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Profiles Of Patients Treated For Gambling Disorder Based On Gambling Activities And Related Features

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Abstract. Aims: This study identified profiles of gambling activities among patients with gambling disorder (GD), and associated those profiles to patient characteristics and the quality of care they received. Methods: Public health (2009-2021) and education administrative data (1979-2021) from Quebec (Canada) were linked to a cohort of 705 patients with GD. Latent class analysis was used to identify gambling profiles based on types of games, gambling settings, and chronic GD (5+ years). Bivariate analyses examined associations between patient sociodemographic and clinical characteristics, and service use including GD treatments in addiction centers over 12 years and other public care in the year before patient index date (last patient GD diagnosis or treatment recorded). Results: Three profiles were found. Profile 1 (50% of the cohort) mainly included patients with chronic GD, games of chance players (e.g., slot machines) who gambled in bar settings. Profile 2 (23%) was mostly composed of younger individuals with acute GD (<5 years) who favored table games online or in casinos. Profile 3 (27%) mainly included men who were multi-game gamblers. Profile 1 had the most women and older patients, who had the most severe conditions and received the most services. Conversely, Profile 2 patients had the least problems and lowest service use. Profile 3 shared the characteristics of other profiles, but showed a high number of young adults and patients with chronic GD. Conclusion: Tailored interventions are recommended for each profile. More social and health services are needed, given that these patients had important unmet needs.

Keywords: Gambling Disorder, Type of Games, Gambling Settings, Gambling Activities, Latent Class Analysis

Introduction

Gambling disorder (GD) has emerged as an important public health issue, especially in recent years with the rapid expansion of online gambling platforms (Wardle et al., 2024). Affecting between 0.7% and 7% of individuals in their lifetime (Calado & Griffiths, 2016), with a chronicity equivalent to or higher than substance-related disorders (SRDs) (Gooding et al., 2022), GD has key detrimental impacts on affected individuals, their relatives, and on society. It is estimated that by 2028, net losses by consumers will top US$700 billion (Wardle et al., 2024). Besides financial losses, GD is associated with multiple adverse outcomes that may lead to interpersonal violence, including mounting debt, disruption of employment or family life (Moreira et al., 2023), poverty, homelessness, and criminality (Matheson et al., 2014). GD also frequently co-occurs with mental disorders (MDs), SRDs, and chronic physical illnesses (Schluterman et al., 2025).

Individuals affected by GD are not a homogeneous population, with differences observed in the severity of the harms they face, their sociodemographic or clinical characteristics, and contextual features like the support they receive. Studies also found that players differ according to the gambling settings they favor—the types of games they play, the context in which gambling occurs (Mathieu et al., 2020). Strategy games like poker, blackjack and sports betting may involve skills, while others like lottery and slot machines are purely based on chance, with little or no decision-making on the part of the player (Bonnaire, 2015). Games can be played on online platforms or in more traditional settings such as bars, casinos, or gambling halls. Gambling halls are typically smaller and less elaborate than casinos; they often focus on specific games and may be standalone or located within larger complexes such as hotels, restaurants, or shopping centers. Some individuals engage in various games played in diverse settings: those are referred to as “multi-game gamblers” (or mixed, heavy, or extensive gamblers) (Mathieu et al., 2020). A study reported that 60% of problem gamblers (risky gambling, including GD) regularly participate in more than one game, with 25% of them engaging in four or more forms of gambling (Binde et al., 2017). Men and younger individuals with higher income are reported to favor table games in casinos and sports betting (Mathieu et al., 2020; Moragas et al., 2015; Svensson & Romild, 2014), while women and older individuals gravitate towards games of chance like lotteries and slot machines (Odlaug et al., 2011). Online gamblers were stated to have a higher level of education than “land-based” gamblers (Gainsbury et al., 2014). Players of electronic gaming machines (e.g., slot machines), poker, sports betting, and multi-game gamblers were found to be more prone to problem gambling than other gamblers (Binde et al., 2017). Players who gamble online or in casinos (Binde et al., 2017) may also be more at risk, while multi-game gamblers may be more susceptible to co-occurring issues like psychological distress or SRDs than other gamblers (Goudriaan et al.,

2009; Mathieu et al., 2020). However, we found no study that compares health-seeking patterns for different types of problem gambling, this even though service use for GD is globally reported to be quite low in the general population (Loy et al., 2018). Increasing knowledge about how gambling activities are related to other patient characteristics such as the severity of conditions and the quality of care received could help improve preventive intervention and treatment for GD and related issues, especially in health-seeking populations that constitute a vulnerable group (Sharman et al., 2019).

We only found a few studies that identified gambler typologies while differentiating gaming activities. Based on "person-centered approaches", they correlate specific user characteristics rather than variables in heterogeneous populations or subgroups. Those typologies usually identify 4 to 6 gambler profiles, including specific profiles of lottery players (Boldero et al., 2010; Lloyd et al., 2010; Studer et al., 2016), sports bettors (Lloyd et al., 2010), electronic gaming machine players (Goudriaan et al., 2009; Studer et al., 2016), multi-game gamblers (Boldero et al., 2010; Goudriaan et al., 2009; Lloyd et al., 2010; Studer et al., 2016), and casino gamblers (Goudriaan et al., 2009; Studer et al., 2016). However, several typologies that focus more broadly on gambling have been published: these usually integrate the risk of developing problem gambling and GD severity using population surveys, or focus on GD among clinical or health-seeking populations. Most studies include few demographic and clinical patient characteristics, mainly psychopathology and personality traits derived from cross-sectional data (Granero et al., 2018; Studer et al., 2016; Szerman et al., 2023).

To our knowledge, no previous typology has formulated profiles of gamblers with GD based on the types of games they play and their favored gambling settings, using a large clinical population of patients 12 years and older. This study is based on comprehensive data, representative of the Quebec population who uses addiction treatment centers. Data included all the province's public service use for this population over a 12-year period, contrasting patients with acute or chronic GD—defined in the recovery literature as having had GD for at least five years (White, 2012). We found very few typologies that include long-term gamblers, or that assess GD service use over more than a year (Goudriaan et al., 2009). This study is also innovative in that it measured the quality of the care patients with GD received, both for GD and other health issues—co-occurring disorders are quite prevalent among this health-seeking population (Dowling et al., 2015). Indicators such as the motivation to obtain care, treatment dropout, and continuity and regularity of physician care were measured and associated with the gambling profiles. This study thus aimed to identify profiles of gambling activities (types of games/gambling settings, including GD chronicity), and to associate those profiles with the patients' sociodemographic characteristics, clinical characteristics and service use, in

order to suggest more targeted interventions aimed at these vulnerable populations.

