Mental Health Inpatient Use Over Time:

Identifying Characteristics Associated with Increased Use Following Index Admission

by

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Authors Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Purpose: The purpose of this study was to describe patterns of inpatient mental health service following index admission and to identify individual and socio-environmental factors associated with high use following index admission.

Methods: Secondary data analysis of the Ontario Mental Health Reporting System (OMHRS) and the Ontario Marginalization Index (On-Marg) was performed. OMHRS—which is derived from the Resident Assessment Instrument - Mental Health (RAI-MH), and contains all inpatient mental health service use for the province of Ontario—was linked with the On-Marg— geographic socio-environmental data drawn from the Canadian Census—via a common geographic descriptor: the forward sortation area (FSA).

A retrospective cohort containing data from 2006-2014 with an intake period from 2006-2009 and a 5-year follow-up period was established. Two outcome variables were examined: high intensity episodic use, and high intensity days in hospital. High-intensity use was defined as use in the 90th percentile for either variable following index admission. Descriptive, bivariate, and multivariate statistics were used to identify variables to be included in the parsimonious iterative modelling process. Multivariate logistic regression using generalized estimating equations (GEE) was used to determine factors associated with high intensity use following index admission.

Results: Among those with an index admission to inpatient mental health services, 70% did not have further use over the 5-year follow-up. High intensity use (48+ days, 3+ episodes) following index fell into 3 categories: high use days only (2.8%), high use episodes only (5%), high use of both episodes and days (7.7%). The modelling process identified several variables associated with high intensity use. Schizophrenia and its related symptomology were shown to increase the odds of being high intensity users, while dementia, substance use, and adjustment disorders were shown to decrease odds. Two interactions were shown to predict the high intensity days outcome: marital status of never having been married with positive symptoms scores greater than 6 on the positive symptoms scale, and being male with cognitive impairment scores greater than 4 on the cognitive performance scale. Finally, middle quintile area dependency scores were shown to predict high intensity episodic use.

Conclusions: Schizophrenia and psychotic symptoms represents the primary driver of high intensity inpatient use (both days and episodes) following index admission, though the observed interactions may suggest that issues with social support may be driving higher lengths of stay in inpatient settings following the index admission. Socio-environmental factors appear to play a smaller role, after adjusting for individual risk factors, in high intensity inpatient use following index admission.

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Completing this thesis has been akin to climbing a mountain, so I'm opting for a mountain climbing analogy here.

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Introduction

       Driven by heightened use of medical and technological interventions for tertiary health issues (and an aging population that will access these services), health care costs in Canada are increasing (1). Since healthcare in Canada is primarily government funded, there is increasing concern that the current system cannot be sustained; as such, researchers are exploring ways to ensure long-term sustainability of the healthcare system. One approach is to better understand the role high cost users(HCU) play in driving costs. HCU's represent a small percentage of the population, but account for large proportions of healthcare spending. For example, in Ontario 1.5% of the population (5% of service users) account for 61% of expenditures (2). Finding ways to improve treatment and care for HCUs can free up resources, allowing them to be reinvested in other areas, improving and ensuring long-term sustainability of Canadian healthcare.

       While mental illness related treatments do not represent the highest level of HCUs, they are a unique leverage point: 89% of mental illness healthcare costs in Ontario can be attributed to high-cost users (2). Developing a better understanding of high-cost users and addressing their needs more effectively can improve the long-term sustainability of the healthcare system. Further, many Canadians experience unmet health needs where approximately 1 in 5 Canadians experience mental illness during their life (3) while anywhere from 50% - 70% of individuals with need do not get formal treatment (4–6). Expenditures related to mental illness and problems stemming from unmet need combine to cost the Canadian economy an estimated $42.3 billion dollars in direct costs and $6.3 billion in indirect costs annually (3). Research investigating patterns of mental health service use (MHSU) can provide insights about unmet needs, costs, and strategies for improving system efficiencies.

Andersen's Health Behavioural Model

The dominant theoretical framework used in MHSU research is Andersen's Behavioural Model. The Behavioural Model holds that contextual (where you are) and individual (who you are) factors can be used to understand health service use. Both contextual and individual components of the Behavioural Model can be broken down into smaller units known as predisposing, enabling, and needs factors (7–9). Predisposing factors are any biological, social, or normative factors that suggest an individual will be more likely to access health services. At the individual level, sex or race represent predisposing factors, while the average age of an area (e.g. a community for older adults) is a contextual factor. Enabling factors are any resources that encourage individuals to utilise health services; lack of resources act as a barrier. At the individual level, medical insurance is an enabling factor. Contextually, social programs such as Canadian healthcare are enabling factors. Needs factors are any health issues or conditions the individual may be experiencing. For MHSU, this can be understood as distress, symptoms of mental illness, or mental illness diagnosis. Finally, health behaviour and outcomes are also included in the Behavioural Model. Health behaviour captures the real-time decisions individuals make regarding their lifestyle and service use, and can be considered partially the result of a combination of contextual and individual predisposing, enabling and need effects. Outcomes represent the result of previous aspects of the model. It is important to note that the Behavioural Model is not a static causal pathway: each component of the model can affect the others through feedback loops (10,11). Appendix A includes a figure outlining the most recent iteration of the Behavioural Model (7).

A great deal of research has examined the role that individual factors play in MHSU, with a smaller number of articles examining contextual factors (9). While few studies have

investigated contextual effects on MHSU, a growing literature exists that demonstrates their effects on the aetiology and maintenance of mental illness. Both physical (12) and social (13) differences among living environments have been found to be related to mental health. It is becoming clear that where we live influences how we feel. Our understanding of the relationship between living environment and MHSU has not kept pace with that of the relationship between living environment and mental illness. Therefore, given the personal and societal ramifications of mental illness—particularly when untreated—increased research on contextual factors of MHSU is imperative.

The Mental Health System in Ontario

The mental healthcare system in Ontario is made up of a variety of treatment options and services. General practitioners represent the most common point of access for mental health treatment, though psychologists, psychiatrists, and other professionals are also seen (14,15). Treatment options include institutional services such as inpatient, outpatient, day hospital, emergency, and educational services. While many facilities offer all these services, several are exempted from providing day hospital or emergency care (16). Finally, a variety of community services exist, including assertive community treatment teams, early intervention programs and intensive case management programs, as well as supported housing and supported employment (15). While this suggests there is a wealth of programs in Ontario the system lacks cohesion, resulting in numerous people falling through the cracks: "Mental health and addictions services are funded or provided by at least 10 different ministries. Community care is delivered by 440 children's mental health agencies, 330 community mental health agencies, 150 substance abuse treatment agencies, and approximately 50 problem gambling centres. Many people simply fall through the cracks, or give up in frustration because of the complexity of the system." (p3) (15)

In response to these criticisms, a new provincial mental healthcare strategy was developed to better address the needs of the Ontarians (17). Better understanding of the factors of MHSU can help to inform this process.

Given potential benefits of further MHSU research, particularly when examining living environments, a firm understanding of what has already been done—at both individual and contextual levels— is needed. The following section will present a literature review that outlines MHSU research.

Literature Review

There is a modest body of research investigating the correlates of MHSU. Research into MHSU varies along multiple methodological lines, ranging from sampling and population focus to outcome operationalization and measurement. Different methodological choices can lead to different findings. For example, how researchers define their population of interest can result in different results; MHSU correlates among Canadian immigrants differ from those of the general Canadian population (18–20). Further, research shows that there are different correlates depending on the type and frequency of mental health services being utilized (21). Andersen's behavioural model, outlined above, provides a useful tool with which to organize the research. Factors that have been examined in association with MHSU can be labelled as predisposing, enabling, needs, or contextual factors (11). As such, this literature review will be structured to present research findings using Andersen's framework.

Predisposing Factors

Predisposing factors have been studied extensively in relation to MHSU (9,22). Common factors examined in relation to MHSU include age (4,18,19,22–50), gender (4–6,18,19,22–45,47–56) ,marital status (4,5,18,19,26–29,33,34,38–41,43,45,47–52,57,58) and education

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(4,6,22,23,26–37,41,43–45,47–50,54,55,58). Gender and marital status have both consistently been shown to have statistically significant associations with MHSU (22). These associations are also consistent in how the relationship between the predisposing factor and MHSU is expressed; women have higher rates of MHSU than men, and individuals who are single, separated, or divorced have higher rates of MHSU than individuals with significant others.

Education and age also have a great deal of research connecting them to MHSU. However, while they have reliably been shown to have statistically significant associations with MHSU, the character of those associations is less clear. In some research, lower levels of education has been associated with MHSU (35), whereas other research observes an association between MHSU and higher levels of education (6,34,43,45). Recent research suggests the relationship between education and MHSU may depend on the type of services being accessed. Research has shown that individuals with higher levels of education   utilize psychologists/ psychiatrists more readily, while those with lower levels of education access community and emergency resources (28,32,34,37,58).   Age and MHSU also have contradictory findings, though research suggests that age may have an inverted u-shape relationship with MHSU (26), where the youngest and oldest among the population are the least likely to use mental health services, with MHSU rates increasing until middle age (22), and decreasing after.

A challenge in examining predisposing factors associated with MHSU is that it is difficult to identify mechanisms for the association. For example, there are multiple explanations for why females have higher rates of MHSU. The first explanation is that there more mental health issues among individuals who share the characteristic found to be associated with MHSU, and that increased need is ultimately driving MHSU rates (e.g., women have more mental health needs and, therefore use mental health services more than men). Another explanation is that

among individuals who share the characteristic, there is some reason why they are not accessing

mental health services (e.g. men and women have similar needs for services, but are accessing

services differently). In the second scenario, different rates for MHSU between men and women

may suggest that there are barriers which prevent men from accessing mental health services, or

an enabler that encourages women to access services. Both explanations—females have more

MH needs, males/ females have equivalent needs, but access mental health services differently—

are problematic, and need to be addressed if they exist.

Gender represents one of the few situations where MHSU research goes beyond

identifying MHSU correlates and attempts to explain why the association exists. Using social

anchorage theory, which suggests that the roles individuals play (e.g. spouse, worker) in life

reinforce the cultural values and beliefs associated with those roles, researchers are investigating

how gender interacts with professional and conjugal anchorage to impact rates of MHSU

(51,52). The research shows that cultural expectations of men and women as workers and

spouses affect their help-seeking behaviour. Professional anchorage (having a job) results in

different rates of MHSU for men and women, while conjugal anchorage (being a spouse) further

mediates that relationship. Research is starting to show that the predisposing correlates can have

interactive effects beyond their individual aspects.

Other novel research methodologies informed by theory have illuminated how

predisposing factors can interact. Research using data mining techniques has shown that men

and women use mental health services under differing circumstances (26). Lower income

(reported below as inconsistently associated with MHSU) is a stronger driver of MHSU among

women, while marital status plays a greater role among aged men. The researchers utilized

intersectionality theory to explain these differences. Intersectionality theory can be seen as an

extension of social anchorage theory, arguing that researchers must "consider social determinants not in terms of single factors (e.g., gender or SES), but in terms of multiple, interacting factors" (p145) (26). Intersectionality theory posits that health outcomes are affected by a multitude of aspects of social advantage and disadvantage that continuously and dynamically interact with one another. Essentially, under intersectionality theory, individuals aren't subsumed under a single 'master' class. In traditional research, they are treated as such, with gender, age, or other factors being tested individually and consecutively. Underlying the classic approach is the assumption that these social factors are additive in nature, so that female gender—referring to MHSU research— is assumed to be a risk for MHSU in and of itself. The problem with this approach is that it simplifies the human experience. The 24 year old single mother doesn't simply occupy the social role of woman at the time of analysis, but also mother, 24 year old, first nations, *simultaneously* (26,59).

This idea of multiple aspects of identity helps clarify the distinctions in the behavioural model between predisposing (factors where intersectionality would be expressed) and enabling factors. Specifically, a good example is the difference between an individuals' profession and their income. The income attached to the profession is an enabling factor: the more you earn, the more resources at your disposal. The income is not a predisposing factor however, because you don't identify with making $48,000, but rather the profession that earned you that income. Intersectionality theory argues those concurrent inhabitancies, or our intersections of identity matter for our health and our health service use (26,59).

Research into predisposing correlates of MHSU has identified several individual characteristics—female gender, marital status of lacking a significant other, increasing age between 18 to 65, and educational attainment (either low or high)—as associated with MHSU

(22). Newer theoretical and methodological work has also demonstrated that many correlates that did not have statistically significant associations when examined individually can play mediating roles. Finally, while it can be difficult to determine why specific predisposing correlates are associated with MHSU, theories like social anchorage and intersectionality work to bridge that gap, and help connect predisposing correlates to systemic and structural barriers categorized as the enabling factors of Andersen's model.

<u>Enabling factors</u>

Enabling factors have received less attention than predisposing factors. Few potential enabling correlates have been examined, and fewer have been examined systematically across studies. The most commonly investigated enabling factors are living situation, social support, cost of services, and stigma. All of which are described below.

Living situation has received the most attention among enabling factors, but encompasses a variety of operationalizations that differ across studies. These operationalizations generally consist of a combination of where someone lives (29,32), whom they live with (23,28,33,34,36,38,42,44,58) , and the quality of living arrangements (24). Among studies that have investigated living situation, homelessness (24,29,42), living alone (23,28), and living in rented housing (44) were associated with increased MHSU. All three of the above aspects of living situation can be construed as indicative of housing stability. Those results stand in contrast to other findings which do not show a relationship between housing stability and MHSU (32–34). However, this contrast needs to be considered with the caveat that the second set of results are derived from a single research program that focussed on one population within a specific urban context. It is possible that in that population, MHSU and housing stability are not associated. Further, this research program used a single binary operationalization of housing

stability (yes vs. no) that may have failed to adequately capture the complexity of the relationship between living situation and MHSU (32–34). Finally, research has also considered whether living with a partner is associated with MHSU, with varying results (28,36). It appears as if living situations with increased instability—be it the actual brick and mortar building, ownership of the space, or who (if anyone) they share it with—are associated with increased MHSU. What is unclear is why. One possible explanation for this is that living situation is indicative of social support an individual can draw upon.

Social support has been defined as "perceived or instrumental and/or expressive provisions supplied by the community, social networks, and confiding partners" (p 18) (60). This definition includes a variety of ways in which social support can be operationalized. These include presence of support, perceived versus tangible support, types of support provided (emotional, instrumental, etc.), who is providing the support, among others. Within the MHSU research, social support has been operationalized in many of the ways described above, including whether there was any social support (29), the size/function/make-up of social networks (61–64), types of support provided (both emotional and instrumental measures) (27,31,33,34,45), and who was providing the different types of support (32).

Among the research that has investigated social support, some found statistically significant associations (24,29,35,45), while others did not (31–34,50). Further, among studies reporting significant associations between MHSU and social support, results differed. For example, one study found that increased MHSU was associated with larger social networks (24), while another found the opposite: less social support was associated with outpatient service use (29). This seems to suggest that the relationship between social support and MHSU is decidedly unclear; however, further investigation shows an intriguing pattern. One study demonstrated an

association between MHSU and social support among service users without mental disorders, while finding no association between MHSU and social support among service users with a mental disorder (35). All of the studies that did not find an association between social support and MHSU examined populations with mental disorders (31–34), suggesting that the relationship between MHSU and social support may be dependent on the presence of mental disorders. Finally, one study that found an association between MHSU and social support demonstrated that social support acts within the causal pathway as a mediator variable, influencing psychological distress, which in turn influences MHSU (45). It is possible that when examining individuals with mental disorders, social support fails to achieve significance because the effect that psychological distress has on MHSU is subsumed by the presence of mental disorders.

Cost of services is another area whose contradictory results need untangling. In research that investigated barriers to treatment, the most prominent barrier among participants who did not seek treatment was cost of mental health services (4), and research investigating the associations between income, insurance, and MHSU support this finding. In research where income is found to have a statistically significant association with MHSU, increased MHSU is associated with higher incomes (23,26,36,41). That said, other studies did not find a relationship between income and MHSU (30,33,35,39,40,45,48,58). Studies examining correlates of MHSU for specific mental health services can help explain these results. Research has shown that higher and lower income were associated with increased rates of use for different types of mental health services (34). For example, one study showed that higher income was positively associated with use of psychologists and negatively associated with the use of other services (50). The differing relationship between high/low income and types of MHSU found in this study may help explain why previous research failed to demonstrate an association. If researchers do not distinguish

between types of services used, different patterns for different services may not be detected. The study above also showed that within their sample, which had a higher proportion of individuals with lower incomes, psychologists were underutilized (34). To explain this, the authors suggest that income and cost barriers may have played a role, as within the Canadian context, general practitioners (GP's) are covered by public healthcare, while psychologists may not be (34). As such, low income individuals can be expected to use the services (GP's) they have access to via public healthcare, but not the services (psychologists) that require out-of-pocket payments. One explanation for why individuals with higher income may utilize mental health services requiring out-of-pocket expenditures when publicly covered help is available is that long wait times in the public system could act as a barrier to those services, rendering their financial availability moot (41). This highlights why it is necessary to think beyond income when considering costs of services, as public and private insurance may help people access services.

Several studies have also examined presence of insurance in addition to income when considering costs of services (29,41–43,54,65). Three studies found that having insurance leads to increased MHSU (42,43,65), while others did not demonstrate an association (29,41,54). Further, comparisons between countries with different public insurance schemes suggests that publicly provided insurance can also increase MHSU (39,47,50). When comparing the U.S.A, Canada (39,47,50), and the Netherlands(47), the U.S.A is shown to have lower MHSU rates (39,47,50). One study contextualizes these results, having found that individuals with low income in the U.S.A were more likely to report financial barriers than individuals with low income in other countries (47). Financial considerations have effects beyond the barrier/enabler function described above. One study found that found that there is an association between positive attitudes towards MHSU and higher levels of income (36). Even if no financial barrier

exists to prevent individuals with lower income from accessing services, beliefs regarding those services may prevent them from getting help. This highlights the final aspect of enabling factors that has received attention in the research: beliefs and attitudes regarding treatment.

Beliefs and attitudes regarding treatment can range from beliefs regarding efficacy of the treatment, to worries about stigma (4). The relationship between beliefs and attitudes regarding mental health treatment and MHSU has received little attention (4,33,34,45). Of the research that has been done, the only factor that has been examined beyond a single study is stigma (4,33,34,45). Two of these studies did not find an association between stigma and MHSU (33,34). In another study examining unmet need, two attitudes related to stigma were cited as barriers to explain why individuals did not seek help (4). The studies that did not find an association between MHSU and stigma focussed on individuals with previous contact with mental health services (33,34). It is possible that stigma plays a role prior to first contact with mental health services, with fears regarding the stigma of mental illness preventing individuals from seeking help. Once that barrier has been breached, stigma no longer prevents individuals from continuing to use mental health services; the presence of a diagnosis may disguise the effects of stigma on MHSU. Ironically and unfortunately, the fears that individuals have regarding stigma may not be misplaced. The final study investigating stigma utilized path analysis to demonstrate that perceived stigma—an operationalization designed to capture the degree to which individuals believe they are being stigmatized—was found to be correlated with needs factors that in turn drove MHSU; the more stigma an individual feels, the greater their need, which in turn leads to increased MHSU. (45).

Ngui's path analysis described above (45) illustrates why enabling factors, when studied, often return contradictory results. They rest within the causal pathway, mediating the relationship

between predisposing and needs factors, eliciting different effects on needs factors which in turn drive MHSU. It is only when careful consideration of the populations under investigation and strict sample selection are done that the role of enabling factors becomes clear; the effects of enabling factors are often subsumed by the effect of need factors on MHSU. The lack of examination of enabling factors is unfortunate, because if predisposing factors are the 'who' of MHSU, and theoretical explanations—such as social anchorage and intersectionality—are the 'why', enabling factors can be considered the 'how'—how individuals are encouraged or prevented from using services. Returning to the example of gender used previously, females are the 'who', professional and conjugal anchorage are the 'why', while enabling factors such as social networks and social support can be considered the 'how'.

Needs Factors

Need factors have received the most attention within MHSU literature. The most common needs factors investigated are presence of a disorder, severity and comorbidity of disorders, psychological distress, symptomology, and self-rated mental health. These factors are described in detail below.

