used to define the Combined Index. (Shaded areas represent the ICD codes used to define the Combined index of medical conditions).

Combined index of medical conditions	Charlson	
	ICD-9	ICD-10
Hypertension		
Chronic pulmonary disease	490x–505.x, 506.4, 508.1, 508.8 <sup>a</sup>	I27.8 <sup>c</sup> , I27.9 <sup>c</sup> , J40.x–J47.x, J60.x–J64.x, J65.x, J66.x, J67.x, J68.4, J70.1, J70.3
Cardiac arrhythmia		
Diabetes, uncomplicated	250.0–250.2, 250.3 <sup>a</sup>	E10.0, E10.1, E10.9, E11.0, E11.1, E11.9, E13.0, E13.1, E13.9, E14.0, E14.1, E14.9
Any tumor without metastasis	140.x–172.x, 174.x, 175.x, 179.x–195.x, 200.x, 201.x, 202.x, 203.0, 238.6, 273.3	C00.x–C26.x, C30.x–C34.x, C37.x–C41.x, C43.x, C45.x–C58.x, C60.x–C76.x, C81.x–C85.x, C88.x, C90.0, C90.2, C96.x
Renal disease	403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93, 585.x, 586.x, 588.0, V42.0, V45.1, V56.x	I12.0 <sup>c</sup> , I13.1 <sup>c</sup> , N18.x, N19.x, N25.0, Z49.x, Z94.0, Z99.2
	Only 4 digits	
Fluid and electrolyte disorders	403.0, 403.1, 403.9, 404.0, 404.1, 404.9, 585.x, 586.x, 588.0, V42.0, V45.1, V56.x	
Myocardial infarction	410.x, 412.x	I21.x, I22.x, I25.2
Congestive heart failure	398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.x	I09.9 <sup>c</sup> , I11.0 <sup>c</sup> , I13.0 <sup>c</sup> , I13.2 <sup>c</sup> , I25.5 <sup>c</sup> , I42.0 <sup>c</sup> , I42.5–I42.9 <sup>c</sup> , I43.x <sup>c</sup> , I50.x, P29.0 <sup>c</sup>
	Only 4 digit	
Valvular disease	402.1, 404.1, 428.x	
	394.x–397.x, 424.x, 746.3–746.6, V42.2, V43.3	I05.x–I08.x, I09.1, I09.8, I34.x–I39.x, Q23.0–Q23.3, Q23.8, Q23.9, Z95.2, Z95.3, Z95.4
Metastatic cancer	196.x–199.x	C77.x–C79.x, C80.x
Cerebrovascular disease	362.34 <sup>a</sup> , 430.x–438.x	G45.x, G46.x, I60.x–I69.x

Neurological disorders		
Liver disease	Mild liver disease 070.22 <sup>a</sup> , 070.23 <sup>a</sup> , 070.2 <sup>b</sup> , 070.32 <sup>a</sup> , 070.33 <sup>a</sup> , 070.3 <sup>b</sup> , 070.44 <sup>a</sup> , 070.4 <sup>b</sup> , 070.54 <sup>a</sup> , 070.5 <sup>b</sup> , 571.x, 573.3, 573.4, 573.9, V42.7 Moderate or severe liver disease 456.0–456.2, 572.3, 572.8 250.3 <sup>b</sup> , 250.4–250.9	B18.x, K70.0–K70.3, K70.9, K71.3–K71.5, K71.6, K71.7, K73.x, K74.x, K75.4, K76.0, K76.1, K76.3, K76.4, K76.8, K76.9, Z94.4  I85.x, I86.4, I98.2, K71.1, K72.1, K72.9, K76.5–K76.6 E10.2–E10.8, E11.2–E11.8, E13.2–E13.8, E14.2–E14.8
Diabetes, complicated		
Pulmonary circulation disorders		
Rheumatoid arthritis/collagen vascular disease	446.5, 710.0–710.4, 714.0–714.2, 714.8, 725.x	M05.x, M06.x, M31.5, M32.x–M34.x, M35.0, M35.1, M35.3
Coagulopathy		
Weight loss		
Paralysis	334.1, 342.x, 343.x, 344.0, 344.1, 344.2, 344.3, 344.4, 344.5, 344.6, 344.8, 344.9	G04.1, G11.4, G80.x, G81.x, G82.x, G83.x
Ulcer disease	531.x–534.x	K25.x–K28.x
AIDS/HIV	042.x–044.x	B20.x–B24.x

Abbreviations: ICD-9 = International classification of diseases 9th edition (When no indication, ICD-9-CM code equivalent to ICD-9-QC code); ICD-10 = International classification of diseases 10th edition. (ICD-10-CM code equivalent to ICD-10-CA code. Include all codes to be equivalent to ICD-9-CM codes.)

<sup>a</sup> To include code in ICD-9-CM only.

<sup>b</sup> To include code in ICD-9-QC only.

<sup>c</sup> To exclude code to be equivalent to ICD-9-QC.

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