Methods

Study design and sample

The initial cohort study included 23,474 patients treated in 14 of Quebec's (Canada) addiction treatment centers between April 1, 2012 and March 31, 2013—only two very small and remote centers did not participate. In Quebec, addiction treatment centers are the main specialized public organizations offering a range of residential and outpatient treatment for GD and SRDs, primarily through individual and group therapy. Patients may come to those centers of their own accord or be referred by another organization or by court order. Those patient data were merged with the provincial public social and health databases (2009-2021, a 12-year period), and with the public education database (1979-2021). To be included in the initial study, patients had to be at least 12 years old, and for this specific study identified as having a GD between 2009 and 2021 either based on physician records, the Addiction Severity Index (Bergeron et al., 1992) or the Global Appraisal of Individual Needs scales (Dennis et al., 2008). Patient records also needed to include which gambling games were problematic for them (e.g., table games), as well as the main settings in which they gambled (e.g., casinos). Cohort data were aggregated considering the "index date", defined as a patient's last GD diagnosis date or last date of GD treatment received in addiction treatment centers. For patients with several GD diagnoses or treatment episodes between 2009 and 2021, the end date of the last recorded GD was considered the index date.

Study sources

Initial data were extracted from the addiction treatment center databases (SIC-SRD), which included information on patient sociodemographic characteristics, GD and SRDs, and treatments provided. SIC-SRD data were then linked with data from the Ministry of Health and Social Services, and the Quebec Health Insurance Plan (*Régie de l'assurance maladie du Québec* [RAMQ], 2009-2021), which included the following: Health Insurance Registry (FIPA, for demographic data), Physician Claims Database (RAMQ), Hospital Inpatient Database (MED-ECHO), Emergency Department Service Use Database (BDCU), Community Healthcare Centers Service Use Database (I-CLSC—mostly psychosocial services). Data from the Education Ministry were incorporated (1979-2021) only for the level of education. In Quebec, both the healthcare and education systems are mainly public, providing coverage for medical and the most key psychosocial services, as well as secondary and postsecondary education. The RAMQ billing system integrates nearly all Quebec physicians—only about 6% operate outside the public system (Régie de l'assurance maladie du Québec, 2017). Data were merged for each patient and year using a unique patient identifier that allowed integration of variables (e.g.,

diagnoses) across multiple databases (**Table 1** footnotes). This study followed the Strobe guideline for epidemiological studies (Vandenbroucke et al., 2007). Access to databases was authorized by the Quebec Commission for Access to Information, and the study protocol was approved by the ethics review board of a health organization.

Study variables

Profiles of gambling activities integrated data from 2009-2010, up to the patient's index date. The start and end dates of each care episode or treatment admission in addiction centers for GD (or SRD) are registered for each patient in the SIC-SRD. For each care episode, patients are recorded as having completed or dropped out of their treatment episode, with additional information such as the number and duration of treatments. Variables included in gambling profiles encompassed: chronic GD, types of gambling games, and settings in which gambling occurred. As mentioned earlier, chronic GD was defined as having GD for at least 5 years—a common benchmark for recovery (White, 2012). The gambling games considered were: lottery/bingo/keno, slot machines/video-lottery, table games (e.g., blackjack, poker), and sports betting (e.g., horse or dog racing). Gambling settings were classified as: casinos, bars/taverns/breweries, online gaming platforms, and gambling halls.

Covariates were linked to each gaming profile and included the patients' sociodemographic and clinical characteristics and their service use, categorized as GD treatments in addiction treatment centers or other public outpatient care, for co-occurring issues or preventive care. Variable selection was based on prior typologies for health-seeking populations, including risk factors and behaviors that could influence a patient's conditions and service use (Fleury et al., 2025; Granero et al., 2020). Sociodemographic characteristics integrated: sex at birth, age group, education level, unemployed/retired, living alone, living in more materially or socially deprived areas, residing in urban areas (>100,000), all measured at index date. History of homelessness and criminal history were measured from 2009 to index date. Using the smallest dissemination areas where patients resided, the Material Deprivation Index incorporated employment ratios, average income, and education levels; the Social Deprivation Index measured the proportion of individuals who were single, living alone, or single parents (Pampalon et al., 2009). Both indexes were classified in quintiles, but for analysis purposes areas were categorized either as least (1-3) or most deprived (4-5 or unassigned areas like homelessness).

Measured within a 3-year period preceding index date, clinical characteristics included: MDs, SRDs, chronic physical illnesses, and suicidal behavior (suicide attempt/ideation). Diagnostic codes were based on the International Classification of Diseases, Ninth or Tenth Revisions (though GD appeared only in the latter—see **Appendix 1**). In order to capture "true MDs" and prevent clinical biases from non-MD specialists, MDs were defined as requiring at least one diagnosis in the hospitalization

database (MED-ECHO) or from psychiatrists (RAMQ/BDCU), or at least two MD diagnoses by general practitioners during the 3-year period (Blais et al., 2014). MDs encompassed common MDs (e.g., anxiety and depressive disorders), serious MDs (e.g., bipolar disorders), and personality disorders. As SRDs are often underdiagnosed in administrative databases (Huynh et al., 2021) only one diagnosis was required; they were also assessed with the same standardized instruments used to diagnose GD. SRDs comprised substance-induced or use disorders, and intoxication or withdrawal from alcohol and drugs. Chronic physical illnesses were measured based on an adapted version of the Charlson and Elixhauser comorbidity indexes, with chronicity entailing the presence of at least two diagnoses (Simard et al., 2018). Suicidal behavior was documented by physicians during hospitalization, or in emergency departments by triage nurses trained to recognize such issues (Rahme et al., 2016).

Assessed from 2009 to the index date, GD treatment variables included: repeated (2+) GD treatment episodes, residential GD treatment, and high rate of self-referral to or dropout from GD treatment. Measured over the 12 months preceding index date, other outpatient care integrated: high continuity of physician care; high intensity or regularity of care from any provider; and acute care use. Residential treatment involved both accommodation and intensive therapeutic interventions for GD. Self-referral to GD treatment and dropout rates served as proxies for patient motivation and were categorized as "high" when they happened over 66% of the time—this threshold, as well as most of those mentioned hereafter (e.g., 12+ services/year), were determined based on empirical distribution. Continuity of physician care was assessed using the Usual Provider Continuity Index (Breslau & Reeb, 1975), which calculates the proportion of outpatient consultations with a usual physician (e.g., family physician) relative to all physicians consulted (e.g., in walk-in practice)—a score of ≥0.80 was considered indicative of high care continuity (Ionescu-Ittu et al., 2007). Intensity of outpatient care was measured by the mean number of treatments received from general practitioners and psychiatrists in addiction treatment centers both for GD and SRDs, and community healthcare centers (the main providers of public psychosocial services in Quebec). High care intensity was defined as receiving 12+ services/year, which could either represent around one service use per month or several services received over fewer months. An indicator of close patient follow-up (Moorin et al., 2020), "high regularity of care" specifies whether patients received services in each 4-month period of a 12-month cycle, as opposed to low (services received <2 periods) or moderate (in 2 periods) regularity of care. Contrasting intensity of care, regularity of care measured whether patients received "constant" formal help over the previous year. Acute care integrates emergency department use and hospitalization, both reflecting patient vulnerability or possible unmet needs in outpatient care (Becker et al., 2017; Sun et al., 2013).