Mood and anxiety disorders are the most researched diagnoses (6,23,25,30,33–40,42,48–50,58), followed by substance use (6,23–25,30,34,35,40,42,48,58) and psychotic disorders (23,24,42,57). Among those studies, only three (24,35,42) did not show a relationship between specific disorders an MHSU. Further, wherever a specific disorder and MHSU were connected, their relationship was often the strongest observed. It is unclear why mood, anxiety, and substance disorders have received the most attention, though one explanation is that it is because many of these studies analyse data from health surveys. It is possible, that due to the low prevalence/incidence of psychotic and other disorders, the number of cases obtained within study

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samples was too small to make statistical inferences. One important thing to note is that many studies investigate multiple disorders concurrently, such as mood/anxiety/substance use. As such, any estimate on the association between disorders and MHSU probably represents more a global effect of mental illness on MHSU rather than the effect of any single disorder.

Among the studies that have examined the differences between disorders, effects on MHSU of different types of services accessed has been observed. For example, one study demonstrated that nonaffective psychoses appear to have a much higher rate of outpatient use than other disorders (57). Further, another study found that schizophrenia (a nonaffective disorder) was strongly associated with increased rates of mental health care, while mood disorders (including bipolar disorder—an affective psychosis) were associated with primary health care providers such as general practitioners (23). The divide between primary and mental health care use was also found between mood and anxiety disorders, with anxiety disorders having stronger associations with psychiatrists and psychologists, while mood disorders had a stronger association with general practitioners (58). It appears as though different disorders may be associated with different types of services.

While little research has examined how different mental illnesses are related to MHSU, a large amount of research has investigated how the severity and comorbidity of disorders (4–6,23,25,30,31,33–35,38–40,42,45,48,57) . Severity and comorbidity are grouped together here because MHSU researchers often use comorbidity as a proxy for severity of illness. Severity of illness and comorbidity were found to be significant in most studies (4–6,23,25,31,33–35,38–40,42,45,48,57), while two did not find an association (33,35). Within the studies that did find an association between comorbidity and MHSU, how the relationship is expressed remains unclear; the relationship can change depending on type and number of comorbidities (25). For example,

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studies found that increased comorbidities are associated with increased use of mental healthcare services (37,57) while another found increased primary care use (40). Simplifying things somewhat, another study found that presence of comorbidities was associated with the number of professionals consulted while showing no differences in type of service(34). Finally, regardless of how the relationship between MHSU and severity/comorbidity is expressed, severity of illness is clearly a strong driver of service use. For example, one study demonstrated that comorbidity of two mental disorders was a stronger driver of MHSU than either disorder individually (6), while another showed a strong relationship between illness severity and MHSU when considering severity of symptoms rather than comorbidities (25).

Symptomology represents another (albeit small) area of research into the effects of need on MHSU (4,32,37,38,43,45,49,58). The most comprehensive investigation of the association between symptoms and MHSU examined the role of depressive symptoms (37). The researchers found that more severe symptoms (such as weight fluctuations, sleeping issues, fatigue, and suicidal ideation) were all associated with MHSU. Suicide has received some attention: two studies investigating suicidal ideation demonstrated an association with MHSU (43,49). Another study which included number of suicide attempts did not find an association (32). The other symptom that has received attention is neuroticism; both studies that investigated neuroticism found an association with MHSU, though it is unclear how this relationship is expressed (38,58). Finally, studies looking at the number of symptoms (45), and symptom frequency/duration (4) did not which found any association with MHSU.

In addition to symptoms, psychological distress is under-examined area of MHSU needs research (6,25,27,30,33–35,45,48). Studies looking at distress often utilize the Kessler 6 or Kessler 10 scales. The Kessler scales are designed to determine non-specific psychological

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distress within the general population (66). Evidence linking distress and MHSU is mixed. Some studies have found an association (6,30,31,35,45,48), while others have not (25,33,34). There is no clear explanation yet regarding the mixed results of distress, though one study (6) found different degrees of nonspecific distress depending on type of disorder, so it is possible that effects of distress on MHSU are subsumed by disorders when they are included as covariates.

Beyond disorders, symptomology, and distress, other needs factors have been examined that were found to have significant associations with MHSU. Factors such as emotional (31,33–35) and legal problems (31) have been associated with MHSU. However, these factors have not received a great deal of attention, and stem from the same research program, and indeed, the same data.

Need factors have received the most attention within MHSU literature, and typically have the strongest effect on MHSU. Presence of any disorder and severity/comorbidity have been found to have consistent effects on MHSU. Additionally, work is beginning to show which types of diagnoses lead to which types of MHSU. Further, symptomology and non-specific psychological distress may have associations with MHSU, though their relationships remain unclear, and their effects may be subsumed by the inclusion of disorders as covariates for analysis. In keeping with the analogy used previously, if predisposing factors are the 'who' of MHSU, theoretical explanations the 'why', enabling factors the 'how', then needs factors are the when and what. Individuals seek help when they finally decide they need help, and their issues are what they are getting treatment for.

Contextual Factors

Contextual factors—factors external to single individuals that can affect MHSU rates across populations—have received little attention. While the newest version of Andersen's

model (7) breaks contextual factors into predisposing, enabling, and needs categories that mirror the individual factors, these divisions will not be observed here due to the small amount of research that will be described. Instead 'contextual factors' will act as catch-all category for the purposes of this review.

The studies that compared MHSU rates between countries and provinces when investigating the effects of public insurance programs described above are an example of the effects of contextual factors on MHSU (36,39,47,49,50,57). Like enabling factors, contextual factors have received little attention. Most studies on contextual factors have explored the effects of urban or rural geographic areas (4,26,30,32,38,41,46,49,58). The most common operationalization of rurality was a binary measure of urban or rural (26,30,38,49,58), none of which found an association between the urban/rural divide and MHSU. Studies with more complex operationalizations—which established degrees of urbanicity (4,32,36,41,44) or rurality (46)—were split in their findings. Some found no association (4,44,46,48), while one study found a small association between urbanicity and MHSU (41).

The availability of mental health services within geographic areas has also been examined. For example, several studies included a variety of measures that examined proximity to and presence of different types of mental health services (28,33–35,54,65,67). The results from this research were split, with four studies finding no association between proximity to services and MHSU (33–35). However, in other studies, presence of a hospital within the area (67), shorter distances to services (28), and the density of mental health professionals (65) and resources (54) within an area were all associated with increased MHSU. These measures could be considered proxy measures for accessibility of services, with increasing distance to services and lack of services/ few professionals within an area representing barriers to seeking help.

Given that these measures are drawn from geographical data, they can be considered objective measures of accessibility. One study which examined subjective measures of satisfaction of accessibility and availability of services found an association with MHSU (32). Given that the operationalizations included within this grouping of measures includes different independent variables (e.g. density of psychologists within an area vs. distance to hospitals), concrete conclusions regarding the contradictory results should not be attempted. Further research is required.

Socio-environmental characteristics of geographic areas provide another measure of contextual factors. These range from operationalizations of income inequality (33,35,54,67), to operationalizations capturing living environment characteristics distinct from, but associated to, inequality (20,33,35,46). These include living environment characteristics such as social fragmentation, material deprivation, home ownership, and proportion of living environment population made up by immigrants. Three studies utilizing strict income inequality measures did not show an association with MHSU (33,35,67), while one did (54). Studies utilizing measures distinct from income inequality, such area deprivation and area home ownership were found to be associated with MHSU (28,46,67), while social fragmentation (46) and proportion of immigrants in living environment (35) were not. This grouping of factors reflects recent theoretical and methodological advances in recent research regarding socio-environmental effects on health. Researchers have begun combining effects of income inequality with measures designed to capture other aspects of living environment. One example of this is the Ontario Marginalization Index (68), which goes beyond traditional conceptualizations of inequality to examine living environment aspects such as residential instability, material deprivation, ethnic concentration, and dependency.

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The relationship between contextual factors and MHSU has received little attention to date. While most of the urban-rural comparisons did not find associations with MHSU, more specific research examining availability of services, and types of inequality did find associations. Returning to the analogy used previously, if predisposing factors are the 'who' of MHSU, theoretical explanations the 'why', enabling factors the 'how', needs factors the "when and what", contextual factors represent the where, impacting each aspect mentioned previously, intersecting with individual characteristics and circumstances to drive need and MHSU.

Defining Mental Health Service Use

In the studies reviewed here, many conceptualized MHSU as a binary (Yes/No) "have you used mental health services at all in the past xx (1,6,12,) time-frame (days, months, years, lifetime)" measures, lumping all types of services together. However, some articles expanded MHSU beyond this binary operationalization, and in doing so derived new findings (31–35). This suggests that expanding the operationalization of MHSU may allow researchers to obtain further insights. One possible expansion is to explore the degree of service use. For instance, the increased number of professionals consulted as a measure of MHSU (>4) was associated with increased education, relationships with neighbours, proportion of immigrants in their neighbourhood, having been a victim of violence, and exhibiting aggressive behaviour (34).

Other studies investigating intensity of use have focussed on number of visits and episodes that occur within during specific period of time (42,69), or the resources utilized (2,70,71). In research focusing on inpatient use, researchers operationalized high use as more than 3 uses per 1 year (42), or 2 years (69). Research looking at the costs associated with different types of service users has identified a group of individuals, labelled high cost users, who account for a great deal of healthcare spending (2). Within mental health care research,

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high cost users have been defined as those individuals who fall within a certain percentile of the cost distribution (e.g. the 90^{th}(70), 95th (2)). In Ontario—where both of those studies occurred—assigning costs to individual patients is done through a process that combines number of days spent in hospital, case-mix, and facility and time specific cost factors (71), suggesting that number of days in hospital is also an important measure of intensity of use.

Summary

Several gaps in the literature about factors related to MHSU have been identified

1. **Little Focus on enabling and contextual factors**. The first gap is the focus on predisposing and needs factors to the detriment of enabling and contextual factors. Within research that focuses on predisposing and needs factors there are further gaps. For example, most of the research that has been done does not include theoretical underpinnings. Therefore, while a variety of predisposing characteristics have been identified, there are few attempts at explaining why these characteristics are important to MHSU. Further, among needs research, the emphasis on presence of disorder has resulted in other potential needs factors such as psychological distress and symptomology being under-investigated. Additionally, even within the disorders component of the research, some disorders have received much greater attention than others (e.g. depression has been the focus of more research than schizophrenia).

2. **Collapsed Outcome Variables**. Much of the research described here uses self-report inquiries regarding generic service use in past (3, 6, 12, etc.) months to operationalize MHSU. Recent research that uses more expanded operationalizations has found results that both contradict and elaborate previous findings (33).

3. **Atheoretical research**. Most of the research within the MHSU field has no theoretical underpinning. Those that do include theory tend to utilize Andersen's Behavioural model. Further, Andersen's Model acts more as descriptive framework than as prescriptive theory.

The gaps in the literature above may be attributed to the fact that much of the research was based on secondary data analysis of population health surveys. While this approach has provided a wealth of information to date, it has its limits. For example, when conducting secondary data analysis, researchers are limited to the questions originally asked. As such, while researchers may be interested in the effects of enabling, contextual, and different needs factors, they are limited to the predisposing characteristics that are always included (e.g. age, sex, marital status) in surveys, and only those needs factors captured by commonly included measures such as the World Mental Health Composite International Diagnostic Interview (WMH-CIDI). Further, as stated previously, schizophrenia—and other disorders with low prevalence rates— may have received less attention due to low numbers in the samples or the nature of MHSU being studied.

Lack of options for analysis isn't exclusive to independent variables. Researchers are also limited to outcome measures that were included in the original research—this helps explain why so much of the research utilizes the common self-report binary operationalization of MHSU. This is problematic for several reasons. First, while the questionnaires consider MHSU singularly, there are a variety of different services provided. As such, a population questionnaire that asks "have you used mental health services in the past 12 months? Y/N" will capture the individual seeing their GP for depression and the individual with schizophrenia who went to the emergency room, and treat them equivalent. Second, while this issue has been identified, and

specific services are now being targeted for investigation, there has been an imbalance between the types of services researched. For example, in a review of 28 studies only 9 focused on inpatient mental health use. Different services within the mental health care continuum may have different drivers of use.

While much of the research is secondary data analysis of population health research, newer research programs have done their own data collection with a tailor-made MHSU focus (27,31–35,45). Longitudinal designs are emerging that makes inquiries regarding enabling, contextual, and diversified needs factors, while also utilizing expanded operationalizations of MHSU (27,31–35,44–46).

The purpose of the current research is to address some of the gaps identified above within inpatient psychiatry, an area of MHSU that has received less study.   First, this study goes beyond binary operationalizations of MHSU that lump all types of services together by focussing exclusively on inpatient use and looking at usage patterns over five years. This approach allows researchers to *examine the patterns of MHSU in terms of number of episodes and number of days in hospital in the five years following an index admission (RQ1)*. Second, by utilizing OMHRS—rich population level clinical data—this study can investigate a variety of underexamined predisposing and enabling factors to better determine what *individual factors are predictors of increased inpatient MHSU intensity (RQ2)*. Third, by linking OMHRS and ON-MARG—contextual level data derived from the Canadian census data—this study can include under looked socio-environmental factors to determine *what socio-environmental factors are predictors of increased impatient MHSU intensity (RQ3)*. Finally, analyzing all of these factors concurrently will allow the research to *compare the effects of individual and socio-environmental factors on MHSU intensity (RQ4).*

Methods

Ethics

The Office of Research Ethics at the University of Waterloo provided ethics clearance for this research on May 19, 2016, under ORE file number 21523.

Design

A retrospective cohort study was performed using data from persons receiving inpatient psychiatry care in Ontario, Canada between January 1st, 2006 and December 31, 2014. These data were also merged with information from the Canadian census about the geographic areas where individuals resided at the time of their first admission to inpatient psychiatry.

Mental Health Service Use

MHSU was defined based on the number of inpatient psychiatry hospitalizations that occurred within the 5 years following a person's index hospitalization. Total inpatient mental health service use was calculated based on the number of days in hospital and number of episodes being observed following the index hospitalization. To illustrate this, an individual discharged from an index admission in 2006 would be followed until 2011, while someone discharged in 2009 would be followed until 2014. Hospitalizations with an admission date that were greater than 1826 days (5 years) after the discharge date of the index admission were excluded.

Data Sources

Ontario Mental Health Reporting System (OMHRS)

The OMHRS of the Canadian institute for Health Information (CIHI) is based on clinical data from the Resident Assessment Instrument for Mental Health (RAI-MH) collected from individuals who are admitted to dedicated adult mental health beds in Ontario. OMHRS contains

data regarding demographics, social support, diagnoses, symptoms, distress, and finances, among others. Provincially mandated in 2005, OMHRS acts as a standardized clinical and research resource for all of Ontario (72) with approximately 78 facilities in Ontario submitting data to CIHI (72).

The RAI-MH contains more than 300 data elements, which can be grouped into a variety of categories such as demographic information, referral information, service history, mental state indicators, cognition, addictions, functioning, and stressors.(72). Additionally, items on the RAI-MH can be combined into summary scales and applications for care planning (Clinical Assessment Protocols or CAPs) (72–81). The forward sortation area (FSA), the first 3 digits of the postal code where the individual resides, is included in the data. The reliability and validity of the RAI-MH and its applications have all received extensive testing (82–84). The RAI-MH is administered by care professionals (nurses, social workers) during regular clinical practice (72,83). These data are routinely submitted to the Canadian Institute for Health Information (CIHI) for reporting. CIHI acts as a repository of the data, sharing anonymized data with researchers (81)

Ontario Marginalization Index (ON-MARG)

The Ontario Marginalization index is an Ontario subset of the Canadian Marginalization Index first developed in 2001 and updated in 2006, using census data from 2001-2006. The ON-Marg is derived from items in the Canadian census. Each of the following four domains are described in table 1: 1) residential instability, 2) material deprivation, 3) ethnic concentration, 4) dependency (68,85). Marginalization is "the process by which individuals and groups are prevented from fully participating in society. Marginalized populations can experience barriers to

accessing meaningful employment, adequate housing, education, recreation, clean water, health services and other social determinants of health." (86)

The 4 dimensions of the ON-MARG were determined via a process utilizing both theoretical and empirical techniques (68). First, from a systematic review of deprivation and marginalization the researchers identified 42 theoretical factors for further examination. Following this, principal components analysis identified 18 factors that fell within the four dimensions outlined above. More information regarding the 4 domains and their sub-components can be found in table 1. The score of an area for each domain is that corresponding areas factor score, which was derived during the factor analysis. The ON-MARG contains census tract (CT) and dissemination area (DA) score which were aggregated to the FSA level. This was done by determining which DA's exist within each FSA. Following this, the ON-MARG score for each DA within the FSA was multiplied by the population of the DA. These values were then summed, and divided by the total population count for the FSA.

Table 1: ON-MARG Dimensions. Adapted from ON-MARG user guide (85)

	Dimensions			
	Residential instability	**Material Deprivation**	**Dependency**	**Ethnic Concentration**
Indicators	Proportion of the population living alone	Proportion of the population aged 20+ without a high-school diploma**	Proportion of the population who are aged 65 and older	Proportion of the population who are recent immigrants (arrived in the 5 years prior to census)
	Proportion of the population who are not youth (16+) ***	Proportion of families who are lone parent families	Dependency ratio (total population 0-14 and 65+/ total population 15-64)	Proportion of population who self-identify as a minority
	Average # of persons per dwelling***	Proportion of the population receiving government transfer payments	Proportion of population not participating in the labour force (age 15+) ***	
	Proportion of dwellings that are apartment buildings	Proportion of the population aged 15+ who are unemployed		
	Proportion of dwellings that are not owned***	Proportion of the population considered low-income****		
	Proportion of the population that moved during the past 5 years	Proportion of households living in dwellings that are in need of major repair		
	Proportion of population who are single/divorced/widowed			

* Aboriginal factors did not load on any of the factors
** For the 2006 index, the indicator is the proportion of the population aged 25+ without a certificate, diploma or degree. This is due to a change in the Statistics Canada definition.
*** Indicators were reverse coded, meaning they were coded opposite of the measure (e.g. % married/common law becomes %single/divorced/separated/widowed).
**** "Low income" is defined as below the low-income cut-off (LICO), a Statistics Canada measure that is adjusted for community size, family size and inflation.

<u>Data Linkage</u>

The OMHRS and ON-MARG data were linked via the FSA. The FSA is the first 3

characters in a postal code indicating regional, rural, and development level aspects of the

location. The RAI-MH obtains individual postal code data, and following de-identification by

CIHI, the FSA associated with the episode is available in OMHRS. The ON-MARG contains

census tract (CT) and dissemination area (DA) data which were aggregated to the FSA level.

<u>Sample</u>
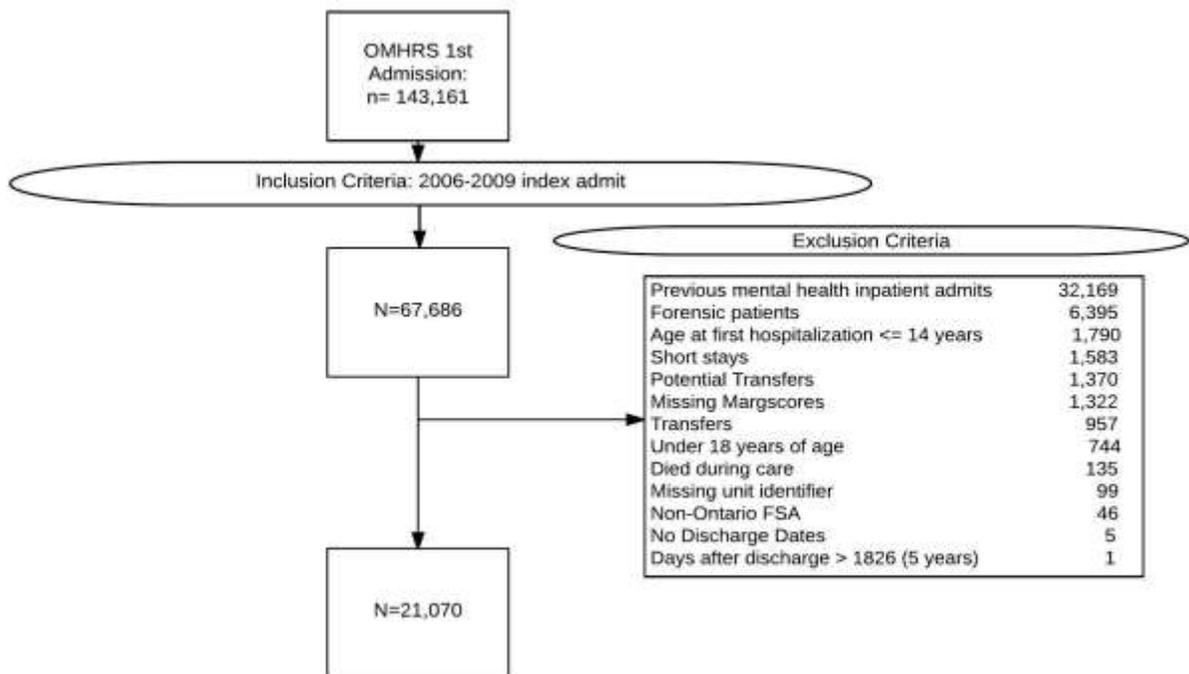
Figure 1. Sample inclusion and exclusion criteria[1].

The sample consisted of 21,070 adults residing in Ontario who experienced their first

admission to Ontario inpatient mental health services between 2006 and 2009. Individuals who

were in hospital for forensic reasons, with transfers, and short stays were excluded due to

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[1] Short Stays represent episodes in which individuals are in hospital for short periods of time. In these instances, they are administered a brief version of the RAI-MH that does not gather the full amount of information collected during an admission.

administrative issues surrounding service use (forensic) and to avoid inflation of the high

intensity episode outcome variable (short-stays). Additionally, individuals with no discharge

date (e.g. they were still in hospital at the end of the follow-up period), who died in hospital, or

had days in hospital greater than 1826 days were all deleted as they would inflate the high-use

day variable while deflating the episode variable. Observations where marginalization scores

could not be determined (missing ON-MARG scores, no FSA, non-Ontario FSA) were deleted,

as area level variables were a focus of this research. Individuals below the age of 18, or who had

their first service use below the age of 14 were deleted to ensure that the population focused on

adults. Individuals who died in care, or who had no discharge date, were also deleted because

they did not have a not have a 5-year follow-up period for examination.

Variables

Outcome Variables

The outcome measures for this research can be found in table 2. The 90th percentile was

used to define high intensity of use based on the distribution of total episodes and total days

following index discharge. This cut-off has also been used elsewhere (70).

Table 2: Outcome variables to be included in study

Variable	*Operationalization*
90th percentile of days (48 days) following discharge from index admission	Binary High intensity (1) vs. low intensity (0).
90th percentile (2 episodes) of episodes following discharge from index admission.	Binary High intensity (1) vs. low intensity (0).

Independent Variables

Independent variables used in this research can be found in table 3. Operationalizations

can be found in tables 4-8.

Table 3. Independent variables included in study.

Behavioural Model	Conceptual Blocks	Variables	
Predisposing	N/A	1. Sex 2. Age 3. Education	4. Marital Status 5. Aboriginal Status 6. First Language
Enabling	Living Environment (7-8) Enabling Caps (10-14) Income Sources (15-22)	7. Lived alone 8. Homeless 9. Residential Stability 10. Education and Employment CAP 11. Social Relationship Cap 12. Discharge Support Cap 13. Interpersonal Conflict Cap 14. Criminal Activity Cap 15. Income Source: Disability 16. Income Source: Other	17. Income Source: Employment Income Source: EI 18. Income Source: Pension 19. Income Source: Social Asst. 20. No Income 21. Multiple Sources of income
Needs	Diagnoses (23-41) Symptoms (42-47) Addictive behaviours (48-56) Other needs (57-61)	22. Disorders of childhood/youth 23. Delirium, dementia, amnestic and other cognitive disorders 24. Mental disorders due to general medical conditions 25. Substance-related disorders 26. Schizophrenia and other psychotic disorders 27. Mood disorders 28. Anxiety disorders 29. Somatoform disorders 30. Factitious disorders 31. Dissociative disorders 32. Sexual and gender identity disorders 33. Eating disorders 34. Sleep disorders 35. Impulse control disorders not classified elsewhere 36. Adjustment disorders 37. Personality disorders 38. Multiple Diagnoses (excluding substance use) 39. Concurrent primary substance use, secondary mental illness 40. Concurrent primary mental illness, Secondary substance use 41. Social Withdrawal Scale 42. Depressive Severity Index	43. Positive Symptoms Scale 44. Mania scale 45. Cognitive Performance Scale 46. Aggressive Behaviour Scale 47. Activities of Daily Living Hierarchy scale 48. Inhalant use 49. Hallucinogen use 50. Cocaine/Crack 51. Stimulants use 52. Opiates use 53. Cannabis use 54. Tobacco use 55. Alcohol use past 2 weeks 56. Substance Use CAP 57. Traumatic Events CAP 58. Self Care CAP 59. Self-Harm CAP 60. Risk of Harm to Others CAP 61. Medication Adherence CAP

	N/A	62. Area residential instability 63. Area material deprivation 64. Area dependence	65. Area ethnic concentration
Contextual			
Health Service Use	N/A	66. Alternate Level of Care 67. Age at 1st hospitalization 68. Admission inpatient status 69. Incapable of consenting to treatment 70. Incapable of managing property 71. Incompetent to disclosing record 72. Left against medical advice	73. Legal Guardian 74. Time since contact with 75. community mental Health 76. Unit Type

Table 4. Operationalization of predisposing factor variables.

Variable	Operationalization
Sex	Binary: Female/ Male
Age	Nominal: 6 age groups: 18-24, 25-34, 35-44, 45-54 55-64, 65+
Marital Status	Nominal: Never Married, Married, Partner/Significant other, Widowed, Separated, Divorced
Education	Nominal: < High-school, High-school, >HS
Aboriginal Status	Binary (Y/N)
First Language	Nominal: English/French/Other

Table 5. Operationalization of enabling factor variables.

Variable	Operationalization
Living Environment conceptual block	
Lived alone	Binary (Y/N)
Homeless	Binary (Y/N)
Residential Stability	Binary (Y/N): Prior to admission, most recent residence was temporary
Enabling Clinical Assessment Protocols (CAP) conceptual block	
Education and Employment CAP	Nominal: 0= No education/ employment concerns. 1=Risk of losing job or dropping out of school. Individual demonstrating any of the following indicators: increase in lateness or absenteeism over the last 6 months; poor productivity/disruptiveness at work/school; expressed intent to quit work/school; persistent unemployment/fluctuating work history over the last 2 years 2= Support employment search. includes individuals seeking employment; individuals between ages 10-30 who have recent dropped out of or failed school; individuals aged 15-65 who are unemployed and not seeking work.

Social Relationship CAP	Nominal: 0= No issues.
	1= *Reduce social isolation/ family dysfunction.* Individuals have any of the following indicators: Family/friends overwhelmed by person's illness; beliefs about dysfunctional family roles; severed or conflict-laden relationship within the last year; as well as having no confidant, and are demonstrating social isolation.
	2= *Improve close friendships and family functioning.* Individuals have any of the symptoms described above, but may have confidant or are not experiencing social isolation.
Support Systems for Discharge CAP	Binary: 0= *Support available/Unneeded;* 1=*Support unavailable.*
Interpersonal Conflict CAP	Ordinal: 0= *No Conflict.*
	1= *Widespread conflict.* Individuals have two or more of the following symptoms: persistent anger with self/others; conflict with/repeated criticism of family or friends;/ other care recipients or staff; staff members report persistent frustration in dealing with the person
	2= *Specific relationship.* individuals have one of the above symptoms.
Criminal Activity CAP	Binary: 0= *CAP not triggered.* 1= *CAP triggered.* Individuals have experienced police intervention for any history of violent crime or nonviolent crime within the past year;
Income Source conceptual block	
Income Source: Employment	Binary: Not a source of Income, Source of income
Income Source: EI	Binary: Not a source of Income, Source of income
Income Source: Pension	Binary: Not a source of Income, Source of income
Income Source: Social Assistance	Binary: Not a source of Income, Source of income
Income Source: Disability	Binary: Not a source of Income, Source of income
Income Source: Other	Binary: Not a source of Income, Source of income
No Income	Binary: 0: No, 1: Yes
Multiple Sources	Binary: Not a source of Income, Source of income

Table 6. Operationalizations of needs factor variables.

Variable	Operationalization
Diagnoses conceptual Block	
Primary DSM IV Diagnosis	Binary (Y/N): Y= if any below receive a score of '1' Disorders of childhood/adolescence Delirium, dementia, and amnestic and other cognitive disorders

	Mental disorders due to general medical conditions Substance-related disorders Schizophrenia and other psychotic disorders Mood disorders Anxiety disorders Somatoform disorders Factitious disorders Dissociative disorders Sexual and gender identity disorders Eating disorders Sleep disorders impulse control disorders not classified elsewhere Adjustment disorders Personality disorders
Multiple Diagnoses	<u>Binary</u> (Y/N): Y= If any of the above disorders are rated as '1', and any other disorder—excluding substance related disorders—receives a score of '2' or '3'
Concurrent Primary Substance use	<u>Binary</u> (Y/N): If Substance related disorder is '1' and any other is '2' or '3'
Concurrent Secondary Substance use	<u>Binary</u> (Y/N): Y= If any disorder is '1' and a Substance related disorder is '2' or '3'
Symptoms conceptual block
Activities of Daily Living Hierarchy Scale (ADL-H)	<u>Nominal:</u> 0= ADL-H score of 0, 1= ADL-H score of 1 or 2, 3: ADL-H score ≥ 3 ADL-H scores are derived from a combination of the following symptoms: personal hygiene, locomotion, eating, toilet use, which are coded as follows: 0 = Independent: No help, set-up, or supervision; 1 = Set-up help: article provided or placed within persons reach 3 times; 2 = Supervision: oversight, encouragement, or cueing; 3 = Limited assistance: help to complete task on some occasions; 4 = extensive assistance: assistance throughout task—person performs 50% of sub-tasks; 5 = Maximal assistance: Person involved, but completes less than 50% of sub-tasks on own 6 = Total dependence: full performance of activity by others during total entire period 8=Activity did not occur Scores range from 0-6
Aggressive Behaviour Scale	<u>Nominal:</u> 0=ABS score of 0, 1= ABS score 1-4, 2=ABS score ≥ 5 ABS scores are derived from a combination of the following indicators:

	verbal abuse, physical abuse, socially inappropriate/disruptive, resists care, which are coded as follows: from 0-3, with 0. Indicator not exhibited in the last 3 days 1. Indicator not exhibited in the last 3 days but is **reported to be present** 2. Indicator exhibited on 1 to 2 of the last 3 days 3. Indicator exhibited daily in the last 3 days Scores range from 0-12.
Cognitive Performance Scale (CPS)	Ordinal: 0= CPS score of 0, 1= CPS score 1-2, 2 =CPS score 3-4, 3= CPS score $\geq$ 5 CPS scores are derived from a combination of the following symptoms: short-term memory, daily decision making over last 3 days, making self understood, how individual eats/drinks. Scores range from 0-6: 0 = intact 1 = borderline intact 2 = mild impairment 3 = moderate impairment 4 = moderate to severe impairment 5 = severe impairment 6 = very severe impairment **Appendix B includes a figure showing the decision tree used for the CPS.
Depression Severity Index (DSI)	Nominal: 0= DSI score of 0, 1= DSI score 1-2, 2= DSI score 3-5, 3= DSI score $\geq$ 6 DSI scores are derived from a combination of the following symptoms: sad/pained facial expressions, made negative statements, self-deprecation, expressions of guilt/shame, hopelessness, which are coded as follows: from 0-3, with 0. Indicator not exhibited in the last 3 days 1. Indicator not exhibited in the last 3 days but is **reported to be present** 2. Indicator exhibited on 1 to 2 of the last 3 days 3. Indicator exhibited daily in the last 3 days Scores range from between 0-15.
Mania	Nominal: 0= mania score of 0; 1= mania score of 1-3; 2= mania score 4-8; 3= mania score $\geq$ 9 DSI scores are derived from a combination of the following symptoms: inflated self-worth, hyperarousal, irritability, increased sociability/hyper-sexuality, pressured speech, labile affect, sleep problems due to hypomania, which are coded as follows: from 0-3, with

	0. Indicator not exhibited in the last 3 days 1. Indicator not exhibited in the last 3 days but is **reported to be present** 2. Indicator exhibited on 1 to 2 of the last 3 days 3. Indicator exhibited daily in the last 3 days Scores range from 0-20.
Social Withdrawal Scale (SWS)	Nominal: 0=SWS score of 0, 1=SWS score 1-2, 2=SWS score 3-5,3= SWS score ≥ 6 SWS scores are derived from a combination of the following symptoms: decreased energy, flat or blunted affect, anhedonia, loss of interest, lack of motivation, reduced interaction, which are coded as follows: from 0-3, with 0. Indicator not exhibited in the last 3 days 1. Indicator not exhibited in the last 3 days but is **reported to be present** 2. Indicator exhibited on 1 to 2 of the last 3 days 3. Indicator exhibited daily in the last 3 days Score vary between 0 and 18.
Positive Symptoms Scale (PSS)	Nominal: 0= PSS score of 0, 1= PSS score 1-2, 2= PSS score 3-5, 3= PSS score ≥ 6 A combination of the following symptoms: hallucinations, command hallucinations, delusions, abnormal thought process, which are coded as follows: from 0-3, with 0. Indicator not exhibited in the last 3 days 1. Indicator not exhibited in the last 3 days but is **reported to be present** 2. Indicator exhibited on 1 to 2 of the last 3 days 3. Indicator exhibited daily in the last 3 days Scores range from 0-12. Higher scores indicate higher levels of psychotic symptoms.
Other Needs conceptual block	
Medication Adherence CAP	Nominal: *0= No risk.* *1= Problems with due to existing symptoms.* Individual has cognitive impairment/positive symptoms and one of the following indicators: adhere to medication regimes <80% of time; refused medication last 3 days; requires supervision for medication adherence. *2= Stopped taking medication due to side effects.* Individual has stopped taking medication due to side-effects and is experiencing one of the following symptoms: Extrapyramidal symptoms; sleep disturbance; dizziness/vertigo/light-headedness; anticholinergic effects; seizures; emergent conditions; weight gain; diabetes; hyper salivation/drooling; sexual dysfunction.

Risk of harm to others CAP	Nominal: *0= No risk.* *1= Moderate risk.* Individual has a score of 3 or 4 on the RHO Scale; OR has had violent thoughts, actions, or acts of intimidation in the last 7 days. *2= High risk.* Individual has a score 5 or 6 on the RHO scale. ** RHO scale described in Appendix B.
Self-Care CAP	Nominal: *0= No risk.* *1= Support involvement.* Individuals whose lesser self-care issues can be involved in more complex decisions regarding self-care. *2= Acute Symptoms Prioritized.* Individuals with substantial self-care issues for whom treatment of acute mental health symptoms must take priority.
Suicidality and Purposeful Self-Harm CAP	Nominal: *0= No risk.* *1= Moderate risk.* Individual has a score of 4 on the SoS Scale; *2= High risk.* Individual has a score 5 on the SoS scale. **SoS Scale described in Appendix B.
Trauma CAP	Nominal: *0= No trauma.* *1= Immediate danger.* Individual has experienced one or more of the following traumatic events in the last 7 days: sexual abuse, physical abuse emotional abuse, criminal victimization OR are fearful of others or currently have concerns for personal safety. *2= Individuals who have experienced one or more traumatic events that evoke an intense sense of fear.* Individuals report having experienced traumatic life events AND describe the event(s) as having evoked an intense sense of horror or fear.
Addictive Behaviours conceptual block	
Substance use	Nominal: 0= Never or more than 1 year ago; 1= Within the past year; 2= Within the last 3 months Inhalants Hallucinogen Cocaine/Crack Stimulants Opiates Cannabis
Tobacco	Nominal: No; Not in last 3 days but is daily smoker; Yes
Gambling	Binary (Y/N)
Alcohol last 2 weeks	Nominal: No drinks; 1 drink; 2-4 drinks; 5 or more drinks
Substance Use CAP	Nominal: 0= Never or more than 1 year ago, 1=Within the past year 2= Within the last 3 months

Table 7. Operationalization of contextual factor variables.

Variable	Operationalization
Area residential instability	Ordinal: FSA scores sorted into quintiles 1= lowest score 5=highest score
Area material deprivation	Same as above
Area dependence	Same as above
Area ethnic concentration	Same as above

Table 8. Operationalization of health service use variables.

Variable	Operationalization
Alternate Level of Care	Binary: No ALC/ ALC
Age at 1st hospitalization	Nominal: 15-24; 25-44; 45-64; 65+
Admission inpatient status	Nominal: Application for psychiatric Assessment, Voluntary, Informal, Involuntary, Other
Incapable of consenting to treatment	Binary (Y/N)
Incapable of managing property	Binary (Y/N)
Incompetent to disclose info regarding clinical record	Binary (Y/N)
Left against medical advice	Binary (Y/N)
Have a legal Guardian	Binary (Y/N)
Time since contact with community mental Health	Nominal: No Contact; 31 days or more; 30 Days or less
Unit Type	Nominal: Acute; Addiction; Unknown; Psychiatric Crisis; Longer term

Analysis

Univariate and bivariate statistics were calculated to describe the sample and understand the distribution of independent and outcome variables. Additionally, the bivariate statistics (chi-squares), were used to identify variables to include in the modelling process; any variable significant at the p=0.05 level was selected for examination.

To further identify variables for inclusion in the final modelling process, multivariate models of conceptual variable blocks (see table 4) were independently developed. Each of the sections in table 4 represents a conceptual block whose variables were tested concurrently (e.g. the predisposing block included variables 1-6) in multivariate models. Given the large number of variables included in the needs category, sub-categories were defined for this process. The

diagnosis conceptual block included variables 23-41, the symptoms block 42-47, the addictive behaviours variables 48-56, and a 'other' needs category contained variables 57-61. Finally, the enabling category was split into three conceptual blocks: living environment (variables 7-9), enabling CAPs (10-14), and income (15-22). Each of the conceptual blocks were modelled separately, and any variable statistically significant with a p value <0.05 was identified for testing in the final modelling process. Finally, to test intersectionality theory (26,59), interaction terms were derived from predisposing variables by testing their multiplicative effects with variables from the other conceptual blocks—a practice was in line with previous research investigating intersectionality (20,51,52).

Logistic regression models using generalized estimated equations (GEE) were used for the model building process. GEE was selected for the analysis because while the data is nested in hospitals—suggesting that within-cluster correlation may be an issue—the focus of the present research was on variable effect estimates rather than correlation structure. GEE provides reliable estimates while controlling for clustering of observations within each facility (87).

Using GEE, iterative parsimonious model building was performed. The process began with the first conceptual block—predisposing factors—followed by diagnoses (as predisposing and needs variables were identified as the most important factors of the behavioural model in the literature review above), and continued with each conceptual block defined above. Throughout the process, sex and age were kept in the models as control variables, as they had been consistently investigated in previous research. A new model was described when specific individual variables were shown to be statistically significant at the p<0.0001. In instances where interactions were being tested, the main effect variables were maintained, regardless of significance.

Results

<u>Descriptive Statistics</u>

Outcome Variables

      Seventy percent (n=14,882) of individuals who experienced their first (index) admission to inpatient mental health services in Ontario between 2006 to 2009 had no additional inpatient use in Ontario for 5 years following discharge from their index admission. Among those who did have additional use following discharge from index admission (Figures 2 and 3), 75% spent equal to or less than 10 additional days in hospital and/or had 1 additional episode, 90% spent equal to or less than 48 days and/or 2 episodes. The maximum use in the sample was 1722 days and 14 episodes. Figure 4 shows a trend where the number of episodes following index admission increases, the number of days following index admission also increase. With a Spearman's rho of 0.986 (p<0.0001), these variables are highly associated.

      The relationship between high use in terms of days and episodes is shown in figures 4 and 5. For the number of days in hospital following discharge from index admission, 2,108 were classified as high-use, having at least 48 days in hospital following index discharge. For the number of episodes following discharge from index admission, 2,558 were classified as high-use, having at least 2 episodes of care after index discharge.