Data analysis

Descriptive analyses for categorical variables included frequencies and percentages. The study had no missing data, except for the education level variable (17% missing), justifying multiple imputation (Van Buuren & Groothuis-Oudshoorn, 2011) with 20 imputations conducted (see **Table 1** footnotes). Sensitivity analyses were also produced for this variable by comparing the imputed results to the raw data for each profile, yielding very similar findings (**Appendix 2**). Latent class analysis (Goodman, 1974) was conducted to identify subgroups of patients with GD based on their gambling activities (types of games/gambling settings; GD chronicity). Unlike traditional cluster analysis which relies on arbitrary distance metrics, LCA offers model-based classification with formal tests of fit and probabilistic class membership (Hagernaars & McCutcheon, 2009). To determine the optimal number of classes, a series of increasingly complex models were estimated. Model fit was assessed using the Akaike Information Criterion (AIC) (Akaike, 1987), Bayesian Information Criterion (BIC) (Schwarz, 1978), Consistent Akaike Information Criterion (CAIC) (Bozdogan, 1987), and entropy values (Celeux & Soromenho, 1996). Bivariate analyses were then used to examine associations between covariates and class membership. Chi-square tests were applied for variables without missing data, and multinomial logistic regression used for the imputed postsecondary education variable. Multinomial model comparing one reference profile with all others and adjusting for all covariates was not performed because: (i) no single profile was judged sufficiently distinctive to serve as a reference category; (ii) cohort size provided only limited statistical power for such an analysis. LCA was performed using SAS 9.4 (Lanza et al., 2007). Other analyses were conducted with Stata 18.

Results

From the initial cohort of 23,474 patients, 3715 had GD, and among those 705 (19%) had at least one record of a gambling type and setting. Of the 705 patients in the final cohort, 45% had chronic GD; 49% were treated for table games use, 46% for slot machines/video-lottery, 37% for lotteries/bingo/keno, and 9% for sports betting (**Table 1**). While most of them played in bars/taverns/breweries (79%), 28% gambled online, 25% in casinos, and 24% in gambling halls. Among patients, 75% were men, 57% were age 34-59, 22% had postsecondary education, 57% were unemployed/retired, and 51% lived alone; 49% and 60% lived in more materially or socially deprived areas, respectively; 55% lived in urban areas; 17% had a history of homelessness and 18%, a history of criminality. In the cohort, 68% of patients had MDs, 60% had common MDs (37% depressive disorders, 41% anxiety disorders), 55% had SRDs, 46% had chronic physical illnesses, and 18% exhibited suicidal behavior. As for treatment in addiction treatment centers, 51% experienced repeated GD treatment episodes, 9% received residential treatment, 62% showed a high

rate of self-referral and 53%, a high dropout rate. In terms of other outpatient care, 47% received a high continuity of physician care, 32% had high care intensity, 48% showed high use of regular care, and 55% used acute care.

Table 1. Characteristics of patients with a gambling disorder (GD) (N=705)

		n	%
GD characteristics (measured from 2009-2010 to index date) [1]			
Chronic GD (≥5 years) [a, b, c]		320	45.39
Lotteries/bingo/keno [a]		261	37.02
Slot machines/video-lottery [a]		321	45.53
Table games [a]		348	49.36
Sports betting [a]		60	8.51
Casinos [a]		179	25.39
Gambling halls [a]		168	23.83
Bars/taverns/breweries [a]		558	79.15
Online gambling platforms [a]		195	27.66
Patient sociodemographic characteristics (measured at index year, the last year available or other as specified)			
Sex at birth [d]	Women	175	24.82
	Men	530	75.18
Age group (years) [d]	14-34 [2]	188	26.67
	35-59	401	56.88
	60+	116	16.45
Postsecondary education (%, 95% C.I.) [3 e]		22.16	(19.23, 25.09)
Unemployed/retired [4 a]		402	57.02
Living alone (including single parent) [a]		342	51.04
Living in more materially deprived areas (index 4-5 or areas not assigned) [d]		348	49.36
Living in more socially deprived areas (index 4-5 or areas not assigned) [d]		421	59.72
Urban areas (>100,000) [d]		385	54.61
History of homelessness (measured from 2009-2010 to index date) [a, c]		122	17.30
Criminal history (measured from 2009-2010 to index date) [a]		130	18.44
Patient clinical characteristics (measured within a 3-year period before index date)			
Substance-related disorders (SRDs) [a, b, c, f]		388	55.04
Mental disorders (MDs) [b, c, f]		476	67.52
Common MDs [b, c, f]		421	59.72
Depressive disorders		260	36.88
Anxiety disorders		290	41.13

Adjustment disorders	146	20.71
Other common MDs	148	20.99
Serious MDs [b, c, f]	164	23.26
Schizophrenia spectrum and other psychotic disorders	102	14.47
Bipolar disorders	110	15.60
Personality disorders [b, c, f]	158	22.41
Chronic physical illnesses [b, c, f]	327	46.38
Suicidal behavior (suicide attempt/ideation) [c, f]	128	18.16
GD treatment in addiction treatment centers (measured from 2009 to index date)		
Repeated GD treatment episodes (2+ treatment episodes) [5 a]	361	51.21
Residential GD treatment [a]	66	9.36
High rate of self-referral to GD treatment (>66% of times) [a]	437	61.99
High rate of GD treatment dropout (>66% of times) [a]	371	52.62
Other outpatient care received (measured within the 12-month period before index date)		
High continuity of physician care (≥80%) [b, g]	332	47.09
High intensity of care from any provider (12+ services) [a, b, g]	224	31.77
High regularity of care from any provider (services received over each 3-month period of a 12-month cycle) [a, b, g]	338	47.94
Acute care use [6 b, c, f]	387	54.89

[1] Index date is defined as the date of the last GD diagnosis or treatment received. [2] No patients were age 12 or 13 in this specific study, and only 5 (<1%) were less than 18 years old. Therefore, most patients in this study were young adults. [3] Analysis employed multiple imputation (20 imputations), auxiliary variables including: sex, age, material and social deprivation, history of homelessness. [4] Few patients were retired (N=83, 11.77%), justifying their integration with unemployed patients. [5] The maximum number of treatment episodes in the "repeated treatment group" was 11, with a mean of 3.14 (SD: 1.65), and median of 3 (IDR: 2). [6] This included 158 (22%) patients hospitalized, and 378 (54%) patients with emergency department use.