      Finally, a cross-tabulation between the high use variables further elucidates different patterns of high intensity use. Most of the sample were not considered high-users in either category (85%, n=17,946) while 2.7% (n=566) were not high intensity episodic users, but are high intensity daily users. Conversely, 5.3% (n=1,106) of individuals who were high intensity episodic users were not high intensity daily users. Finally, 7.3% (n=1,542) were high intensity episodic and daily users.
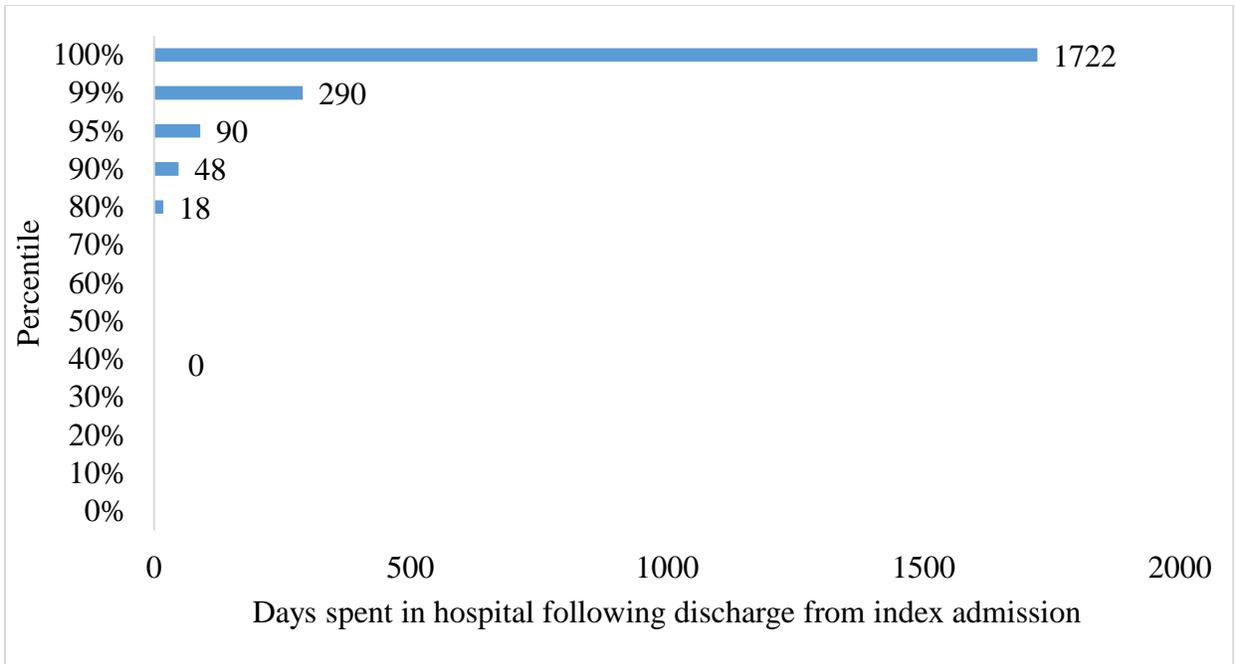
Figure 2. Quantile distribution of the number of days in hospital following discharge from index admission.
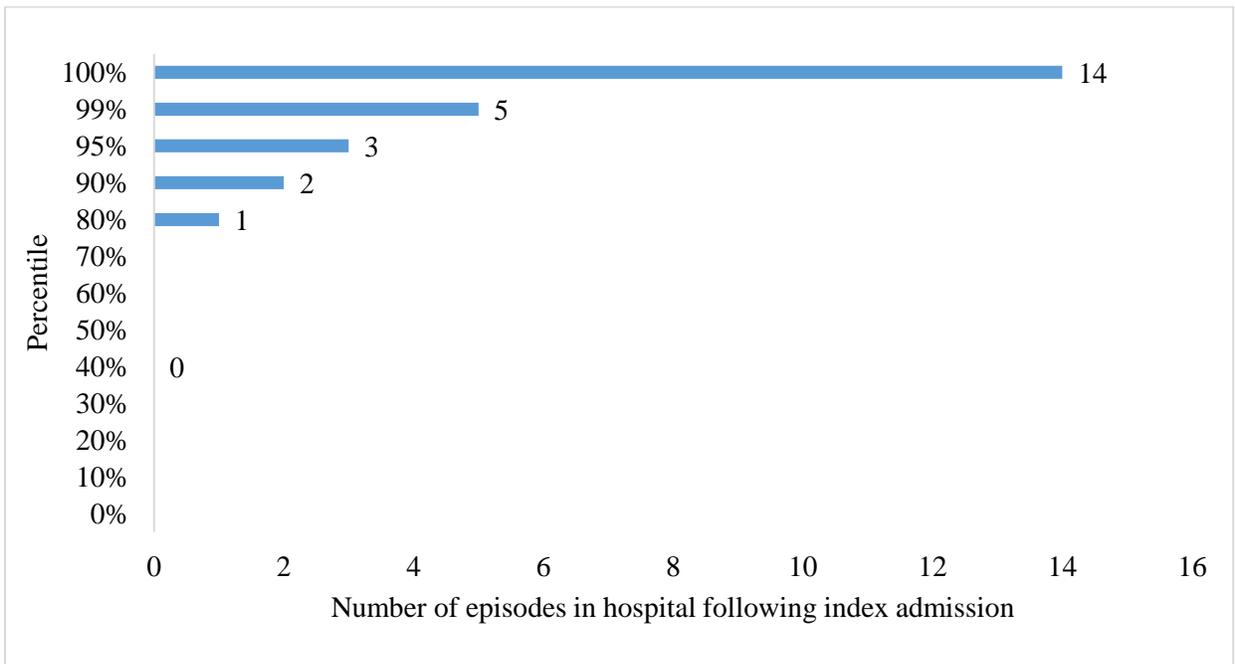
Figure 3. Quantile distribution of the number of episodes following discharge from index admission.
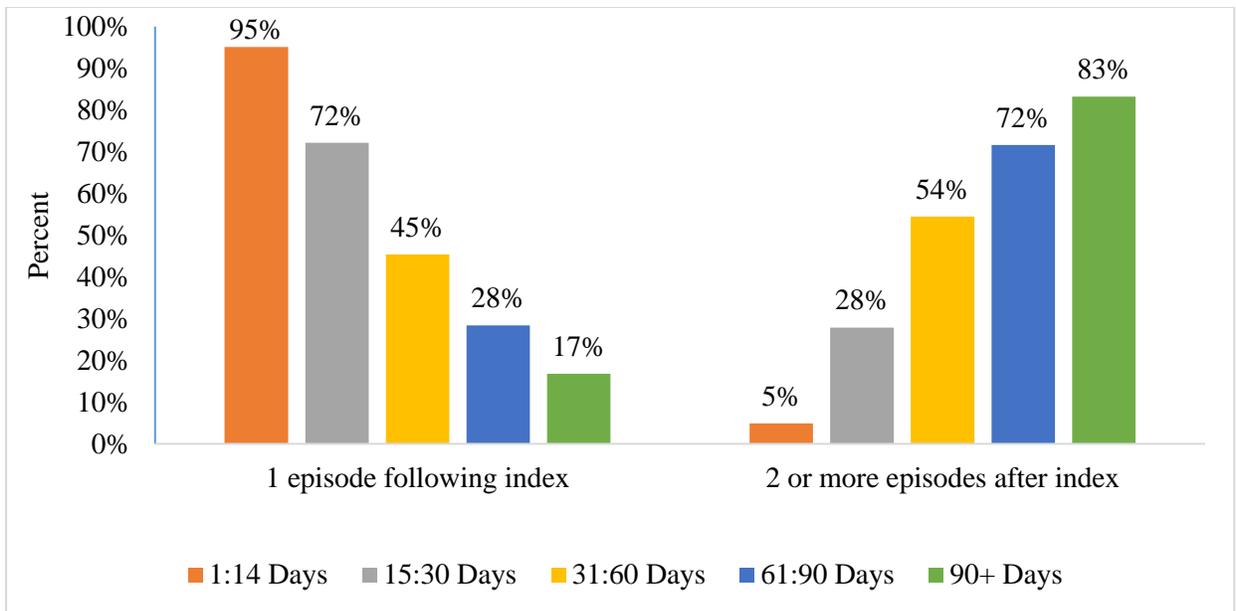
Figure 4. Number of days in hospital following discharge from index admission by number of episodes after discharge from index admission. Those individuals with no further use (n=14,882, %= 70.6%) were not included in this figure.
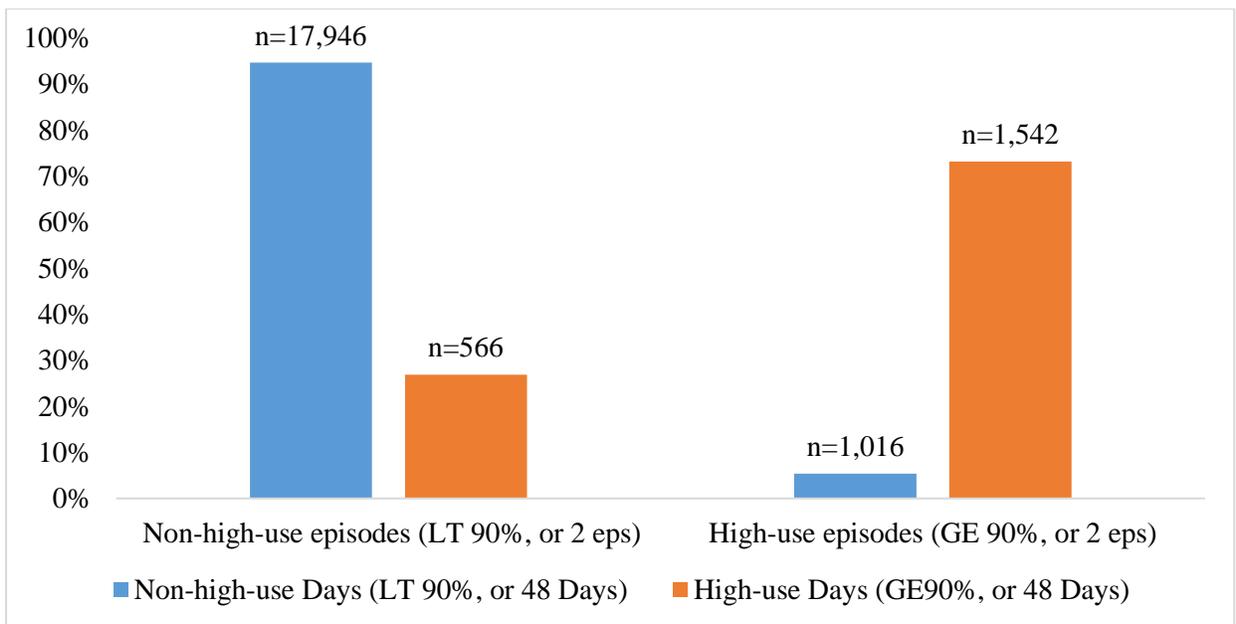
Figure 5. High-use days variable versus high-use episodes following discharge from index admission.

Predisposing Factors

Table 9 contains descriptive statistics of predisposing factors. Fifty-one percent of the sample are women, with a mean age of 46 years (median = 44). More than half the population had some education beyond high-school, with 22% reporting less than high-school. Most subjects had been married at some point (62%), with 37% losing their spouse, separating, or getting divorced. Finally, 93% of the sample identified English as their primary language.

Among demographic variables, age (p<0.0001) and marital status (p<0.0001) are the only variables with statistically significant associations with high intensity use of days following index admission. Within age categories, the youngest group (≤24) has the highest proportion (12%) of individuals classified as high intensity daily users, with a decreasing trend at each age group until middle-age (45-54), at which point the proportion begins to increase alongside age. Within the marital variable, the never married group has the highest proportion (11%) of individuals classified as high intensity day users.

For high intensity use of episodes, age (p<0.0001), marital status (p<0.0001), and level of education (p=0.0019) all demonstrate statistically significant associations. Age once again demonstrates a trend in which the proportion of individuals classified as high intensity decreases as age group increases (17%-8%); in this case, there is no reversal of the trend at middle-age. Once again, individuals who have never married have a higher proportion (15%) of high intensity episodic use. Finally, individuals who attended high-school have a higher proportion (14%) of high intensity episodic use than individuals with either more or less education.

Table 9. Descriptive statistics for predisposing factors. Bivariate relationships with High use variables that are statistically significant are denoted as: bold: p < 0.0001, underlined/Italics: p < 0.05

Variable	Level	N	%	High Use Days				High use Episodes			
				No		Yes		No		Yes	
				n	%	n	%	n	%	n	%
Age	<=24	2,946	14	**2,594**	**88.1%**	**352**	**11.9%**	*2,455*	*83.3%*	*491*	*16.7%*
	25-34 (Ref)	3,672	17	**3,328**	**90.6%**	**344**	**9.4%**	*3,177*	*86.5%*	*495*	*13.5%*
	35-44	4,065	19	**3,705**	**91.1%**	**360**	**8.9%**	*3,551*	*87.4%*	*514*	*12.6%*
	45-54	4,018	19	**3,657**	**91.0%**	**361**	**9.0%**	*3,543*	*88.2%*	*475*	*11.8%*
	55-64	2,368	11	**2110**	**89.1%**	**258**	**10.9%**	*2,091*	*88.3%*	*277*	*11.7%*
	65+	4,001	19	**3,568**	**89.2%**	**433**	**10.8%**	*3,695*	*92.4%*	*306*	*7.6%*
Sex	F	10,644	51	9,546	89.7%	1,098	10.3%	9,315	87.5%	1,329	12.5%
	M	10,421	49	9,411	90.3%	1,010	9.7%	9,193	88.2%	1,228	11.8%
	O	5	0	5	100.0%	-	0.0%	4	80.0%	1	20.0%
Primary Language	ENG	19,585	93	17,628	90.0%	1,957	10.0%	17,207	87.9%	2,378	12.1%
	FRA	378	2	345	91.3%	33	8.7%	343	90.7%	35	9.3%
	OTH	1,107	5	989	89.3%	118	10.7%	962	86.9%	145	13.1%
Aboriginal Status	Not aboriginal	20,645	98	18,570	89.9%	2,075	10.1%	18,142	87.9%	2,503	12.1%
	Aboriginal	425	2	392	92.2%	33	7.8%	370	87.1%	55	12.9%
Education	Less than High school	4,682	22	4,233	90.4%	449	9.6%	*4,135*	*88.3%*	*547*	*11.7%*
	High school	5,077	24	4,551	89.6%	526	10.4%	*4,389*	*86.4%*	*688*	*13.6%*
	More than High school	11,311	54	10,178	90.0%	1,133	10.0%	*9,988*	*88.3%*	*1,323*	*11.7%*
Marital	Never Married	7,858	37	**6,971**	**88.7%**	**887**	**11.3%**	6,700	85.3%	1,158	14.7%
	Married or partner	8,508	40	**7,730**	**90.9%**	**778**	**9.1%**	7,594	89.3%	914	10.7%
	Widowed, separated, divorced	4,704	22	**4,261**	**90.6%**	**443**	**9.4%**	4,218	89.7%	486	10.3%

Enabling Factors

Tables 10 and 11 show the distribution of enabling factor variables. Thirty-seven percent of subjects reported employment as a source of income, while 11% reported having no income. Less than 10% were receiving social assistance, while 12% and 26% were receiving disability or pension payments. Finally, 5% of individuals identified employment insurance as a source of income. Twenty-six percent reported living alone, while 22% reported residential instability.

Among income sources, employment ($p<0.0001$), employment insurance($p=0.0464$), and pensions ($p=0.0002$) as sources of income all have statistically significant associations with high intensity day use. Individuals without employment (11% vs. 8%) or employment insurance (10% vs. 8%) as sources of income encompass a greater proportion of the high intensity day users compared to those who do. Individuals who do not report a pension as a source of income are a smaller proportion (10%) of high intensity day users than those who indicate pension as a source of income (11%).

For the high intensity episode variable, employment ($p<0.0001$), disability ($p=0.0477$), and pension ($p<0.0001$) have statistically significant associations. Employment maintains a similar relationship as above, while the trend for the effect of pension income is reversed. Those who do not report pensions as a source of income are a greater proportion (13%) of high intensity episodic users compared to those who do report pension as a source of income (10%). Finally, individuals who reported disability payments as a source of income are a smaller proportion (11%) of high intensity episodic users than those who do report disability as a source of income (12%).

Table 10. Descriptive statistics for sources of income. Bivariate relationships with High use variables that are statistically significant are denoted as: bold: p < 0.0001, underlined/Italics: p < 0.05

| | | | | High Use Days | | | | High use Episodes | | | |
| | | | | No | | Yes | | No | | Yes | |
Variable	Level	N	%	n	%	n	%	n	%	n	%
Disability	Not a Source of Income	18,580	88	16,732	90.1%	1,848	9.9%	*16,294*	*87.7%*	*2,286*	*12.3%*
	Source of Income	2,490	12	2,230	89.6%	260	10.4%	*2,218*	*89.1%*	*272*	*10.9%*
Employment	Not a Source of Income	13,321	63	**11,832**	**88.8%**	**1,489**	**11.2%**	11,615	87.2%	1,706	12.8%
	Source of Income	7,749	37	**7,130**	**92.0%**	**619**	**8.0%**	6,897	89.0%	852	11.0%
Employment Insurance	Not a Source of Income	20,011	95	*17,990*	*89.9%*	*2,021*	*10.1%*	17,586	87.9%	2,425	12.1%
	Source of Income	1,059	5	*972*	*91.8%*	*87*	*8.2%*	926	87.4%	133	12.6%
No Income	No	18,658	89	*16,834*	*90.2%*	*1,824*	*9.8%*	**16,497**	**88.4%**	**2,161**	**11.6%**
	Yes	2,412	11	*2,128*	*88.2%*	*284*	*11.8%*	**2,015**	**83.5%**	**397**	**16.5%**
Other Income	Not a Source of Income	17,740	84	15,977	90.1%	1,763	9.9%	15,616	88.0%	2,124	12.0%
	Source of Income	3,330	16	2,985	89.6%	345	10.4%	2,896	87.0%	434	13.0%
Pension	Not a Source of Income	15,580	74	*14,092*	*90.4%*	*1,488*	*9.6%*	**13,544**	**86.9%**	**2,036**	**13.1%**
	Source of Income	5,490	26	*4,870*	*88.7%*	*620*	*11.3%*	**4,968**	**90.5%**	**522**	**9.5%**
Social Assistance	Not a Source of Income	19,692	93	17,713	90.0%	1,979	10.0%	**17,324**	**88.0%**	**2,368**	**12.0%**
	Source of Income	1,378	7	1,249	90.6%	129	9.4%	**1,188**	**86.2%**	**190**	**13.8%**

Table 11. Descriptive statistics for living environments. Bivariate relationships with High use variables that are statistically significant are denoted as: bold: p < 0.0001, underlined/Italics: p < 0.05

| | | | | High Use Days | | | | High use Episodes | | | |
| | | | | No | | Yes | | No | | Yes | |
Variable	Level	N	%	n	%	n	%	n	%	n	%
homelessness	not homeless	21,010	99.7	18,912	90.0%	2,098	10.0%	18,460	87.9%	2,550	12.1%
	homeless	60	0.3	50	83.3%	10	16.7%	52	86.7%	8	13.3%
Lives Alone	Does not live alone	15,693	74.5	*14,173*	*90.3%*	*1,520*	*9.7%*	13,824	88.1%	1,869	11.9%
	Lives alone	5,377	25.5	*4,789*	*89.1%*	*588*	*10.9%*	4,688	87.2%	689	12.8%
Residential Instability	No instability	16,483	78.2	14,830	90.0%	1,653	10.0%	14,532	88.2%	1,951	11.8%
	Instability	4,587	21.8	4,132	90.1%	455	9.9%	3,980	86.8%	607	13.2%

For living environment, living alone (p=0.0084) was demonstrated to have a statistically significant association with high intensity use of days. Individuals who live alone make up a greater proportion (11%) of high intensity day users than those who do not (10%). Finally, no living environment variables were statistically significant for high intensity episodic use.

Table 12 includes distributions of enabling factors captured using interRAI CAPs. 28% of individuals were identified as needing support and encouragement for participation in vocational/educational activities, 9% are at risk of dropping out of school or losing their job, 7% appear unable to manage their finances, and 17% are experiencing economic hardship. Twenty-eight percent of individuals in the sample need informal care following discharge, but lack familial support. Further, 29% of individuals are experiencing social isolation, 26% are experiencing widespread conflict and 31% need improvement to specific relationships, while 10% have conflict within specific relationships. Finally, 14% have been identified as potentially at risk for future criminal behaviour.