[a] *Système d'information sur la clientèle des services de réadaptation en dépendance* (SIC-SRD, Addiction Treatment Center Database, including GD and SRD diagnoses based on standardized instruments); [b] *Régie de l'assurance maladie du Québec* (RAMQ, Physician Claims Database); [c] *Maintenance et exploitation des données pour l'étude de la clientèle hospitalière* (MED-ECHO, Hospital Inpatient and Day Surgery database); [d] *Fichier d'inscription des personnes assurées* (FIPA, Health Insurance Registry); [e] Education Database; [f] *Banque de données communes des urgences* (BDCU, Emergency Department Database); [g] *Système d'information permettant la gestion de l'information clinique et administrative dans le domaine de la santé et des services sociaux* (I-CLSC, Registry of Psychosocial Interventions in Community Healthcare Centers).

Profiles of gambling activities

The lowest BIC, AIC, and CAIC values were observed for the five-class solution (BIC: 3-class = 947, 4-class = 947, 5-class = 889; AIC: 3-class = 801, 4-class = 751, 5-class = 643; CAIC: 3-class = 979, 4-class = 990, 5-class = 943). However, in the five-class solution, the smallest group accounted for less than 10% of the sample, which raised concerns about interpretability and stability. The three-class and four-class solutions were therefore considered as alternatives. While both had the same BIC, the four-class solution had a lower AIC and the three-class solution, a lower CAIC. The three-class model was ultimately selected due to its higher entropy (0.9), exceeding the recommended threshold of 0.8 and indicating good class separation with minimal overlap. The three-class model also produced highly interpretable subgroups.

Representing 50% of the cohort, Profile 1 reported the most patients with chronic GD (53%), slot machines/video-lottery use (59%), and problem gambling with lotteries/bingo/keno (54%). None were documented as having table games problems. Compared to other profiles, more Profile 1 patients gambled in bars/taverns/breweries (97%), but fewer gambled online (2%) or in casinos (1%). Profile 1 was labeled: “Gamblers playing games of chance in bars, mostly with chronic GD”.

Accounting for 23% of the cohort, Profile 2 patients were the least affected by chronic GD (27%). They were second-highest to report table games issues (97%), but fewer of them used slot machines/video-lottery (24%) or lotteries/bingo/keno (7%). This profile featured the most patients gambling online (76%) or in casinos (72%), but were fewest gambling in bars/taverns/breweries (21%) or gambling halls (4%). Profile 2 was labeled: “Gamblers playing table games online or in casinos, with acute GD”.

In Profile 3 (27% of the cohort), 47% of patients had chronic GD. It included the most patients with table games (100%) or sports betting problems (20%), and playing in gambling halls (61%). This profile featured the second highest percentage of patients with slot machines/video-lottery gambling problems (39%), who played in bars/taverns/breweries (97%), or gambled online (34%) or in casinos (29%). Profile 3 was labeled: “Multi-game gamblers”.

Table 2. Profiles of gambling activities among patients with gambling disorder (GD) (N=705)

	Profile 1. Gamblers playing games of chance in bars, mostly with chronic GD	Profile 2. Gamblers playing table games online or in casinos, with acute GD	Profile 3. Multi-game gamblers
Group size (n/%)	352 (49.93%)	165 (23.4%)	188 (26.67%)
	%	%	%
GD characteristics (measured from 2009-2010 to index date)			
Chronic GD (≥5 years)	53.41	26.67	46.81
Lotteries/bingo/keno	53.69	7.27	31.91
Slot machines/video-lottery	59.09	24.24	38.83
Table games	0.00	96.97	100.00
Sports betting	3.98	5.45	19.68
Casinos	1.42	72.12	29.26
Gambling halls	13.35	4.24	60.64
Bars/taverns/breweries	97.16	20.61	96.81
Online gambling platforms	1.70	76.36	33.51

Typology based on latent class analysis (LCA).

Associations between profiles of gambling activities, patient characteristics and service use

Profile 1 included the most women (32%), individuals aged 60+ (25%), patients with MDs (73%)—especially common MDs (67%)—and depressive disorders (42%). Though fewer of them had a postsecondary education (17%), at 55% patients in this profile received the highest continuity of physician care (**Table 3**). Profile 1 also had more patients who were unemployed/retired (61%), living in more materially deprived areas (53%), or with a history of homelessness (20%). Compared to Profile 2, it featured more patients with high GD treatment dropout rates (55%), high care intensity (38%), and high regularity of care (52%). After Profile 1, Profile 2 included the most women (23%), and compared to the other two profiles it had the lowest percentages of patients with repeated treatment episodes (35%), residential GD treatment (2%), high self-referral to GD treatment (52%), and acute care use (41%). Profiles 2 and 3 included the most patients aged 14-34 (44%, 33%), with Profile 1 being at 15%. Profile 3 encompassed the most men (87%) and reported fewer anxiety disorders than Profile 1.

Table 3. Associations between gambling profiles and patient characteristics and service use (N=705 patients with gambling disorder [GD])

		Profile 1. Gamblers playing games of chance in bars, mostly with chronic GD	Profile 2. Gamblers playing table games online or in casinos, with acute GD	Profile 3. Multi-game gamblers
Group size (n, %)		352 (49.93%)	165 (23.4%)	188 (26.67%)
		%	%	%
Patient sociodemographic characteristics (measured at index year, the last year available or other as specified)				
Sex at birth	Women	32.10[2,3]	23.03[1,3]	12.77[1,2]
	Men	67.90	76.97	87.23
Age group (years)	14-34 [1]	15.06[2,3]	44.24[1]	32.98[1]
	35-59	60.23	49.70	56.91
	60+	24.72	6.06	10.11
Postsecondary education		16.53[2,3]	30.30[1]	27.02[1]
Unemployed/retired		60.51[2]	50.30[1]	56.38
Living in more materially deprived areas (index 4-5 or areas not assigned)		53.41[2]	43.03[1]	47.34
History of homelessness (measured from 2009-2010 to index date)		19.60[2]	12.12[1]	17.55
Patient clinical characteristics (measured within a 3-year period before index date)				
Mental disorders (MDs)		73.01[2,3]	60.00[1]	63.83[1]
Common MDs		66.76[2,3]	50.30[1]	54.79[1]
Depressive disorders		42.00[2,3]	32.73[1]	30.00[1]
Anxiety disorders		45.00[3]	40.00	34.57[1]
GD treatment in addition treatment centers (measured from 2009 to index date)				
Repeated GD treatment episodes (2+ treatment episodes)		58.24[2]	34.55[1,3]	52.66[2]
Residential GD treatment		11.65[2]	2.42[1,3]	11.17[2]
High rate of self-referral to GD treatment (>66% of times)		65.91[2]	51.52[1,3]	63.83[2]
High rate of GD treatment dropout (>66% of times)		54.55[2]	45.45[1]	55.32
Other outpatient care received (measured within the 12-month period before index date)				
High continuity of physician care (≥80%)		54.55[2,3]	39.39[1]	39.89[1]
High intensity of care from any provider (12+ services)		37.50[2]	27.88[1]	28.19

High regularity of care with any provider (services received over each 3-month period of a 12-month cycle)	52.27[2]	40.00[1]	46.81
Acute care use	60.80[2]	41.21[1,3]	55.85[2]

Superscript numbers indicate significant differences between groups at $p < 0.05$, based on a bivariate analysis or multinomial logistic regression for the postsecondary education variable. Only significant variables from Table 1 have been integrated in this table. [1] No patients were age 12 or 13 in this specific study, and only 5 (<1%) were less than 18 years old. Therefore, most patients in this study were young adults.

Discussion

To our knowledge, this study is the first to develop a typology of gambling activities among a cohort of patients with GD, and to associate the resulting profiles with their sociodemographic and clinical characteristics, as well as the quality of care received over a 12-year period. Overall, the study's population was quite vulnerable, with almost half being affected by chronic GD, poor social conditions (e.g., living alone, deprived, unemployed), and chronic physical illnesses. Most had MDs and/or SRDs, and nearly one-fifth of them experienced suicidal behavior, homelessness or a history of criminality. One-fourth of the cohort were women, a similar result to what is usually reported in GD health-seeking populations (Hakansson et al., 2024; Miller et al., 2022), as problem gambling is about 3.4 times more likely to occur in men (Dellosa & Browne, 2024). Although nearly half of the cohort had chronic GD with key issues, only about half had received at least two GD treatments in the 12 years covered by the study, or a high continuity and regularity of care in the year before their index date. Half of the patients had also used acute care in the year before their index date. Overall, these findings indicated that patients in the cohort had numerous unmet needs. Though the typology found that patient profiles differed substantially in terms of gambling activities, patient characteristics and service use, no significant differences were found regarding SRDs.

It was not surprising to find that most of the cohort participated in games of chance played in bars, since those games are widely accessible, require no skills, and that alcohol consumption may heighten the risk of problem gambling in such settings (Ngamini Ngui et al., 2015). Over half these patients were affected by chronic GD. Again, not surprising considering the high prevalence of slot machines/video-lottery use in Profile 1, which are found to be the most addictive games (Choliz, 2010; Delfabbro et al., 2020). Incidentally, Profile 1 included the most women (one-third of the cohort), patients age 60+ (one-fourth of cohort), but the fewest individuals with postsecondary education (one-fifth)—characteristics previously found mainly in players of non-strategic games like slot machines and lottery (Challet-Bouju et al., 2015; Granero et al., 2023). MDs were most prevalent in Profile 1, with nearly three-fourths of patients affected; depressive disorders, in particular, were more prevalent in Profile 1 than in Profiles 2 and 3. This is likely characteristic of gamblers the literature defines as "emotionally vulnerable" (Blaszczynski & Nower, 2002), as this type of gambler has been shown to be more attracted to games of chance—an escape from day-to-day problems and loneliness (Blaszczynski & Nower, 2002; Valleur et al., 2016). Common MDs are about twice as prevalent in women than in men (Kayrouz et al., 2025), which may explain the higher percentage found in Profile 1. Women, older patients and individuals with MDs are also known to use more health services than people without those characteristics (Dhinsa et al., 2023), which could be why continuity of physician care was highest in Profile 1. Literature reports that physicians

underdiagnose patients with GD (Tatar et al., 2025), hinting at the fact physicians could be better trained to detect and treat this condition, and to refer these patients to adequate care. As in Profile 3, a majority of patients in Profile 1 had also used acute care, where clinicians can be trained to detect and refer patients with GD to appropriate support. Patients in Profile 1 may benefit from cognitive behavioral therapy (CBT) (Pfund et al., 2023) and, more broadly, from enhanced psychosocial services to address emotional difficulties, stress tolerance, problem-solving, and coping skills. Additional social support, participation in recreational activities that promote healthier habits, and involvement in self-help groups may also help alleviate loneliness.

Accounting for nearly one-fourth of the cohort, Profile 2 differed the most from Profile 1. About three-quarter of these patients had had GD for less than 5 years, possibly because they were younger—44% of them were in the 14-34 age group. A recent systematic review found that young adults (18-35) had 1.51 more risk to experience and report problem gambling than individuals in the 30-55 age group (Dellosa & Browne, 2024). Profile 2 patients were mostly attracted to table games and to gambling online or in casinos (Dellosa & Browne, 2024)—online platforms are known to attract younger players (Gainsbury et al., 2014). Compared to Profile 1, Profile 2 included less patients who were unemployed/retired, materially deprived or had a history of homelessness, and showed lower rates of GD treatment dropout and of intensity and regularity of care—previous studies did find that strategic game players had better social conditions (Wiebe et al., 2001) that could protect them against psychosocial distress, hence their lower service use. However, Profile 2 also had the lowest self-referral rate, perhaps because it included more men (77%) and young patients, two groups known for using less health services, often only as a last resort, and for preferring to manage problems on their own (Ellis et al., 2013). Though Profile 2 came lowest in acute care use, the 41% figure reported in the case of these patients was double that of the general population (Fleury et al., 2019), indicating that they also had numerous unmet needs. Outreach and motivational interventions (Siegel et al., 2022), preventive strategies (e.g., in schools, work settings), and treatment aimed at reducing impulsivity could be suggested for Profile 2 patients. Peer- and group-based interventions, as well as brief or online interventions targeting stress, psychological distress and promoting accountability may also be recommended, as those are particularly well suited for young adults.