Among the CAPs (table 12) that capture enabling factors, the discharge support (p=0.0024), education/ employment (p=0.0010), finances (p<0.0001), interpersonal conflict (p=0.0025), and social relationships (p=0.0005) have statistically significant associations with high intensity use of days. Individuals without support at discharge represent a larger proportion (11%) of high intensity day users. Individuals without education and employment issues represent a greater proportion (11%) of high intensity day users, while individuals facing economic hardship are a larger proportion (13%) compared to those with no financial issues (10%) and those struggling to maintain their finances (8%). Individuals experiencing conflict (either with a specific individual (12%), or generalized (11%)) have a higher proportion of high intensity day users than those people not experiencing conflict. Finally, individuals with

difficulty with social relationships have a greater proportion (11%) of high intensity day users than individuals experiencing social isolation (9%) or those people with no social relationship issues (10%).

In terms of high intensity episodic use, discharge support (p=0.0015), finances (p=0.0113), interpersonal conflict (p=0.011) and the social relationship (p=0.0031) CAP's are all statistically significant. Mirroring the results for high intensity of days, individuals who have support available at discharge (12%) are a smaller proportion of high intensity episodic users. Regarding finances, when intensity of episodes is considered, a trend opposite the one observed for intensity of days: individuals with no financial issues are the greatest proportion of high intensity episodic users (13%). For the interpersonal conflict cap, the trend observed for days is repeated here, with no conflict representing the lowest proportion (12%) of high intensity episodic users, followed by individuals experiencing generalized conflict (13%) and those with conflict in specific relationships (14%). Finally, individuals who require improvements to all relationships are the largest proportion (13%) of high intensity episodic users, followed by individuals with no relationship issues.

Needs Factors

Table 13 describes the distribution of provisional primary DSM-IV diagnostic categories within the sample. Mood (46%), substance use (18%) and schizophrenia and related psychoses (16%) had the highest prevalence. Comorbidity is prevalent within the sample, as 27% of individuals appear to have a mental and substance disorders, while 38% had at least two mental disorders. Finally, dementia had a prevalence rate of 9% within the sample.

Table 12. Descriptive statistics for enabling factors capture with interRAI CAPS. Bivariate relationships with High use variables that are statistically significant are denoted as: bold: p < 0.0001, underlined/Italics: p < 0.05.

| Variable | Level | N | % | High Use Days | | | | High use Episodes | | | |
| | | | | No | | Yes | | No | | Yes | |
		N	%	n	%	n	%	No	%	n	%
Criminal Activity CAP	No history of criminal behaviour	18,176	86	16,359	90.0%	1,817	10.0%	15,996	88.0%	2,180	12.0%
	History of criminal behaviour	2,894	14	2,603	89.9%	291	10.1%	2,516	86.9%	378	13.1%
Social Discharge CAP	Support Available	15,088	72	*13,628*	*90.3%*	*1,460*	*9.7%*	*13,324*	*88.3%*	*1,764*	*11.7%*
	No informal support provider available	5,982	28	*5,324*	*89.0%*	*658*	*11.0%*	*5,188*	*86.7%*	*794*	*13.3%*
Education and Employment CAP	No issues	13,266	63	*11,863*	*89.4%*	*1,403*	*10.6%*	11,640	87.7%	1,626	12.3%
	Risk of unemployment dropping out of school	1,851	9	*1,694*	*91.5%*	*157*	*8.5%*	1,632	88.2%	219	11.8%
	Need support for participation in employment /education	5,953	28	*5,405*	*90.8%*	*548*	*9.2%*	5,240	88.0%	713	12.0%
Finances CAP	No issues	15,992	76	**14,468**	**90.5%**	**1,524**	**9.5%**	*13,990*	*87.5%*	*2,002*	*12.5%*
	Economic Hardship experienced	3,668	17	**3,196**	**87.1%**	**472**	**12.9%**	*3,269*	*89.1%*	*399*	*10.9%*
	Inability to manage finances	1,410	7	**1,298**	**92.1%**	**112**	**7.9%**	*1,253*	*88.9%*	*157*	*11.1%*
Interpersonal Conflict CAP	No conflict observed	13,538	64	*12,248*	*90.5%*	*1,290*	*9.5%*	*11,951*	*88.3%*	*1,587*	*11.7%*
	Widespread conflict identified	5,463	26	*4,888*	*89.5%*	*575*	*10.5%*	*4,780*	*87.5%*	*683*	*12.5%*
	Specific relationship conflict	2,069	10	*1,826*	*88.3%*	*243*	*11.7%*	*1,781*	*86.1%*	*288*	*13.9%*
Social Relationships CAP	Not issues observed	8,475	40	*7,633*	*90.1%*	*842*	*9.9%*	*7,447*	*87.9%*	*1,028*	*12.1%*
	Reduce Social isolation	6,061	29	*5,517*	*91.0%*	*544*	*9.0%*	*5,387*	*88.9%*	*674*	*11.1%*
	Improve relationships	6,534	31	*5,812*	*89.0%*	*722*	*11.0%*	*5,678*	*86.9%*	*856*	*13.1%*

Table 13. Descriptive statistics for primary provisional diagnostic categories upon discharge from care. Bivariate relationships with High use variables that are statistically significant are denoted as: **bold: p < 0.0001**, *underlined/Italics: p < 0.05*.

Variable	Level	N	%	High Use Days No / No	%	High Use Days Yes / n	%	High use Episodes No / No	%	High use Episodes Yes / n	%
Adjustment	No Diagnosis	20,483	97	**18,403**	**89.8%**	**2,080**	**10.2%**	*17,978*	*87.8%*	*2,505*	*12.2%*
	Diagnosis	587	3	**559**	**95.2%**	**28**	**4.8%**	*544*	*92.7%*	*43*	*7.3%*
Anxiety	No Diagnosis	20,244	96	18,233	90.1%	2,011	9.9%	17,789	87.9%	2,455	12.1%
	Diagnosis	826	4	729	88.3%	97	11.7%	723	87.5%	103	12.5%
Childhood	No Diagnosis	20,973	100	**18,886**	**90.0%**	**2,087**	**10.0%**	18,433	87.9%	2,540	12.1%
	Diagnosis	97	<1	**76**	**78.4%**	**21**	**21.6%**	79	81.4%	18	18.6%
Dementia	No Diagnosis	19,149	91	17,242	90.0%	1,907	10.0%	**16,695**	**87.2%**	**2,454**	**12.8%**
	Diagnosis	1,921	9	1,720	89.5%	201	10.5%	**1,817**	**94.6%**	**104**	**5.4%**
Dissociative	No Diagnosis	21,061	100	18,954	90.0%	2,107	10.0%	18,505	87.9%	2,556	12.1%
	Diagnosis	9	<1	8	88.9%	1	11.1%	7	77.8%	2	22.2%
Eating	No Diagnosis	20,822	99	*18,756*	*90.1%*	*2,066*	*9.9%*	18,292	87.8%	2,530	12.2%
	Diagnosis	248	1	*206*	*83.1%*	*42*	*16.9%*	220	88.7%	28	11.3%
Factitious	No Diagnosis	21,068	100	18,960	90.0%	2,108	10.0%	18,510	87.9%	2,558	12.1%
	Diagnosis	2	<1	2	100.0%	-	0.0%	2	100.0%	-	0.0%
General medical issues leading to MI	No Diagnosis	20,845	99	18,764	90.0%	2,081	10.0%	18,313	87.9%	2,532	12.1%
	Diagnosis	225	1	198	88.0%	27	12.0%	199	88.4%	26	11.6%
Impulse	No Diagnosis	20,987	100	18,888	90.0%	2,099	10.0%	18,437	87.8%	2,550	12.2%
	Diagnosis	83	<1	74	89.2%	9	10.8%	75	90.4%	8	9.6%
Intellectual	No Diagnosis	20,492	97	*18,466*	*90.1%*	*2,026*	*9.9%*	18,019	87.9%	2,473	12.1%
	Diagnosis	578	3	*496*	*85.8%*	*82*	*14.2%*	493	85.3%	85	14.7%
Mood	No Diagnosis	11,474	54	**10,220**	**89.1%**	**1,254**	**10.9%**	10,074	87.8%	1,400	12.2%
	Diagnosis	9,596	46	**8,742**	**91.1%**	**854**	**8.9%**	8,438	87.9%	1,158	12.1%
Schizophrenia	No Diagnosis	17,645	84	**16,134**	**91.4%**	**1,511**	**8.6%**	**15,833**	**89.7%**	**1,812**	**10.3%**
	Diagnosis	3,425	16	**2,828**	**82.6%**	**597**	**17.4%**	**2,679**	**78.2%**	**746**	**21.8%**
Sexual Identity	No Diagnosis	21,066	100	18,958	90.0%	2,108	10.0%	18,509	87.9%	2,557	12.1%

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		N	%							
	Diagnosis	4	<1	4	100.0%	-	0.0%	3	75.0%	1	25.0%
Sleep	No Diagnosis	21,059	100.0	18,952	90.0%	2,107	10.0%	18,502	87.9%	2,557	12.1%
	Diagnosis	11	0.1	10	90.9%	1	9.1%	10	90.9%	1	9.1%
Somatoform	No Diagnosis	21,025	99.8	18,924	90.0%	2,101	10.0%	18,471	87.9%	2,554	12.1%
	Diagnosis	45	0.2	38	84.4%	7	15.6%	41	91.1%	4	8.9%
Substance	No Diagnosis	17,243	81.8	**15,337**	**88.9%**	**1,906**	**11.1%**	**14,971**	**86.8%**	**2,272**	**13.2%**
	Diagnosis	3,827	18.2	**3,625**	**94.7%**	**202**	**5.3%**	**3,541**	**92.5%**	**286**	**7.5%**
Personality	No Diagnosis	20,937	99.4	18,846	90.0%	2,091	10.0%	19,397	92.6%	1,540	7.4%
	Diagnosis	133	0.6	116	87.2%	17	12.8%	115	86.5%	18	13.5%
Concurrent MI substance use	No Diagnosis	15,347	72.8	**13,618**	**88.7%**	**1,729**	**11.3%**	**13,326**	**86.8%**	**2,021**	**13.2%**
	Diagnosis	5,723	27.2	**5,344**	**93.4%**	**379**	**6.6%**	**5,186**	**90.6%**	**537**	**9.4%**
Secondary Substance Use	No Diagnosis	19,174	91.0	17,243	89.9%	1,931	10.1%	16,867	87.9	2,307	12.1%
	Diagnosis	1896	9.00	1,719	90.7%	177	9.3%	1645	86.8	251	13.2
Multiple diagnoses – No Substance	No Diagnosis	13,109	62.2	11,768	89.8%	1,341	10.2%	11,501	87.7%	1,608	12.3%
	Diagnosis	7,961	37.78	7,176	90.1%	785	9.9%	7,011	88.1%	950	11.9%

Among the provisional diagnostic categories assigned to patients at discharge (table 13), there are multiple disorders that have statistically significant associations with high intensity of days spent in hospital, though the nature of the relationships can differ. Four diagnostic categories are associated with smaller proportions of high intensity daily users: adjustment disorders ($p<0.0001$), mood disorders ($p<0.0001$), substance use disorders ($p<0.0001$), and concurrent substance use and mental illness ($p<0.0001$). Individuals who are assigned an adjustment disorder provisional diagnosis make-up a smaller proportion (5%) of high intensity daily users than those who are not assigned an adjustment disorder categorization (10%). Mood disorders mirror this trend, as individuals with a diagnosis represent a smaller proportion (9%) than those without (11%). Additionally, individuals who receive a provisional diagnosis of substance use disorder are the smaller proportion (5%) of high intensity daily users when compared to those who did not receive a diagnosis (11%). Finally, individuals with concurrent substance use and mental illness make up a smaller proportion (7%) of high intensity daily users than individuals without concurrent mental illness and substance use issues (11%).

Unlike the disorders mentioned above, eating disorders ($p<0.0001$), intellectual disorders ($p=0.0003$), disorders of childhood ($p=0.0007$), and schizophrenia/related psychotic disorders ($p<0.0001$), all demonstrate statistically significant relationships with high intensity use of days where the diagnostic groups represent an increased proportion of high intensity daily users. A larger proportion of individuals with a disorder of childhood (22%) were high intensity daily users than those who are not (10%). Individuals with eating disorders represent a larger share (17%) of high intensity daily users than individuals without a diagnosis (10%). A larger proportion of those with an intellectual disability (14%) were high intensity daily users than those without the disorders (10%). Finally, schizophrenia and other psychotic disorders relate

similarly to high intensity of day use: a larger proportion of those with the disorder were high users (17%) than those without a diagnosis (9%).

For high intensity of episodic use, dementia and other cognitive disorders (p<0.0001), substance use disorders (p<0.0001), and concurrent mental illness and substance use (p<0.0001) all have a relationship in which those with a diagnosis have represent a smaller proportion of high intensity episodic users. In contrast, those individuals with presence of schizophrenia and other psychotic disorders (p<0.0001), a larger proportion of those with the disorder were high intensity episodic users (22% vs. 10%). Among the relationships with smaller proportions, individuals with dementia were the smaller proportion (5%) of high intensity episodic users, compared to those without a dementia diagnosis (13%). A smaller proportion of individuals with substance use disorders were high intensity episodic users (8%) than those without (13%). Those with a primary substance use disorder and secondary mental illness had a smaller proportion (10%) of high intensity episodic users than those who were not (11%).

Table 14 outlines the distribution of observed/ reported symptoms. Twenty percent of patients did not exhibit depressive or social withdrawal symptoms, while 65% were experiencing any cognitive issues, 49% had no symptoms of mania, and 64% had no positive symptoms. Finally, 22% of individuals presented some form of aggression and 18% had some ADL impairment.

For symptoms (table 16), every scale but the social withdrawal had statistically significant associations with high intensity day use. Further, among these significant associations, only the depression severity index (p=0.0406) was not significant at the 0.0001 level. The ABS (9%-15%), CPS (9%-13%), mania (9%-14%), and the PSS (8%-16%) all show a trend in which the proportion of high intensity day users increased alongside the scale scores.

The ADL-H also showed an increase from no symptoms (9%) to some symptoms (14%,), but then the proportion decreases in the final category (12%).

For high intensity episodic use, all scales other than the DSI had statistically significant associations at the p<0.0001 level. The mania (9%-14%), PSS (8%-16%), and SWS (10%-13%) all show a trend in which the proportion of high intensity episodic users increased alongside the increase in scale scores. The ABS also saw increases in the proportion of high intensity episodic users from no symptoms (11%) to the highest level (14%). Finally, the proportion of high intensity users decreased with increased impairment on the ADL-H (12%-9%) and CPS (12%-11%), though the mid range number of symptoms increases has a larger proportion of high intensity episodic users for both scales.

Descriptive statistics regarding the use of substances and addictive behaviours is shown in table 15. Forty percent of the sample reported having used some kind of substance in the past 3 months, with that number growing to 46% if the entire year is included. Within the specific substances, 17% reported having more than five drinks in one sitting in the past two weeks, while 37% of the sample reported regular tobacco use. Among illicit substances, cannabis had the highest 3-month use percentage: 18%, followed by cocaine and crack (8%) and opiates (6%) All other illicit substance use remained under two percent.

Table 14. Descriptive Statistics for symptoms as captured by interRAI scales. All levels represent the number of symptoms observed or reported over a 3-day period. Bivariate relationships with High use variables that are statistically significant are denoted as: **bold: p < 0.0001**, _underlined/Italics: p < 0.05_.

Variable	Level	N	%	High Use Days				High use Episodes			
				No		Yes		No		Yes	
				n	%	n	%	n	%	n	%
ADL-H	0	17,195	82	**15,585**	**90.6%**	**1,610**	**9.4%**	**15,076**	**87.7%**	**2,119**	**12.3%**
	1-2	2,163	10	**1,868**	**86.4%**	**295**	**13.6%**	**1,877**	**86.8%**	**286**	**13.2%**
	GE 3	1,712	8	**1,509**	**88.1%**	**203**	**11.9%**	**1,559**	**91.1%**	**153**	**8.9%**
ABS	0	16,477	78	**14,964**	**90.8%**	**1,513**	**9.2%**	**14,567**	**88.4%**	**1,910**	**11.6%**
	1- 4	3,188	15	**2,802**	**87.9%**	**386**	**12.1%**	**2,735**	**85.8%**	**453**	**14.2%**
	GE 5	1,405	7	**1,196**	**85.1%**	**209**	**14.9%**	**1,210**	**86.1%**	**195**	**13.9%**
CPS	0	13,721	65	**12,515**	**91.2%**	**1,206**	**8.8%**	**12,125**	**88.4%**	**1,596**	**11.6%**
	1-2	4,963	24	**4,370**	**88.1%**	**593**	**11.9%**	**4,245**	**85.5%**	**718**	**14.5%**
	3-4	1,316	6	**1,152**	**87.5%**	**164**	**12.5%**	**1,169**	**88.8%**	**147**	**11.2%**
	GE 5	1,070	5	**925**	**86.4%**	**145**	**13.6%**	**973**	**90.9%**	**97**	**9.1%**
DSI	0	4,192	20	_3,746_	_89.4%_	_446_	_10.6%_	3,688	88.0%	504	12.0%
	1-2	4,038	19	_3,657_	_90.6%_	_381_	_9.4%_	3,564	88.3%	474	11.7%
	3-5	6,187	29	_5,532_	_89.4%_	_655_	_10.6%_	5,400	87.3%	787	12.7%
	GE 6	6,653	32	_6,027_	_90.6%_	_626_	_9.4%_	5,860	88.1%	793	11.9%
Mania	0	10,301	49	**9,407**	**91.3%**	**894**	**8.7%**	**9,187**	**89.2%**	**1,114**	**10.8%**
	1-3	5,614	27	**5,034**	**89.7%**	**580**	**10.3%**	**4,955**	**88.3%**	**659**	**11.7%**
	4-8	3,785	18	**3,346**	**88.4%**	**439**	**11.6%**	**3,243**	**85.7%**	**542**	**14.3%**
	GE 9	1,370	7	**1,175**	**85.8%**	**195**	**14.2%**	**1,127**	**82.3%**	**243**	**17.7%**
PSS	0	13,393	64	**12,318**	**92.0%**	**1,075**	**8.0%**	**12,121**	**90.5%**	**1,272**	**9.5%**
	1-2	2,124	10	**1,897**	**89.3%**	**227**	**10.7%**	**1,858**	**87.5%**	**266**	**12.5%**
	3-5	2,897	14	**2,510**	**86.6%**	**387**	**13.4%**	**2,419**	**83.5%**	**478**	**16.5%**
	GE 6	2,656	13	**2,237**	**84.2%**	**419**	**15.8%**	**2,114**	**79.6%**	**542**	**20.4%**
SWS	0	4,646	22	4,232	91.1%	414	8.9%	**4,205**	**90.5%**	**441**	**9.5%**
	1-2	5,965	28	5,411	90.7%	554	9.3%	**5,238**	**87.8%**	**727**	**12.2%**
	3-5	7,527	36	6,697	89.0%	830	11.0%	**6,520**	**86.6%**	**1,007**	**13.4%**
	GE 6	2,932	14	2,622	89.4%	310	10.6%	**2,549**	**86.9%**	**383**	**13.1%**

Table 15. Descriptive statistics for substance use and addictive behaviours. Bivariate relationships with High use variables that are statistically significant are denoted as: **bold: p < 0.0001**, _underlined/Italics: p < 0.05_.