Accounting for a little over one-quarter of the cohort, Profiles 3 integrated patients engaging in multiple games of chance (e.g., slot machines, lotteries) and strategy games (e.g., table games) played in various settings (e.g., bars, online platforms). Multi-game gamblers have been reported as having higher gambling severity (Mathieu et al., 2020). As in Profile 1, roughly half of Profile 3 had chronic GD, even though one-third of patients in that profile were in the 14-34 age group. Profile 3 multi-game gamblers also came highest in sports betting (20%) and playing in gambling

halls (61%). Previous studies found that, compared to other types of gamblers, sports bettors played more frequently and were thus on a faster track to develop GD (Grubbs & Kraus, 2023). Sports betting was also characterized as highly competitive (Moragas et al., 2015), and so proves especially attractive to impulsive young men looking for an adrenaline rush (Valenciano-Mendoza et al., 2023). Mostly composed of men and young adults, Profile 3 fit neatly into that category. This may be why they were more attracted to small establishments like gambling halls, where they can more easily socialize with peers. Besides ranking higher in postsecondary education (27%) and lower in MDs (64%) than Profile 1—especially anxiety disorders (35%)—, Profile 3 showed similar patient characteristics than the other two profiles. The more highly-educated patients in Profile 3 might have favored strategy games even though they were multi-game gamblers. And the fact Profile 3 included more men might explain its lower percentage of MDs compared to Profile 1, men being twice as less likely than women to be affected by MDs (Kayrouz et al., 2025). The GD treatment profile of patients in Profile 3 was similar to that of Profile 1, but they used fewer services from other health providers (though similar in that to Profile 2). This characteristic of Profile 3 could be due to the fact it included a greater number of younger men, a group that usually tends to prefer self-managing problems (Sheikh et al., 2025). A majority of patients in Profile 3 (56%) used acute care (similar to Profile 1, but lower than Profile 2), which may point to a significant number of unmet needs. Clinicians working in acute care settings could especially play an important role in detecting these patients and referring them to appropriate services—this recommendation holds for the three profiles. Patients in Profile 3 may benefit from interventions incorporating cognitive restructuring and psychoeducation, as well as strategies to enhance psychosocial and peer support, along with digital tools to help manage gambling disorder and related challenges.

Limitations

This study had some limitations worth noting. First, as we used administrative databases, data were recorded only if services were used and codifications adequately reported. GD was probably underreported, as it was mostly identified in the addiction treatment database, with ICD-9 mostly used by physicians where the last digit of the 312.31 GD code was missing, and thus could not be used. Second, we didn't have information on gambling frequency, financial losses, or disruptions to employment or family life. Third, due to differences in how personality disorders are classified in ICD-10 versus ICD-9, sub-diagnoses could not be studied separately. Fourth, no data were available on the patients' use of services like Gamblers Anonymous, online help, crisis or suicide prevention centers, and private psychologists. Fifth, though imputation and sensitive analyses were produced, there were significant data missing for the education level variable. Finally, findings may have limited generalizability, particularly to

individuals without GD, those who are not seeking help, and in countries that have no comparable gaming activities or no public health insurance for vulnerable populations.

Conclusion

This study identified three profiles of gambling activities among a clinical population with GD. Profile 1 mainly included patients with chronic GD who played games of chance in bars. Profile 2 was mainly constituted of patients with acute GD who played table games online or in casinos. Profile 3 included multi-game gamblers (various types of games and gambling settings). Integrating the most women and older patients, Profile 1 had the worse conditions and received the most services. Conversely, Profile 2 encompassed patients with the best conditions and lowest service use, probably because of their younger age. The vast majority of Profile 3 patients were men who shared the same characteristics as patients in the other profiles: like those of Profile 2, they were younger, more educated, had fewer MDs, received less continuity of care, and they shared the same pattern of GD treatment and acute care use as those of Profile 1. Patients with more chronic GD (Profiles 1 and 3) received the most GD treatments, while profiles with the most men and younger individuals (Profiles 2 and 3) showed the poorest continuity of physician care. Adapted interventions for each profile were suggested, yet the overall cohort was found to have received few GD treatments over the 12-year period and showed high acute care use. All this testifies to their high number of unmet needs. More outreach and motivational interventions, especially through acute and primary care, might be suggested to improve the health of these vulnerable populations. More social and health services may be provided to help GD patients deal with life issues, strengthen their coping strategies, and help them engage in healthier leisure activities.

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Statement of Competing Interests

The authors do not declare any competing interests.

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Compliance with Ethical Standards

The Quebec Commission for Access to Information granted access to the province databases, and the Research Ethics Board (REB) of the *Centre intégré universitaire de santé et de services sociaux* (CIUSSS*) du Centre-sud-de-l'Île-de-Montréal* approved the study protocol. As the study used health and education administrative databases, informed consent from patients is deemed unnecessary according to national regulations (Quebec's Act respecting access to documents held by public bodies and the protection of personal information, R.L.R.Q, c. A-2.1, and the Act respecting health services and social services, R.L.R.Q., c. S-4.2.)

Ethics Approval

The Ethic Research Committee of the CIUSSS du-Centre-Sud-de-l'Île-de-Montréal approved the project (MP-51-2024-1955) on September 13, 2023.

Relative Contributions

MJF designed the analytic plan for the article, revised by ZC, SK, MB and GG. ZC produced the analyses and tables. GG, ZC and MJF wrote the article. MB and SK reviewed the article. All authors approved the submitted version.

Research Promotion

This study analyzed 705 patients with gambling disorder (GD) in Quebec to identify distinct gambling profiles and their links to patient characteristics and care quality. Three profiles emerged: chronic slot machine gamblers (Profile 1, older and mostly women, with severe conditions and high service use), younger online or casino table games players with acute GD (Profile 2, with better conditions and the least treated), and multi-game male gamblers (Profile 3, mostly young with chronic GD). The authors recommend tailored interventions for each profile and increased social and health services to address unmet needs.

Appendix 1: Diagnosis codes for gambling disorder, substance-related disorders, mental disorders, suicide attempt, 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)***
Gambling disorder (GD) [a]	* (See footnote)	F63.0 (Pathological gambling)
Substance-related disorders (SRDs) [a]		
Alcohol-related disorders	303.0*, 303.9* (other and unspecified alcohol dependence), 305.0* (non-dependent abuse of alcohol); 291.0*, 291.1*-291.5*, 291.8* (alcohol withdrawal), 291.9*, 357.5, 425.5, 535.3, 571.0-571.3 (alcohol-induced disorders); 980.0, 980.1, 980.8, 980.9 (alcohol intoxication)	F10.1*(abuse), F10.2* (dependence); F10.3 (withdrawal), F10.4* (withdrawal with delirium); F10.5-F10.9, K70.0*-K70.4*, K70.9*, G62.1*, I42.6, K29.2*, K85.2, K86.0, E24.4, G31.2, G72.1, O35.4 (alcohol-induced disorders); F10.0*, T51.0, T51.1*, T51.8, T51.9 (alcohol intoxication)
Cannabis-related disorders	304.3 (dependence), 305.2 (non-dependent cannabis abuse)	F12.1 (abuse), F12.2 (dependence); F12.3-12.4 (withdrawal); F12.5-F12.9 (cannabis-induced disorders); F.12.0. T40.7 (cannabis intoxication)
Drug-related disorders other than cannabis	304.0-304.2, 304.4-304.9, 305.3-305.7, 305.9 (drug abuse or dependence); 292.0 (drug withdrawal); 292.1, 292.2, 292.8, 292.9 (drug-induced disorders); 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, F13.1, F14.1, F15.1, F16.1, F18.1, F19.1, F11.2, F13.2, F14.2, F15.2, F16.2, F18.2, F19.2 (drug abuse or dependence); F11.3-F11.4, F13.3-F13.4, F14.3-F14.4, F15.3-F15.4, F16.3-F16.4, F18.3-F18.4, F19.3-F19.4 (drug withdrawal) F11.5-F11.9, F13.5-F13.9, F14.5-F14.9, F15.5-F15.9, F16.5-F16.9, F18.5-F18.9, F19.5-F19.9 (drug-induced disorders); F11.0, F13.0, F14.0, F15.0, F16.0, F18.0, F19.0, T40,0-T40.6, T40.8, T40,9, T42,3, T42.4, T42.6, T42.7, T43.5, T43.6, T43.8, T43.9, T50.9, T52.8, T52.9 (drug intoxication)
Mental disorders (MDs) [a]		
Serious MDs		
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); F44.8 (other dissociative and conversion disorders); F48.1 (depersonalization - derealization syndrome)
Bipolar disorders	296.0-296.6 (manic disorders); 296.8 (other affective psychoses); 296.9 (unspecified affective psychoses)	F30.0-F30.2, F30.8, F30.9 (manic episode); F31.0-F31.7, F31.8, 31.9 (bipolar episode)
Personality disorders	301.0 (paranoid personality disorder); 301.1 (affective personality disorder); 301.2 (schizoid disorder); 301.3, 301.4 (obsessive-compulsive personality disorder); 301.5 (histrionic personality disorder); 301.6 (dependent personality disorder); 301.7 (antisocial personality disorder); 301.8 (other personality disorders); 301.9 (unspecified personality disorder)	F60.0 (paranoid personality disorder); F61 (mixed and other personality disorders); F34.0 (cyclothymic disorder); F34.1 (dysthymic disorder); F60.1 (schizoid personality); F60.3 (borderline personality disorder); F60.5 (obsessive-compulsive personality disorder); F60.4 (histrionic personality disorder); F607 (dependent personality disorder); F60.2 (antisocial personality disorder); F60,9 (unspecified personality disorder); F21 (schizotypal personality); F60.6 (avoidant personality disorder); F60.8 (other specified personality disorders); F68.1 (factitious disorder); F68.8 (other specified disorders of adult personality and behaviour); F69 (unspecified disorder of adult personality and behaviour)

Common MDs		
Depressive disorders	300.4 (neurotic depression)*; 311, 311.9* (depressive disorder, not elsewhere classified)	F32.0- F32.3 (major depressive disorder, single episode); F32.8 (other depressive episodes); F32.9 (depressive episode, unspecified); F33.0-F33.4 (major depressive disorder, recurrent); F33.8 (other recurrent depressive disorders); F33.9 (recurrent depressive disorder, unspecified); F34.8 (other persistent mood [affective] disorders); F38.0, F38.1 (persistent mood [affective] disorder, unspecified); F38.8 (other specified mood [affective] disorders); F39 (unspecified mood [affective] disorders); F41.2* (mixed anxiety and depressive disorder)*
Anxiety disorders	300 (except 300.4); 300.0 (anxiety states); 300.2 (phobic anxiety disorders); 300.3 (obsessive-compulsive disorder); 300.1 (hysteria); 300.6 (other anxiety disorder); 313 (disturbance of emotions specific to childhood and adolescence)	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)
Adjustment disorders	309.0 (brief depressive reaction); 309.2 (adjustment reaction with predominant disturbance of other emotions, include: abnormal separation anxiety); 309.3 (adjustment reaction with predominant disturbance of conduct); 309.4 (adjustment reaction with predominant disturbance of other emotions and conduct); 309.8 (other specified adjustment reactions); 309.9 (unspecified adjustment reaction)	F43.0 (acute stress reaction); F43.1 (post-traumatic stress disorder); F43.2 (adjustment disorders); F43.8 (other reactions to severe stress); F43.9 (reaction to severe stress, unspecified)
Other MDs	314 (attention deficit/hyperactivity disorder); 293.0, 293.1 (transient organic psychotic conditions); 294.0, 294.1 (other organic psychotic conditions); 299.0, 299.1*, 299.8, 299.9 (pervasive developmental disorders); 290, 294.1, 331.0, 331.2 (dementia); 302.0-302.9 (sexual deviations and disorders); 307.0-307.9 (special symptoms or syndromes, not elsewhere classified include anorexia nervosa, tics); 312 (disturbance of conduct, not elsewhere classified); 315.0-315.9 (specific delays in development); 316 (psychic factors associated with diseases classified elsewhere); 317-318 (mental retardation)	F90.0; F90.1; F90.8; F90.9 (attention deficit/hyperactivity disorder); F06.0-F06.9 (other mental disorders due to known physiological condition); F84.0, F84.1, F84.2, F84.3, F84.4, F84.5 (pervasive developmental disorders); F00.x-F03, F05.1, G30, G31.1(dementia); F50.0-F50.2 (eating disorders); F52.0-F52.9 (sexual dysfunction, not caused by organic disorder or disease); F51.0-F51.5 (nonorganic sleep disorders); F95.0-F95.2, F95.8, F95.9 (tic disorders); F98.0-F98.6, F98.8, F98.9 (other behavioral and emotional disorders with onset usually occurring in childhood and adolescence); F63.0-F63.3, F63.8, F63.9 (habit and impulse disorders); F70-73, F78, F79 (mental retardation)
Suicide attempt [b]	E950-E959	X60-X84; Y87.0
Chronic physical illnesses [a, c]		
Traumatic brain injury	800.0-800.3; 801.0-801.3; 803.0-803.3; 804.0-804.3; 850; 851-853; 854.0; 854.1	S02.0; S02.1; S02.7; S02.89; S02.9; S06.0-S06.6; S06.8-S06.9; T06.0
Cerebrovascular illnesses	430-438	G45, G46, I60-I69
Neurological illnesses	331.9, 332.0, 332.1, 333.4, 333.5, 333.9, 334–335, 336.2, 340, 341, 345, 348.1, 348.3, 780.3, 784.3	G10–G12, G13, G20, G21–G22, G25.4, G25.5, G31.2, G31.8, G31.9, G32, G35, G36, G37, G40, G41, G93.1, G93.4, R47.0, R56
Endocrine illnesses (hypothyroidism; fluid electrolyte disorders and obesity)	240.9, 243, 244, 2461, 246.8; 253.6, 276; 278.0	E00, E01, E02, E03, E89.0; E22.2, E86, E87; E66