Variable	Level	N	%	High Use Days				High use Episodes			
				No		Yes		No		Yes	
				No	%	n	%	n	%	n	%
Alcohol:	No drinks	14,304	68	**12,703**	**88.8%**	**1,601**	**11.2%**	**12,458**	**87.1%**	**1,846**	**12.9%**
# of drinks in 1	1 drink	994	5	**917**	**92.3%**	**77**	**7.7%**	**888**	**89.3%**	**106**	**10.7%**
sitting in last	2 to 4 drinks	2,159	10	**1,980**	**91.7%**	**179**	**8.3%**	**1,911**	**88.5%**	**248**	**11.5%**
2 weeks	5 or more	3,613	17	**3,362**	**93.1%**	**251**	**6.9%**	**3,255**	**90.1%**	**358**	**9.9%**
Cannabis	Never/ GT 1 year ago	16,581	79	_14,852_	_89.6%_	_1,729_	_10.4%_	_14,584_	_88.0%_	_1,997_	_12.0%_
	History of Use	645	3	_589_	_91.3%_	_56_	_8.7%_	_545_	_84.5%_	_100_	_15.5%_
	Within last 3 months	3,844	18	_3,521_	_91.6%_	_323_	_8.4%_	_3,383_	_88.0%_	_461_	_12.0%_
Cocaine/Crack	Never/ GT 1 year ago	18,821	89	_16,583_	_88.1%_	_2,238_	_11.9%_	_16,490_	_87.6%_	_2,331_	_12.4%_
	History of Use	462	2	_423_	_91.6%_	_39_	_8.4%_	_403_	_87.2%_	_59_	_12.8%_
	Within last 3 months	1,787	8	_1,686_	_94.3%_	_101_	_5.7%_	_1,619_	_90.6%_	_168_	_9.4%_
Gambled	No	20,657	98	18,579	89.9%	2,078	10.1%	18,143	87.8%	2,514	12.2%
last 3 months	Yes	413	2	383	92.7%	30	7.3%	369	89.3%	44	10.7%
Hallucinogens	Never/ GT 1 year ago	20,399	97	18,353	90.0%	2,046	10.0%	_17,944_	_88.0%_	_2,455_	_12.0%_
	History of Use	329	2	302	91.8%	27	8.2%	_280_	_85.1%_	_49_	_14.9%_
	Within last 3 months	342	2	307	89.8%	35	10.2%	_288_	_84.2%_	_54_	_15.8%_
Inhalants	Never/ GT 1 year ago	20,902	99	18,811	90.0%	2,091	10.0%	18,368	87.9%	2,534	12.1%
	History of Use	65	<1	60	92.3%	5	7.7%	60	92.3%	5	7.7%
	Within last 3 months	103	<1	91	88.3%	12	11.7%	84	81.6%	19	18.4%
Opiates	Never/ GT 1 year ago	19,605	93	_17,573_	_89.6%_	_2,032_	_10.4%_	_17,188_	_87.7%_	_2,417_	_12.3%_
	History of Use	225	1	_208_	_92.4%_	_17_	_7.6%_	_203_	_90.2%_	_22_	_9.8%_
	Within last 3 months	1,240	6	_1,181_	_95.2%_	_59_	_4.8%_	_1,121_	_90.4%_	_119_	_9.6%_
Stimulants	Never/ GT 1 year ago	20,494	97	18,435	90.0%	2,059	10.0%	18,018	87.9%	2,476	12.1%
	History of Use	206	1	186	90.3%	20	9.7%	177	85.9%	29	14.1%
	Within last 3 months	370	2	341	92.2%	29	7.8%	317	85.7%	53	14.3%
Tobacco use	No use	13,416	64	**11,915**	**88.8%**	**1,501**	**11.2%**	**11,746**	**87.6%**	**1,670**	**12.4%**
	Yes	1,823	9	**1,633**	**89.6%**	**190**	**10.4%**	**1,564**	**85.8%**	**259**	**14.2%**
	Yes, not in last 2 weeks	5,831	28	**5,414**	**92.8%**	**417**	**7.2%**	**5,202**	**89.2%**	**629**	**10.8%**
Substance Use	No use	11,444	54	**10,103**	**88.3%**	**1,341**	**11.7%**	**9,948**	**86.9%**	**1,496**	**13.1%**
CAP	History of use	1,229	6	**1,119**	**91.0%**	**110**	**9.0%**	**1,090**	**88.7%**	**139**	**11.3%**
	Current use	8,397	40	**7,740**	**92.2%**	**657**	**7.8%**	**7,474**	**89.0%**	**923**	**11.0%**

Table 15 describes the relationship between substance use/addictive behaviours and high use outcomes. For high intensity of day use, number of drinks in one sitting in the past two weeks, tobacco, cocaine/crack, opiates, and the substance use CAP all have statistically significant associations at the p <0.0001 level. Additionally, cannabis use (p=0.0004) is also statistically significant. In the substance use cap, individuals who are classified as having used a substance recently are the smallest proportion (8%) of high intensity day users compared to those who have a history of use (9%), and those who have not used any substances (12%). This trend is mirrored in all substances and addictive behaviours: number of drinks (11%-7%), cannabis (10%-8%) cocaine/crack use (12%-6), opiate use (10%-7%), and tobacco (11%-7%).

Number of drinks in one sitting in the past two weeks, tobacco and the substance use CAP all have statistically significant associations with high intensity episodic use at the p <0.0001 level. Additionally, cannabis (p=0.0292), cocaine/crack (p=0.0010), hallucinogens (p=0.0330), and opiates (p=0.0093), also have statistically significant associations with high intensity episodic use. Like high intensity day use, the substance use CAP is inversely related with high intensity episodic use (13%-11%). This trend is mirrored in alcohol use (13%-10%), but reversed in both stimulant (12%-14%) and hallucinogen (12%- 25%) use. Cannabis (16% vs.12%) cocaine/crack (13% vs. 9%), and tobacco (14% vs. 11%) all have the level with past use as containing the greatest proportion of high intensity episodic users as opposed to the level describing those with the most recent use.

To conclude needs variables, table 16 includes CAPs that capture additional information that can be classified as needs variables. Thirty-five percent of individuals within the sample struggled with medication adherence, with the majority (31%) citing side-effects as the reason for their struggling to maintain the proper schedule. Sixty-seven percent and 76% of individuals

do not represent a danger to themselves or others, respectively, while 45% experience issues with activities of daily-living. Finally, 7% of individuals had immediate safety concerns, with 7% reporting emotional distress from previous trauma.

All the needs factor caps have statistically significant relationships with high intensity use of days at the $p < 0.0001$ level. Individuals struggling with medication adherence due to side-effects represent the largest proportion (13%) of high intensity day users compared to those without medication adherence issues (8%), or those with issues derived from symptoms (11%). The risk of harm to others CAP (9% - 15%) and the self-care CAP (8%-16%) both have trends in which as the level as the CAP increases, the proportion of high intensity day users increases as well. Conversely, the self-harm CAP (11%-8%) has the opposite relationship, in which the proportion of high intensity day users as the levels of the CAP increase. Finally, individuals with a history of trauma represent a proportion of 11% of high intensity daily users, while those with immediate safety concerns represent 9% and those with no trauma represent 10%.

High intensity episodic use has statistically significant associations with all CAPS but the trauma CAP. The medication adherence, risk of harm to others, and self-care CAP's all have p-values less than 0.0001, while the self-harm (p=0.0190) had a larger p-value. The self-care (11%-19%) and risk of harm (11%-15%) to others CAPs have trends in which the proportion of high intensity episodic users alongside increases in the levels of CAPs. Per the medication adherence CAP, the people struggling with medication adherence due to side-effects has the largest proportion (14%) of high intensity episodic users, compared to those individuals with no medication adherence issues (11%), or those with adherence issues that come from symptoms (10%). Individuals at moderate risk of self-harm have a greater proportion (13%) of high

intensity episodic users than individuals not at risk (12%), and those at high risk of self-harm (11%).

Contextual Factors

Among On-Marg Ontario quintiles (Table 17), there was a general trend across all variables for inpatient mental health patients to have greater representation within quintiles with stronger marginalization scores. For example, in residential instability and ethnic concentration, the 1st quintile, with the lowest marginalization contained only 14% of the sample, while deprivation had 15% of the sample within its lowest quintile. Within the sample, only dependency maintained the quintile distribution established within the provinces total population (e.g. 20% within each quintile).

The relationship between contextual factors as defined by the ON-MARG and the outcome variables can be seen in table 17. All contextual variables have statistically significant associations with high intensity use of days (dependency: $p=0.0053$, deprivation: $p=0.0402$, ethnic concentration: $p=0.0285$, residential instability: $p=0.0008$). For both residential instability (10%-11%) and dependency (9%-10% there is a trend where a greater proportion of high intensity daily users reside in increasingly marginalized areas Additionally, the proportion of high intensity daily users increases alongside degree of deprivation, peaks at the 3rd quintile (11%), and decreases following that (10%). Ethnic concentration has a similar pattern, starting at 9%, peaking at the 3rd quintile at 11%, with the proportion then decreasing as marginalization increases. Finally, residential instability has the opposite trend, where the smallest proportion (8%) is among the 3rd quintile, while the first quintile has 10% of the high intensity day use, and the 5th quintile 11%.

Table 16. Additional needs factor variables captured via interRAI CAP's. Bivariate relationships with High use variables that are statistically significant are denoted as: **bold: p < 0.0001**, _underlined/Italics: p < 0.05_.

Variable	Level	N	%	High Use Days				High use Episodes			
				No		Yes		No		Yes	
				n	%	n	%	n	%	n	%
Medication Adherence Cap	No issues	13,589	64	**12,442**	**91.6%**	**1,147**	**8.4%**	**12,068**	**88.8%**	**1,521**	**11.2%**
	Adherence issues from symptoms	883	4	**788**	**89.2%**	**95**	**10.8%**	**793**	**89.8%**	**90**	**10.2%**
	Adherence issues from side-effects	6,598	31	**5,732**	**86.9%**	**866**	**13.1%**	**5,651**	**85.6%**	**947**	**14.4%**
Risk of Harm to Others CAP	No Risk	15,997	76	**14,543**	**90.9%**	**1,454**	**9.1%**	**14,182**	**88.7%**	**1,815**	**11.3%**
	Moderate Risk	2,976	14	**2,641**	**88.7%**	**335**	**11.3%**	**2,556**	**85.9%**	**420**	**14.1%**
	High Risk	2,097	10	**1,778**	**84.8%**	**319**	**15.2%**	**1,774**	**84.6%**	**323**	**15.4%**
Self-Care CAP	No Risk	11,478	54	**10,572**	**92.1%**	**906**	**7.9%**	**10,261**	**89.4%**	**1,217**	**10.6%**
	Moderate Risk	8,510	40	**7,482**	**87.9%**	**1,028**	**12.1%**	**7,371**	**86.6%**	**1,139**	**13.4%**
	High Risk	1,082	5	**908**	**83.9%**	**174**	**16.1%**	**880**	**81.3%**	**202**	**18.7%**
Self-Harm CAP	No Risk	14,039	67	**12,555**	**89.4%**	**1,484**	**10.6%**	_12,304_	_87.6%_	_1,735_	_12.4%_
	Moderate Risk	3,369	16	**3,018**	**89.6%**	**351**	**10.4%**	_2,941_	_87.3%_	_428_	_12.7%_
	High Risk	3,662	17	**3,389**	**92.5%**	**273**	**7.5%**	_3,267_	_89.2%_	_395_	_10.8%_
Trauma CAP	No Trauma	18,119	86	**16,296**	**89.9%**	**1,823**	**10.1%**	15,906	87.8%	2,213	12.2%
	Immediate safety Concerns	1,498	7	**1,365**	**91.1%**	**133**	**8.9%**	1,341	89.5%	157	10.5%
	Prior trauma	1,453	7	**1,301**	**89.5%**	**152**	**10.5%**	1,265	87.1%	188	12.9%

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Table 17. Descriptive statistics for contextual factor (On-MARG) variables. Increasing scores indicate incresaed marginalization. Bivariate relationships with High use variables that are statistically significant are denoted as: **bold: p < 0.0001**, _underlined/Italics: p < 0.05_.

Variable	Level	N	%	High Use Days				High use Episodes			
				No		Yes		No		Yes	
				n	%	n	%	n	%	n	%
Dependency	Lowest quintile	3,857	18.3	_3,529_	_91.5%_	_328_	_8.5%_	**3,482**	**90.3%**	**375**	**9.7%**
	2nd quintile	4,152	19.7	_3,741_	_90.1%_	_411_	_9.9%_	**3,666**	**88.3%**	**486**	**11.7%**
	3rd quintile	4,257	20.2	_3,791_	_89.1%_	_466_	_10.9%_	**3,726**	**87.5%**	**531**	**12.5%**
	4th quintile	4,312	20.5	_3,876_	_89.9%_	_436_	_10.1%_	**3,787**	**87.8%**	**525**	**12.2%**
	Highest quintile	4,492	21.3	_4,025_	_89.6%_	_467_	_10.4%_	**3,851**	**85.7%**	**641**	**14.3%**
Deprivation	Lowest quintile	3,236	15.4	_2,944_	_91.0%_	_292_	_9.0%_	_2,851_	_88.1%_	_385_	_11.9%_
	2nd quintile	4,440	21.1	_3,995_	_90.0%_	_445_	_10.0%_	_3,870_	_87.2%_	_570_	_12.8%_
	3rd quintile	4,511	21.4	_4,011_	_88.9%_	_500_	_11.1%_	_3,931_	_87.1%_	_580_	_12.9%_
	4th quintile	4,650	22.1	_4,186_	_90.0%_	_464_	_10.0%_	_4,089_	_87.9%_	_561_	_12.1%_
	Highest quintile	4,233	20.1	_3,826_	_90.4%_	_407_	_9.6%_	_3,771_	_89.1%_	_462_	_10.9%_
Ethnic Concentration	Lowest quintile	2,819	13.4	_2,559_	90.8%	260	9.2%	_2,521_	_89.4%_	_298_	_10.6%_
	2nd quintile	3,645	17.3	_3,276_	_89.9%_	_369_	_10.1%_	_3,231_	_88.6%_	_414_	_11.4%_
	3rd quintile	4,413	20.9	_3,947_	_89.4%_	_466_	_10.6%_	_3,885_	_88.0%_	_528_	_12.0%_
	4th quintile	5,512	26.2	_5,005_	_90.8%_	_507_	_9.2%_	_4,841_	_87.8%_	_671_	_12.2%_
	Highest quintile	4,681	22.2	_4,175_	_89.2%_	_506_	_10.8%_	_4,034_	_86.2%_	_647_	_13.8%_
Residential Instability	Lowest quintile	2,855	13.6	_2,576_	_90.2%_	_279_	_9.8%_	_2,500_	_87.6%_	_355_	_12.4%_
	2nd quintile	4,692	22.3	_4,281_	_91.2%_	_411_	_8.8%_	_4,202_	_89.6%_	_490_	_10.4%_
	3rd quintile	3,858	18.3	_3,554_	_92.1%_	_304_	_7.9%_	_3,382_	_87.7%_	_476_	_12.3%_
	4th quintile	4,917	23.3	_4,441_	_90.3%_	_476_	_9.7%_	_4,295_	_87.4%_	_622_	_12.6%_
	Highest quintile	4,748	22.5	_4210_	_88.7%_	_538_	_11.3%_	_4,133_	_87.0%_	_615_	_13.0%_

The relationship between high intensity episodic use and marginalization appears to differ from those above. For example, as residential instability (p=0.0018, 12%-13%) and increase ethnic concentration (p=0.0003, 11%-14%), so too does the proportion of high intensity episodic users. Additionally, while dependence (p< 0.0001, 10%-14%) maintains the same relationship, the size of the proportions are larger. Finally, deprivation maintains the same relationship as described above.

Service Use Variables

Table 18 contains the distribution of service use variables. Thirty-seven percent of the sample experienced their first mental health hospitalization within the age group of 25-44, while 29% had their first hospitalization between the ages of 45-64. Two percent of the sample left hospital against medical advice. Sixty-seven percent of the sample had no contact with community mental health services prior to hospitalization. Nine percent of the sample were deemed incapable of consenting to treatment, 7% incapable of managing property, 10% had a legal guardian, and 19% were involuntary admissions. There were no individuals within the sample classified as alternative level of care. Finally, 80% of individuals within the sample were in acute care beds.

The relationship between the high use outcome variables and other service use variables can be seen in table 18. Age at first hospitalization (p <0.0001), inpatient status at admission (p <0.0001), capacity for consenting to treatment (p <0.0001), capacity for managing property (p=0.0323), having a legal guardian (p=0.0008) and unit type (p <0.0001) all had statistically significant relationships with high intensity day use.

Individuals who had their first mental health hospitalization between the ages of 15-24 represent the greatest proportion (12%) of high intensity daily users. Individuals who are

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voluntarily admitted to inpatient mental health care make up a smaller proportion (8%) of high intensity daily users than those individuals who are involuntarily admitted (13%). Individuals who lacked capacity represent a greater share of high intensity daily users (incapable to consent to treatment:13%, incapable to manage property:12%, guardian: 12%). Finally, individuals within psychiatric crisis units (13%) and longer term care units (13%) make up a greater proportion of high intensity daily users than those individuals in acute care (11%) and addiction units (4%).

Age of first hospitalization (p<0.0001), status at admission (p <0.0001), capacity for consenting to treatment (p=0.0047), capacity for managing property (p<0.0001), capacity to disclose information regarding clinical treatment (p<0.0001), leaving against medical advice (p=0.003) having a legal guardian (p<0.0001) and unit type (p <0.0001) all have statistically significant associations with high intensity episodic use Individuals aged 15-24 have the greatest proportion (17%) of high intensity episodic users. Individuals who are voluntarily admitted to inpatient mental health care make up a smaller proportion (10%) of high intensity daily users than those individuals who are involuntarily admitted (15%). In contrast to high intensity daily use above, individual with **no** capacity issues represent a greater share of high intensity episodic users (consent to treatment:12%, manage property:12%, disclosing clinical record: 12%, legal guardian: 13%). Individuals who left against medical advice represent a greater proportion (17%) of high intensity episodic users. Finally, individuals in psychiatric crisis units represent the largest proportion (18%) of high intensity episodic users, followed by those in acute care (14%), longer term care (8%), and finally those in addiction units (5%).

Table 18. Descriptive statistics for service use variables. Bivariate relationships with High use variables that are statistically significant are denoted as: **bold: p < 0.0001**, _underlined/Italics: p < 0.05_.

Variable	Level	N	%	High Use Days				High use Episodes			
				No		Yes		No		Yes	
				n	%	n	%	n	%	n	%
Alternate Level of Care	No ALC	21,070	100	18,962	90.0%	2,108	10.0%	18,512	87.9%	2,558	12.1%
Age at 1st hospitalization	15-24	3,166	15.03	**2,776**	**87.7%**	**390**	**12.3%**	**2,634**	**83.2%**	**532**	**16.8%**
	25-44	7,814	37.09	**7,090**	**90.7%**	**724**	**9.3%**	**6,785**	**86.8%**	**1,029**	**13.2%**
	45-64	6,199	29.42	**5,610**	**90.5%**	**589**	**9.5%**	**5,487**	**88.5%**	**712**	**11.5%**
	65+	3,891	18.47	**3,486**	**89.6%**	**405**	**10.4%**	**3,606**	**92.7%**	**285**	**7.3%**
Admission inpatient status	App. psych. Assess.	5,180	25%	**4,555**	**87.9%**	**625**	**12.1%**	**4,438**	**85.7%**	**742**	**14.3%**
	Voluntary	11,403	54%	**10,481**	**91.9%**	**922**	**8.1%**	**10,255**	**89.9%**	**1,148**	**10.1%**
	Informal	352	2%	**312**	**88.6%**	**40**	**11.4%**	**317**	**90.1%**	**35**	**9.9%**
	Involuntary	4,101	19%	**3,587**	**87.5%**	**514**	**12.5%**	**3,475**	**84.7%**	**626**	**15.3%**
	Other	34	0%	**27**	**79.4%**	**7**	**20.6%**	**27**	**79.4%**	**7**	**20.6%**
Incapable of consenting to treatment	No	19,271	91.5	**17,394**	**90.3%**	**1,877**	**9.7%**	_16,894_	_87.7%_	_2,377_	_12.3%_
	Yes	1,799	8.5	**1,568**	**87.2%**	**231**	**12.8%**	_1,618_	_89.9%_	_181_	_10.1%_
Incapable of managing property	No	19,617	93.1	_17,678_	_90.1%_	_1,939_	_9.9%_	**17,181**	**87.6%**	**2,436**	**12.4%**
	Yes	1,453	6.9	_1,284_	_88.4%_	_169_	_11.6%_	**1,331**	**91.6%**	**122**	**8.4%**
Incompetent to disclose info regarding clinical record	No	19,848	94.2	17,881	90.1%	1,967	9.9%	**17,388**	**87.6%**	**2,460**	**12.4%**
	Yes	1,222	5.8	1,081	88.5%	141	11.5%	**1,124**	**92.0%**	**98**	**8.0%**
Left against medical advice	No	20,627	97.9	18,568	90.0%	2,059	10.0%	_18,143_	_88.0%_	_2,484_	_12.0%_
	yes	443	2.1	394	88.9%	49	11.1%	_369_	_83.3%_	_74_	_16.7%_
Legal Guardian	No	19,058	90.5	_17,194_	_90.2%_	_1,864_	_9.8%_	16,682	87.5%	2,376	12.5%
	Yes	2,012	9.6	_1,768_	_87.9%_	_244_	_12.1%_	1,830	91.0%	182	9.0%
Time since contact with community mental Health	No Contact	14,040	66.6	12,666	90.2%	1,374	9.8%	12,339	87.9%	1,701	12.1%
	31 days or more	1,909	9.1	1,719	90.0%	190	10.0%	1,679	88.0%	230	12.0%
	30 Days or less	5,121	24.3	4,577	89.4%	544	10.6%	4,494	87.8%	627	12.2%
Unit Type	Acute	16,663	79.1	**14,898**	**89.4%**	**1,765**	**10.6%**	**14,394**	**86.4%**	**2,269**	**13.6%**
	Addiction	2,440	11.6	**2,350**	**96.3%**	**90**	**3.7%**	**2,325**	**95.3%**	**115**	**4.7%**
	50	18	0.1	**18**	**100.0%**	**-**	**0.0%**	**16**	**88.9%**	**2**	**11.1%**
	Psychiatric Crisis	209	1.0	**181**	**86.6%**	**28**	**13.4%**	**172**	**82.3%**	**37**	**17.7%**
	Longer term	1,740	8.3	**1,515**	**87.1%**	**225**	**12.9%**	**1,605**	**92.2%**	**135**	**7.8%**

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Preliminary Multivariate Testing

Appendix C contains all statistically significant (P<0.05) results of the preliminary

multivariate modelling. Tables 19 and 20 contain goodness of fit statistics for the separate

models for conceptual blocks. The living environment block had no statistically significant

variables, but a goodness of fit statistic was generated. While these results are illustrative, the

number of variables within each block differs, making direct comparisons inadvisable.