Any tumor with or without metastasis (solid tumor without metastasis; lymphoma)	140-172, 174, 175, 179-195, 196–199; 200, 201, 202, 203.0, 238.6, 27.33	C00–C26, C30–C34, C37–C41, C43, C45-C58, C60–C76, C77-C79, C80; C81-C85, C88, C90.0, C90.2, C96
Chronic pulmonary illnesses	490–505, 506.4, 508.1, 508.8	I27.8, I27.9, J40-J47, J60-J64, J65, J66, J67, J68.4, J70.1, J70.3
Diabetes complicated and uncomplicated	250.0-250.2, 250.3; 250.4-250.9	E10.2-E10.8, E11.2-E11.8, E13.2-E13.8, E14.2-E14.8; E10.0, E10.1, E10.9, E11.0, E11.1, E11.9, E13.0, E13.1, E13.9, E14.0, E14.1, E14.9
Cardiovascular illnesses (congestive heart failure; cardiac arrhythmias; valvular illnesses; peripheral vascular illnesses; myocardial infarction; hypertension and pulmonary circulation illnesses)	402.1, 404.1, 428; 426.0, 426.7, 426.9,427.0–427.4,427.6–427.9, 785.0, V450, V533; 394–397, 424,746.3–746.6, V422, V433; 093, 440, 441, 443.1– 443.9, 447.1, 557.1, 557.9, V434; 410.9, 412.9; 401.0, 401.1, 401.9, 402.0, 402.1, 402.9, 405.0, 405,405.1, 405.9, 437.2; 415.0, 415.1, 416; 417.0, 417.8, 417.9	I09.9, I11.0, I13.0, I13.2, I25.5, I42.0, I42.5–I42.9, I43, I50, P29.0; I44.1–I44.3, I45.6, I45.9, I47–I49, R00.0, R00.1, R00.8, T82.1, Z45.0, Z95.0; A52.0, I70-I72, I73.0, I73.1, I73.8, I73.9, I77.1, I79.0, K55.1, K55.8, K55.9, Z95.8, Z95.9; I05–I08, I09.1, I09.8, I34–I39, Q23.0–Q23.3, Q23.8, Q23.9, Z95.2, Z95.3, Z95,4, I21.0-I21.4, I21.9, I22.0, I22.1, I22.8, I22.9, I25.2; I10.1, I10.0, I11, I15.00, I15.01, I15.10, I15.11, I15.21, I15.81, I15.90, I15.91, I67.4; I26, I27, I28.0, I28.8, I28.9
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)	280.0, 280.9; 286, 287.1, 287.3-287.5; 531.7, 531.9, 532.7, 532.9, 533.7, 533.9, 534.7, 534.9; 070.2, 070.3, 070.4, 070.5, 456.0–456.2, 572.3, 572.8, 573.3, 573.4, 573.9, V427; 042–044; 136.1, 446; 701.0, 710.0–710.4, 710.5, 710.8, 710.9, 711.2, 714, 719.3, 720, 725, 728.5, 728.8, 729.3; 260–263, 783.2, 799.4; 334.1, 342, 343, 344.0-344.6, 344.8, 344.9; 280.1, 280.9, 281, 285.9	D50.0; K25.7, K25.9, K26.7, K26.9, K27.7, K27.9, K28.7, K28.9; B20-B24; D65–D68, D69.1, D69.3-D69.6; B18, I85, I86.4, I98.2, K70.0- K70.3, K70.9 K71.1, K71.3–K71.5, K71.6, K71.7, K72.1, K72.9, K73, K74, K75.4, K76.0, K76.1, K76.3, K76.4, K76.5, K76.6, K76.8, K76.9, Z94.4; L90.0, L94.0, L94.1, L94.3, M05, M06, M08, M12.0, M12.3, M30, M31, M32–M35, M45, M46.0, M46.1, M46.8, M46.9; G04.1, G11.4, G80, G81, G82, G83; E40–E46, R63.4, R64, D51–D53, D63, D64.9; D50.1, D508; D50.9

[a] All diagnoses identified in RAMQ (*Régie de l'assurance maladie du Québec,* Physician Claims database) for the full study period mostly were based on the International Classification of Diseases Ninth Revision (ICD-9), which included a 4-digit code, from financial year April 1 to March 31. However, starting April 1, 2019, ICD-10 codification was allowed, with gradual use from Quebec physicians. Thus, in the study both systems of codification were used depending on the claims. The Canadian Tenth Revision (ICD-10-CA) was used in MED-ECHO (*Maintenance et exploitation des données pour l'étude de la clientèle hospitalière*, Hospital Inpatient and Day Surgery database) in 2006-07+, and in BDCU (*Banque de données communes des urgences,* emergency department (ED) database). 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 diagnosis and numerous secondary diagnoses. In the databases used in this study, MDs were considered only as principal diagnoses, but SRDs as both principal and secondary diagnoses; SRDs are often underdiagnosed. SRDs included use (abuse, dependence) and induced disorders, intoxication, and withdrawal.

[b] Suicide attempt was identified in MED-ECHO as principal and secondary diagnoses.

[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 Methods section). In this list of chronic physical illnesses, three categories of MDs and two of SRDs (identified with an asterisk [*]) were also included in the list of MDs-SRDs, thus appearing twice.

*It was impossible to identify gambling disorder (312.31) using ICD-9 because the last digit "1" of the "31" code was missing in the administrative database.

Appendix 2. Associations between gambling profiles and the raw data on the patients' education level

	Profiles 1. Gamblers playing games of chance in bars, mostly with chronic gambling disorder (GD)	Profiles 2. Gamblers playing table games online or in casinos, with acute GD	Profiles 3. Multi-game gamblers
	%	%	%
Postsecondary education	16.19[2,3]	30.94[1]	28.14[1]

Superscript numbers indicate significant differences between groups at $p < 0.05$, based on a bivariate multinomial analysis.

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