Diagnoses had the lowest fit statistic among blocks of variables, while living environment had

the highest both outcomes. In both outcome variables, the symptoms had the next lowest fit

statistic. In the high use days' episode, the other needs variables were the next smallest values,

followed by income source variables, enabling factor caps, predisposing variables, service use

variables, and contextual factors. In the high use episodes' outcome, service use variables, and

predisposing variables were the smallest variables followed by income sources, remaining needs

variables, contextual factors, and living environment.

Table 19. Goodness of fit statistics for block modelling for high use days.

Model Block	Number of variables	High Use Days QICu
Full	65	13289.97
Diagnoses	14	13351.90
Symptoms	7	13505.09
Needs CAPS	5	13530.42
Addictive Behaviours	10	13568.06
Income Sources	7	13655.54
Enabling Factor Caps	6	13660.53
Predisposing	5	13671.49
Service Use Factors	4	13685.16
Contextual Factors	4	13696.81
Living Environment	3	13704.05

Table 20. Goodness of fit statistics for block modelling for high use episodes.

Model Block	Number of variables	High Use Episodes QICu
Full	65	15027.04
Diagnoses	14	15186.67
Symptoms	7	15240.11
Service Use Factors	5	15453.00
Predisposing	10	15457.16
Income Sources	7	15522.51
Needs CAPS	6	15526.51
Addictive Behaviours	5	15542.70
Contextual Factors	4	15575.76
Enabling Factor Caps	4	15592.51
Living Environment	3	15593.40

Interaction terms

Appendix D contains a list of interaction terms found to be statistically significant with p values below 0.05. Table 21 contains only those interactions with p values equal to or less than 0.0001. The interaction between gender and CPS was significant [OR = 3.2, 95 % CI (1.91, 5.36)], suggesting that the effect of severe cognitive impairment on the odds of being a high intensity daily user is 3.2 times higher among men than women. Significant interactions between marital status and the PSS were found for PSS scores of 3-5 [OR = 1.81, 95 % CI (1.33, 2.45)] and 6 or more [OR = 1.92, 95 % CI (1.91, 2.66)]. The effect of a PSS score of 3-5 on the odds of being a high intensity daily user is 1.81 times higher, and a score of 6 ore more is 1.92 times higher among those who never married versus married people. Finally, a statistically significant effect [OR = ,43, 95 % CI (0.29, 0.66)] was found between schizophrenia and age. The effect of schizophrenia on the odds of being a high intensity daily user 0 .43 times less among those aged 65+. For high intensity episodic use, statistically significant interactions were found between marital status and the CPS [OR = 1.7, 95 % CI (1.29, 2.24)], and schizophrenia and age [OR =

.44, 95 % CI (.29, .67)]. The effect of a PSS score of 3-5 1.7 times higher among individuals who

never married. While the effect of schizophrenia on high intensity episodic use, is 0.44 times

smaller among those aged 65+.

Table 21. Interaction terms. Statistically significant (P≤0.0001) odds ratios displayed.

Interaction	High Use Days				High Use Episodes			
	O.R	LCL	UCL	pvalue	O.R	LCL	UCL	pvalue
Male*CPS (5+ symptoms)	3.2	1.91	5.36	<0.0001	--	--	--	--
Never married*PSS (3-5)	1.81	1.33	2.45	0.0001	1.7	1.29	2.24	0.0001
Never married*PSS (6+)	1.92	1.39	2.66	<0.0001	--	--	--	--
65+*Schizophrenia	0.43	0.29	0.66	<0.0001	0.44	0.29	0.67	<0.0001

Variables identified for testing in final modelling process

Table 22 includes a list of the variables and interactions identified in the bivariate and

preliminary multivariate tests as being statically significant.

Table 22. Variables Identified for inclusion in model building

High Use Days	High Use Episodes
Sex, Age, Marital Status, Employment income, Finances Cap, Adjustment disorders, Childhood disorders, Eating disorders, Mood disorders, Schizophrenia and related disorders, Substance use disorders, Concurrent substance use and mental illness, concurrent secondary, ADL-H, ABS, CPS, Mania, PSS, social withdrawal scale, Alcohol use past 2 weeks, Tobacco use, Opiate use, Substance Use CAP, Medication Adherence CAP, Risk Harm to Others CAP, Self-Care CAP, Self-Harm CAP, Trauma CAP, Time since last community mental Health visit, **male*CPS, Marital*PSS, Age*Schizophrenia**	Sex, Age, Marital Status, Education, Employment income, No income, Pension, Social Assistance, Dementia, Schizophrenia and related disorders, Substance use disorders, Concurrent substance use and mental illness, concurrent secondary, ADL-H, ABS, CPS, Mania, PSS, Social withdrawal scale, Alcohol use past 2 weeks, Tobacco use, Substance Use CAP, Risk Harm to Others CAP, Self-Care CAP, Social Relationship CAP, Time since last community mental health visit, left against medical advice, presence of a legal guardian, area level dependency, *Marital*PSS, Age*schizophrenia*

Parsimonious Iterative Modelling

Table 23 and 24 include the results from the model building process. Sex and age were kept in all the models regardless of significance, as they were identified as important in the literature review.

Model 1: Predisposing Variables.

The first model included only variables identified as predisposing. For high use days, never having married [OR = 1.29, 95 % CI (1.15, 1.46)] increased the odds of being a high intensity day user when controlling for sex and age. In the high use episodes' model, being in the age group 65 or older [OR = 0.51, 95 % CI (0.44, 0.60)] decreased the odds of being a high intensity episodic user when controlling for sex.

Model 2: Predisposing variables and primary diagnostic category variables

. The second model included predisposing variables identified as statistically significant previously, as well as primary provisional diagnostic categories identified as significant.   For high use days, never having married ceased being significant with the addition of the diagnostic categories. Additionally, adjustment disorders [OR = 0.37, 95 % CI (0.24, 0.55)], mood disorders [OR = 0.73, 95 % CI (0.64, 0.83)], substance use disorders [OR = 0.29, 95 % CI (0.21, 0.37)], and a primary substance use disorder with concurrent secondary mental illness [OR = 0.6, 95 % CI (0.48, 0.76)] were all found to decrease the odds of being a high intensity day user when controlling for age, sex, marital status and the diagnostic categories. Finally, schizophrenia and related psychoses [OR = 1.55, 95 % CI (1.34, 1.79)] was found to increase the odds of being a high intensity day user when controlling for the variables in the model. For high intensity episodic use, schizophrenia [OR = 1.98, 95 % CI (1.79, 2.19)] was associated with an increase in the odds of high intensity use.

Model 3: Predisposing, diagnoses, symptom variables.

The third model introduced the interRAI scales, which were being used to capture symptomology. For high use days, a provisional primary diagnosis of adjustment disorders [OR = 0.40, 95 % CI (0.27, 0.61)] and substance use disorders [OR = 0.32, 95 % CI (0.24, 0.43)], were associated with a decrease in the odds of being a high intensity daily user, while presence of schizophrenia [OR = 1.34, 95 % CI (1.15, 1.57)], and a PSS score of 6 or greater [OR = 1.43, 95 % CI (1.23, 1.65)], were associated with increases in the odds of being a high intensity daily user when controlling for all the variables included in the model.

For high intensity episodic use, being 65 years or older [OR = 0.61, 95 % CI (0.52, 0.72)] and having a primary provisional diagnosis of dementia [OR = 0.62, 95 % CI (0.50, 0.79)] both decrease the odds of being a high intensity episodic user, while schizophrenia [OR = 1.52, 95 % CI (1.36, 1.72)], the presence of 3-5 [OR = 1.54, 95 % CI (1.35, 1.74)] and a PSS score of 6 or greater [OR = 1.73, 95 % CI (1.51, 1.97)], and moderate social withdrawal score [OR = 1.24, 95 % CI (1.12,1.43)] were all associated with an increase in the odds of being a high intensity episodic user.

Model 4 (High Use Days): Predisposing, diagnoses, symptoms, additional needs variables

The day and episode models used for the 4th iteration diverge, as variables from different conceptual blockings were found to be significant. Specifically, the 4th model for high intensity daily use includes the self-care cap, as it was found to be significant when the iterative testing process reached the additional needs category (e.g. those needs factors not identified as diagnoses or symptoms), while the 4th model for high intensity episodic use contains area level dependency. No service use variables were identified as significant in the model building process.

In the 4th model for high intensity day use, provisional primary diagnoses of adjustment [OR = 0.40, 95 % CI (0.26, 0.60)] or substance use disorders [OR = 0.33, 95 % CI (0.25, 0.43)] decreased the odds of being high intensity day users, while schizophrenia [OR = 1.36, 95 % CI (1.16, 1.6)], and moderate self care issues [OR = 1.31, 95 % CI (1.15, 1.49)] increased the odds of being high intensity day users.

Model 4 (High Use Episodes): Predisposing, diagnoses, symptoms, contextual variables

For high intensity episodic use, being 65 years or older [OR = 0.61, 95 % CI (0.52, 0.72)] and having a primary provisional diagnosis of dementia [OR = 0.62, 95 % CI (0.49, 0.78)] both decreased the odds of being a high intensity episodic user, while schizophrenia [OR = 1.51, 95 % CI (1.35, 1.70)], a PSS score of 3-5 [OR = 1.54, 95 % CI (1.35, 1.74)], or 6 or more [OR = 1.72, 95 % CI (1.51, 1.96)], a moderate social withdrawal score [OR = 1.26, 95 % CI (1.03,1.21)], and residing in an area of defined as a mid intensity of area dependency [OR = 1.35, 95 % CI (1.16,1.57)] were all associated with an increase in the odds of being a high intensity episodic user.

Model 5 (High Use Days): Predisposing, diagnoses, symptom, others needs variables, interactions

The final step in the iterative model building process was the inclusion of interactions identified previously. None of the interaction terms identified for high intensity episodic use were significant in the iterative modelling process, and as such, an additional model was not necessary. For high intensity episodic use however, two interactions were significant, requiring the creation of a 5th model. In this model, the presence of primary provisional diagnosis of adjustment [OR = 0.40, 95 % CI (0.26, 0.60)] and substance use disorders [OR = 0.33, 95 % CI (0.25, 0.44)], decreased the odds of being a high intensity daily user, while concurrent mental

illness and substance use [OR = 1.99, 95 % CI (1.46, 2.73)] increases the odds of being a high

intensity user, while moderate self care issues [OR = 1.31, 95 % CI (1.15, 1.49)] increase the

odds. An interaction effect was found between never having married and scores of 6 or more on

the PSS [OR = 1.78, 95 % CI 1.33, 2.40)], suggesting that the effect of having scores of 6 or

more on the PSS on the odds of being a high intensity daily users is 1.79 times higher among

those who never married versus those who are married. Finally, another interaction was found

between being male and having 6 or more cognitive impairment symptoms [OR = 2.48, 95 % CI

(1.68, 3.66)], suggesting that the effect of 6+ cognitive impairment symptoms on the odds of

being a high intensity daily user is 2.48 times higher among men versus women.

Table 23.Parsimonious iterative modelling results for High Use Days. Odds ratios that are statistically significant are denoted as: **bold: p ≤ 0.0001**, _underlined/Italics: p < 0.05_.

Variable	Level	Model 1 Predisposing Only 13668.4146			Model 2 +Diagnoses 13353.3667			Model 3 +Symptoms 13337.5287			Model 4 +Other needs 13325.738			Model 5 +Interactions 13293.8727		
QICu		Est	LCL	UCL	Est	LCL	UCL	Est	LCL	UCL	Est	LCL	UCL	Est	LCL	UCL
Intercept	N/A	**0.09**	**0.08**	**0.11**	**0.12**	**0.79**	**0.14**	**0.10**	**0.08**	**0.12**	**0.09**	**0.08**	**0.12**	**0.11**	**0.09**	**0.14**
Sex	Male	0.93	0.85	1.02	0.96	0.87	1.05	0.95	0.87	1.05	0.95	0.86	1.04	_0.84_	_0.74_	_0.95_
Age **(Ref= 25-34)**	<=24	1.18	1.01	1.39	1.12	0.95	1.32	1.11	0.94	1.31	2.71	0.94	1.30	1.10	0.93	1.30
	35-44	1.02	0.88	1.20	1.03	0.87	1.21	1.04	0.88	1.22	1.03	0.88	1.22	1.03	0.88	1.21
	45-54	1.05	0.90	1.23	1.06	0.90	1.25	1.05	0.89	1.24	1.05	0.89	1.23	1.04	0.88	1.23
	55-64	_1.32_	_1.11_	_1.58_	_1.31_	_1.09_	_1.57_	_1.27_	_1.06_	_1.53_	_1.26_	_1.05_	_1.52_	_1.26_	_1.05_	_1.51_
	65+	1.33	1.13	1.57	1.17	0.98	1.39	1.07	0.90	1.29	1.05	0.88	1.24	1.06	0.88	1.27
Marital **(Ref= Married/partner)**	Never Married	**1.29**	**1.15**	**1.46**	_1.17_	_1.04_	_1.33_	_1.17_	_1.03_	_1.32_	_1.15_	_1.02_	_1.31_	0.92	0.78	1.08
	Wid/Div/Sep	0.97	0.86	1.10	0.96	0.85	1.10	0.97	0.85	1.10	0.96	0.85	1.09	0.92	0.78	1.08
Adjustment	Diagnosis	--	--	--	**0.37**	**0.24**	**0.55**	**0.40**	**0.27**	**0.61**	**0.40**	**0.26**	**0.60**	**0.40**	**0.26**	**0.60**
Mood	Diagnosis	--	--	--	**0.73**	**0.64**	**0.83**	_0.78_	_0.68_	_0.90_	_0.79_	_0.68_	_0.91_	_0.78_	_0.68_	_0.90_
Schizophrenia	Diagnosis	--	--	--	**1.55**	**1.34**	**1.79**	**1.39**	**1.18**	**1.63**	**1.36**	**1.16**	**1.60**	_1.35_	_1.14_	_1.59_
Substance	Diagnosis	--	--	--	**0.29**	**0.22**	**0.39**	**0.32**	**0.24**	**0.43**	**0.32**	**0.24**	**0.43**	**0.33**	**0.25**	**0.44**
Concurrent-Sub Primary	Diagnosis	--	--	--	**0.60**	**0.48**	**0.76**	_0.66_	_0.52_	_0.84_	_0.66_	_0.52_	_0.84_	_0.66_	_0.52_	_0.84_
CPS (Ref=0)	1-2	--	--	--	--	--	--	1.16	1.03	1.30	0.99	0.86	1.13	0.94	0.79	1.12
	3-4	--	--	--	--	--	--	1.13	0.93	1.37	0.95	0.76	1.17	0.82	0.63	1.08
	5+	--	--	--	--	--	--	1.29	1.04	1.60	1.07	0.85	1.36	0.65	0.46	0.91
PSS (Ref=0)	1-2	--	--	--	--	--	--	1.11	0.95	1.30	1.08	0.92	1.27	0.89	0.69	1.15
	3-5	--	--	--	--	--	--	1.26	1.09	1.44	1.20	1.04	1.39	0.97	0.78	1.21
	6+	--	--	--	--	--	--	**1.37**	**1.18**	**1.58**	_1.28_	_1.09_	_1.50_	_0.93_	_0.73_	_1.20_
Self Care (Ref= No Risk)	Moderate Risk	--	--	--	--	--	--	--	--	--	**1.31**	**1.15**	**1.49**	**1.31**	**1.15**	**1.49**
	High Risk	--	--	--	--	--	--	--	--	--	1.37	1.07	1.76	1.41	1.10	1.81
Interactions* Rather than displaying an effect, they highlight how the presence of the first variable modifies second's effect.																
Marital*PSS	Nev/Married*1-2	--	--	--	--	--	--	--	--	--	--	--	--	_1.44_	_1.01_	_2.05_
Marital*PSS	Nev/Married* 3-5	--	--	--	--	--	--	--	--	--	--	--	--	_1.69_	_1.27_	_2.25_
Marital*PSS	Nev/Married*6+	--	--	--	--	--	--	--	--	--	--	--	--	**1.78**	**1.33**	**2.39**
Marital*PSS	Wid/Sep/Div*1-2	--	--	--	--	--	--	--	--	--	--	--	--	1.34	0.89	2.00
Marital*PSS	Wid/Sep/Div*3-5	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.71	1.43
Marital*PSS	Wid/Sep/Div*6+	--	--	--	--	--	--	--	--	--	--	--	--	1.32	0.92	1.91
Sex*CPS	Male*1-2	--	--	--	--	--	--	--	--	--	--	--	--	1.09	0.88	1.34
Sex*CPS	Male*3-4	--	--	--	--	--	--	--	--	--	--	--	--	1.33	0.94	1.90
Sex*CPS	Male*5+	--	--	--	--	--	--	--	--	--	--	--	--	**2.48**	**1.68**	**3.66**

Table 24. Parsimonious iterative modelling results for High Use Episodes. Odds ratios that are statistically significant are denoted as: **bold: p < 0.0001**, _underlined/Italics: p < 0.05_.

Variable	Level	Model 1 Predisposing Only 15469.9812			Model 2 +Diagnoses 15185.5896			Model 3 +Symptoms 15048.5214			Model 4 +Contextual Factors 15044.3615		
QICu		Est	LCL	UCL	Est	LCL	UCL	Est	LCL	UCL	Est	LCL	UCL
Intercept	N/A	**0.18**	**0.83**	**0.21**	**0.15**	**0.13**	**0.18**	**0.11**	**0.11**	**0.14**	**0.09**	**0.08**	**0.12**
Sex	Male	0.96	0.99	1.04	0.93	0.86	1.01	0.93	0.86	1.01	0.93	0.86	1.01
Age (Ref= 25-34)	<=24	1.23	1.07	1.40	_1.18_	_1.04_	_1.35_	1.16	1.02	1.33	1.16	1.02	1.33
	35-44	0.94	0.85	1.04	0.97	0.85	1.10	0.98	0.86	1.11	0.98	0.86	1.12
	45-54	_0.87_	_0.76_	_0.99_	1.10	0.80	1.03	0.92	0.80	1.04	0.92	0.81	1.05
	55-64	_0.83_	_0.72_	_0.95_	0.89	0.76	1.03	0.88	0.75	1.03	0.89	0.76	1.03
	65+	**0.51**	**0.44**	**0.60**	0.62	0.52	0.72	**0.61**	**0.52**	**0.72**	**0.61**	**0.52**	**0.72**
Dementia	Diagnosis	--	--	--	_0.69_	_0.55_	_0.87_	**0.62**	**0.50**	**0.79**	**0.62**	**0.49**	**0.78**
Schizophrenia	Diagnosis	--	--	--	**1.98**	**1.79**	**2.19**	**1.52**	**1.36**	**1.71**	**1.51**	**1.35**	**1.70**
PSS (Ref=0)	1-2	--	--	--	--	--	--	1.19	1.03	1.38	1.20	1.04	1.38
	3-4	--	--	--	--	--	--	**1.54**	**1.35**	**1.74**	**1.54**	**1.35**	**1.74**
	6+	--	--	--	--	--	--	**1.73**	**1.51**	**1.97**	**1.72**	**1.51**	**1.96**
SWS (Ref=0)	mild	--	--	--	--	--	--	_1.17_	_1.03_	_1.32_	_1.16_	_1.03_	_1.31_
	moderate	--	--	--	--	--	--	**1.24**	**1.12**	**1.43**	**1.26**	**1.03**	**1.31**
	severe	--	--	--	--	--	--	_1.24_	_1.07_	_1.44_	_1.24_	_1.07_	_1.44_
Dependency (Ref= Lowest score)	second lowest	--	--	--	--	--	--	--	--	--	_1.21_	_1.04_	_1.39_
	mid	--	--	--	--	--	--	--	--	--	**1.35**	**1.16**	**1.57**
	second highest	--	--	--	--	--	--	--	--	--	_1.23_	_1.05_	_1.45_
	highest score	--	--	--	--	--	--	--	--	--	_1.43_	_1.09_	_1.54_

Discussion

This study addresses many gaps in the literature examining mental health service utilization. By using population level data which includes detailed clinical information, such as a variety of mental health diagnoses, symptoms, and functioning measures, allowed for an extensive examination and comparison of predisposing, needs, and enabling factors related to MHSU. Further, it examines patterns of high intensity service use by looking at episodes and days in hospital. This is important as it provides an opportunity to determine if similar or different factors drive different patterns of service use.

RQ1. What are the patterns of inpatient MHSU following index admission?

A large proportion of individuals discharged from an index admission to inpatient mental health services in Ontario do not have further use within 5 years or had only an additional visit with less than 48 days in hospital over the following 5 years. Of those classified as high intensity users, there were three patterns of use. The first pattern is the most common: these individuals are dual high intensity daily and episodic users, residing in the 90th percentile of use for both outcomes. These individuals had at least 2 additional episodes of care and a minimum of 48 more days in hospital during the 5-year follow-up. This pattern is the result of the high episodic and high daily use being high correlated; the more episodes in hospital, the more days in hospital.

The second and third patterns involved individuals that had patterns of use in which they were either a high intensity user in terms of days or episodes, but not both. Following the dual high intensity pattern, the next most numerous group were those individuals who were high intensity episodic users, but not high intensity daily users. This combination suggests that these individuals are having multiple, shorter, visits to hospital. Finally, the smallest group can be

classified as exclusively high intensity daily users; during their second trip to inpatient services, they are spending 48 or more days within the hospital, but are not returning to hospital after that discharge. The next section will examine what factors are predictive of future intensity of use.

Research Question 2 and 3: What individual and socio-environmental factors are predictive of increased inpatient MHSU intensity?

A variety of individual factors and few socio-environmental factors were found to be predictive of increased inpatient MHSU intensity during the modelling process. For high intensity daily use, these include predisposing factors and needs factors such primary provisional diagnoses and symptoms. Further, interactions between predisposing factors and symptoms were identified. No contextual or socio-environmental variables were found to be significant for high intensity daily use. For high intensity episodic use, fewer individual factors were identified as predictive of high service intensity, no interactions were found, while a contextual level variable was found to be significant. The following sub-sections will discuss these relationships.

Predisposing factors

For both outcomes, few predisposing variables were significant in any of the models. For high intensity episodic use, adults aged 65 + were less likely to be high episode users than younger age groups. These findings are consistent with previous research (22,26,28,54,58,65) which showed that being 65 or older decreased the odds of increased mental health services. In terms of initial service use a number of factors might relate to less use of mental health services among older adults. Factors include personal—stigmatization (the older adult is reluctant to discuss issues) (88,89), 'survival of the healthiest' (in which those individuals who have lived to old age are the healthiest physically and psychologically) (89)— to societal—ageism (informal and formal care providers may assume deterioration of mental health is a natural product of

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aging) (88), cohort effects (the current group of older adults is healthier) (89), and institutionalization (older adults are more like to already reside in care provision facilities) (89). Given that this research found that increased age decreased the odds of high intensity episodic use of inpatient services following first admission, but did not find a relationship between age and high intensity daily use, the institutionalization hypothesis may hold true for further service use as well; older adults are transitioning to other care services from inpatient mental heath services.

Aside from age, marital status was the only other predisposing factor shown to be associated with high intensity inpatient service use. In early statistical models that included only predisposing factors, never having been married was predictive of high intensity use of days. However, as needs factors were introduced in the modelling process, never having been married lost statistical significance. One explanation for this is that inpatient mental health services rest at the extreme of the continuum of mental health care provision, with high intensity use of inpatient services even further down that continuum. Whereas previous research demonstrated an association between predisposing factors and less intense forms of care provision (22), the current research's examination of high intensity inpatient use may have resulted in a focus on a sub-population of mental health service users. This sub-population of service users may have a severity of need so high it subsumes the effects of predisposing variables observed elsewhere.

The results did indicate that predisposing factors play a role in predicting high levels of service use in combination with certain individual need factors: marital status and gender were found to interact with positive symptoms and cognitive impairment respectively. These interactions may be capturing deficits in social support; specifically, instrumental social support. Instrumental support represents the provision of tangible assistance, often by informal caregivers

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(60). Informal caregivers represent an integral component of the healthcare system, and provide

multiple types of help ranging from care planning and medication management to support for

activities of daily living (90). The interaction between never having married and PSS scores

suggests that never having been married could be a proxy variable for the absence of

instrumental support/ informal care, while the gender and cognitive impairment interaction could

be showing a breakdown in the provision of instrumental support/ informal care.   The possibility

that the interactions observed here are signalling deficits in social support is reinforced by the

findings of Cairney et al (26) where researchers demonstrated never having been married as

important to service use patterns for men but not women. One possible explanation for this is

that women get and seek more social support than men (91), meaning that the informal care

provided by significant others may be more vital to men than women.

In addition to the gender differences in access to social support there is also a gender

difference in the presentation of agitation symptoms associated with cognitive impairment.

Verbal agitation is more common among women (92), while aggressive agitation is more

prominent among men (93). A third type of agitation—non-aggressive—has not previously

shown gender differences, but it is possible men also have more non-aggressive physical

agitation. A gender difference in non-aggressive physical agitation associated with cognitive

impairment could drive the observed interaction between severe cognitive impairment and

gender. Further, research has shown that agitation symptoms associated with cognitive

impairment prevent quality care (94), are physically/ emotionally demanding (94), increase care

burden and depression for informal care givers (95,96), and are associated with increased odds of

institutionalization (96,97).   Therefore, the interaction between gender and cognitive impairment

may be capturing a breakdown in instrumental support/informal care that is itself driven by a

combination of gendered access to social support as well as differences in the presentation of agitation symptoms associated with cognitive impairment.

This breakdown in instrumental support, could result in patients in inpatient mental health systems being designated as alternate level of care (ALC). ALC is a status given to patients who remain in a healthcare setting following achievement of treatment goals (98). Patients who have experienced a breakdown in instrumental support, losing their informal care givers, may simply have no where else to go; without informal care givers, returning home may no longer represent a viable option. As such, these individuals need to be transferred to other care facilities, such as long term care or complex continuing care. However, if there are no such spaces available, these individuals remain in inpatient settings, and are designated ALC.

This possible connection between ALC, agitation symptoms associated with cognitive impairment, and the ramifications of caregiver burden, are reinforced by two findings of an analysis performed by the Canadian institute for health information (CIHI) (99,100). First, the researchers found that "individuals with symptoms of dementia, including challenging behaviours, were more likely to have waited in acute care prior to residential care admission" (p1). Second, the researchers also demonstrated that lack of social support was associated with increased ALC when the patients were waiting for formal homecare services (99,100). Finally, the distribution of days in hospital following index admission (Figure 2), and the distribution of ALC days in Little et al's study are strikingly similar (98). Differences between the two distributions could be explained by different sampling focuses (days in hospital following index admission for individuals in OMHRS vs. the days designated ALC for every episode in OMHRS).

Needs

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Several disorders were shown to decrease the odds of being a high intensity inpatient MHSU. Adjustment, mood, and substance use disorders all decreased the odds of being high intensity daily users, while dementia and substance use disorders decreased the odds of high intensity episodic use. The OMHRS dataset also provided the opportunity to investigate a variety of low-prevalence disorders; few of which were shown to influence high intensity inpatient MHSU. Further, even in the inpatient setting, sexual identity and factitious disorders still lacked numbers to permit valid analysis. The low numbers which prevented analysis, and the lack of any effect of those that were analyzed suggests that these disorders may be treated in other areas of the continuum of care, or do not lead to high intensity inpatient use.

Previous research has shown that mood and (31,48,50) substance disorders (6,24,30,42,48) are both associated with increased use of MHSU. However, these studies had outcome measures which did not include inpatient services, or bundled inpatient use with the use of other services. For example, one study found that presence of affective and substance use disorders increased the odds of visiting specific practitioners (GP's psychologists, psychiatrists, etc.), but did not include hospital services in its analysis (58). Few studies delineated the different types of service use, while also explicitly including hospital visits. One study which did do this found that people in hospital for affective or substance use disorders make up the smallest proportion of individuals seeking help for those disorders (25). These findings suggest that there may a pattern of service use for affective and substance use disorders which is primarily made up of types of community services that keep people out of inpatient services. As such, individuals with depression or substance use issues may be engaging with community services following their index admission, thus resulting in a decreased odds of being high intensity users following index admission

The effect of dementia decreased the odds of being a high intensity episodic user may also be driven by care provision. The fact that the presence of dementia decreases the odds of being a high intensity episodic user, but is not associated with being a high intensity daily user may imply that those individuals have a pattern of care in which they are having fewer episodes with shorter stays in inpatient mental health settings. This could suggest that individuals in inpatient mental health for reasons associated with dementia are being successfully diverted to more appropriate areas of care—long term care or complex continuing care—following their first or second episode. However, this identification of dementia and transfer to more appropriate care facilities may not be a speedy process: an ad-hoc analysis found that dementia has a strong effect on the odds being a high intensity daily user during index admission. This suggests that individuals with dementia tend to have longer index admissions followed up with transfer to other care provision facilities, similar to the ALC issues described above.

Among needs factors, schizophrenia and its related symptoms are the primary drivers of high intensity service use (day and episodes). These findings are consistent with other research performed in this population which identified psychotic symptoms as predictive of 90-day rehospitalisation (81), and extend said findings in several ways. First, this research demonstrates that psychotic symptoms remain important predictors of return visits beyond readmission. Second, this research demonstrates that not only are positive symptoms associated with increased visits to hospital, they also interact with marital status to affect time spent in hospital, providing potential new avenues for intervention. Finally, this research demonstrated that other symptoms associated with schizophrenia such as social withdrawal and inability to care for oneself increased the odds of high intensity episodic use, results not present in the rehospitalisation paper (81).

Contextual

Among the variables which examine area effects, individuals residing in areas with higher dependence were more likely to be high intensity episodic users. The three components of the score are proportion aged 65+ or more, the proportion of those over 15 not participating in the labour force, and a ratio comparing the proportion of those younger than 14 and over 65 against proportion of individuals between the ages of 15-64 (68,85). Similar to other deprivation/marginalization research, this finding is constrained by the social drift/social selection debate (101); it is unclear if residence in areas of increasing dependency is driving high intensity service use, or if service use is driving residency in those areas. For example, as previously discussed, proximity to services can increase MHSU (28,54,65,67). It is possible that areas with large proportions of adults 65 years or older have more services provided. However, it is equally possible that individuals 65 years or older opt to live in areas in which more services are provided. Either possibility could lead to the findings observed here.

Enabling/Health Services

There were no enabling or health services factors identified as statistically significant for either high intensity daily or episodic service use. Enabling factors were most likely not associated with high intensity service use because the population of focus was on those with the highest intensity of use throughout the care continuum. As was discussed previously, enabling factors exist within the causal pathway between predisposing and needs factors (45), and their effects on service use appear to be subsumed by needs factors when needs are great enough. This suggests that there may be a specific point in which barriers preventing individuals from seeking care are suddenly outweighed by the distress their needs are eliciting. For health services, the most likely explanation for a failure to detect any relationship is that data regarding

use of other services on the healthcare continuum (GP's, psychologists) were not available. This issue will be further explored in the limitations section.

RQ4: What are the relative effects of individual and socio-environmental factors on MHSU intensity?

Model comparison can help glean some information regarding the relative importance of different types of conceptual blocks of variables as described by the behavioural model. Even before comparing fitness criteria, there were insights from the modelling process. For example, as models were developed, few predisposing variables and contextual factors were related to high intensity use, and no enabling and health service factors were significantly related to high levels of use. In contrast, needs factors played the most important role in determining high intensity service use. Comparing goodness of fit statistics suggests that for high intensity episodic use it is useful to distinguish between diagnoses and symptoms, as model fit statistics between 3 and 4 change considerably. Interestingly, the distinction between different needs factors does not appear as important for high intensity daily use. Finally, comparing goodness of fit statistics of the final models developed in the parsimonious iterative modelling process against those generated from the full model suggests that the parsimonious models are ideal, as their fit statistics approach the full models which included all variables.

Limitations

While the current research, presents multiple strengths, it is not without limitations. These limitations can be grouped by the datasets from which the data for the current research was derived: OMHRS and ON-MARG.

OMHRS

Only OMHRS—inpatient mental health data— was accessed for this research; comparable data from rest of the care continuum were not available. The focus of this research was on inpatient MHSU following index admission to inpatient settings; the dataset includes all inpatient admissions from October, 2005. However, inpatient services are only one of multiple points of contact along the continuum of care. Because this research only had access to inpatient data, use of other services prior to first admission—and between episodes—is unknown; it is unclear what kind of non-inpatient service use occurred prior to and following the person's index episode. While there are few variables which examine non-inpatient mental health in the OMHRS data, those available can provide some insight into the role that prior access to community mental health services plays in high levels of inpatient mental health services. The contact with community mental health variable showed no statistically significant association with high levels of inpatient service use.

In addition to only having access to inpatient service use data, the current research is also cross-sectional in nature. While this research utilizes an outcome variable that is time-sensitive—expanding on previous research which used generic and lumped binary MHSU outcomes—the independent variables are derived from the index admission in inpatient services. This is problematic because the current research can not examine the effect of changes in the independent variables over time. For example, this research captured an interaction effect which suggests marital status is an indicator for the absence/presence of social support. However, changes in marital status (going through divorce) could also represent single instance stressors which drive service use in and of themselves (e.g. could the stress of going through divorce trigger increased need that leads to another episode of care?)   A longitudinal research program

could ask and answer questions of that kind. Further, having the full data for each episode (as opposed to only the index episode) could help address the problems associated with only having access to inpatient data. Variables examining non-inpatient service use included in the RAI-MH would have more granularity, allowing for more a more in-depth analysis of the effect of community resources between episodes of inpatient care.

Finally, data regarding enabling factors were limited, and many of the items that did capture enabling factors were conceptually focussed partially on needs factors. For example, the Support for Social discharge CAP, which was used to examine capture the construct of social support, does not focus exclusively on social support, but also considers need for support. As such, said variable is not necessarily a 'true' enabling factor. Well designed social support variables could help in understanding the interactions observed here. For example, the current research suggests marital status may be a proxy variable for social support. The inclusion of a true social support variable could test this concept: if marital status and social support are both capturing the same underlying construct, then the inclusion of both should result in collinearity. Further, data on issues such as individual health beliefs and the effects of stigma—two major enabling factors—are not available. Issues such as this may not be resolvable; the RAI-MH is designed to inform clinical practice, and as such, items included need to be relevant to front-line care providers.

ON-MARG

Area effect research is fraught with potential pitfalls. The two most prominent issues to consider when thinking about the role that area plays in health are the ecological fallacy and the local trap (102,103). The first of these, the ecological fallacy, holds that it is erroneous to assume that an area effect is present within all individuals residing within an area. The local trap

is the reverse of the area size concern, in which researchers' caution placing too great an emphasis on small sized area effects. In short, people do not spend all their time in their home area; they travel to work, to visit family or friends, any or all of which could be outside their 'home' area.

One solution to these issues is the concept of activity space (102–104). Activity space research is done by following participants' movements over time via GPS. This has shown that individuals have highly individualized activity spaces, taking them over a variety of areas over the course of their day. The activity space concept is an interesting one; it calls into question the nature of area effects. Previous research posits that areas have a singular effect on residents (105,106), but now questions of exposure levels can be considered. For example, if someone resides in a highly marginalized area, but works in a less marginalized one, does time spent in one counteract or exacerbate the other? Does the amount of time spent in either area matter (12 hours at home, 8 at work, 4 running errands)? Do the actions undertook during the time matter (8 hours sleeping at home, 4 doing chores, etc.)? Future research should begin to ask these questions.

Finally, how areas are defined needs consideration (107,108). There are on-going debates regarding how areas should be differentiated. The current research utilized a high level administrative definition created by the federal government, an approach used in other research (109). This approach has been criticized as incomplete (108,110). As contrast, recent research suggested a combination of historical administrative, statistical enumerations, and resident definitions as an alternative (108). An anecdote from the current research can help illustrate this issue. At the beginning of the analyses, researchers explored the concept of non-hierarchical nested modelling to account for clustering. This approach was considered because while

individuals cluster within hospitals, hospitals are not nested within FSA's. To be hierarchically nested, every FSA would need a hospital. Ultimately, it was decided to abandon the non-hierarchical clustering approach, as the FSA's do not represent true clusters. Instead, FSAs are artefacts of administrative use researchers adopt to artificially represent neighbourhoods; they are not necessarily representative of true phenomena.

The current research used administratively defined neighbourhoods that may not be representative of actual natural phenomena, and could not investigate the concept of activity space. Further, the areas defined—while varying in size—were large enough that the ecological fallacy is a concern, but not so large that the local trap could be dismissed. Given these concerns, it is reasonable to think that the effects observed here are biased in some way.

<u>Implications</u>

Theoretical

Andersen's Behavioural model (7,8) represents more of a descriptive framework—helping to explain what is happening—than a prescriptive theory—explaining why something is happening. When used, the behavioural model has allowed researchers to identify, investigate, and create a taxonomy of correlates to MHSU. However, explanations regarding why specific correlates are important have been less forthcoming. Intersectionality theory (26,59) and similar theories—such as social anchorage (51,52)—provide one avenue to better understand why certain correlates are more important than others in predicting MHSU. In the current research, utilizing both intersectionality theory and Andersen's behavioural model allowed researchers new insights into MHSU.

At it's heart, intersectionality theory is a criticism of research approaches wherein researchers attempt to pinpoint the singular independent effect of each variable. Instead,

intersectionality theory makes the case that individuals are not simply the sum of disparate parts, but a greater gestalt whole. In this research, and in line with previous research (20,51,52), interaction terms were used to test intersectionality theory, and demonstrated novel findings. However, this research only investigated two-way interactions, as interpretations threatened to become too unwieldy as higher order interactions were tested, and thus fell short. Two-way interactions consider the multiplicative effects of the variables included in the interaction, but fall shy of intersectionality theory's hypothesis that multiple components interact simultaneously and concurrently. To more effectively investigate intersectionality theory, new research methods need to be advanced and adopted, such as classification and regression tree analysis (CART) used in other studies, such as Cairney et al (2014).

Finally, the goals of this research was not to test intersectionality theory; rather it was to use this theory to attempt to frame the results. Intersectionality theory may not be the best approach for population-based health services research. The goal of health systems research is to maximize efficiency while providing the highest quality of care for patients. Intersectionality's highly individualized focus limits the ability to apply results beyond any specific individual. No two people will completely inhabit the same aspects of identity at the same time; indeed, the same individual could inhabit different aspects of identity at different times. It is important to note that the health care system already has an avenue for the expression of intersectionality: care providers. Daily, skilled care providers are engaging with individual patients, learning their unique intersectional inhabitancies, and providing appropriate and quality care.

Practical

The goal of this research is to achieve a better understanding of high intensity service use in the hopes that the mental health system can help these individuals more effectively and

prevent the need for high intensity use altogether. However, it is possible that these people need that level of care. In the drive to cut costs and streamline the system, we must not lose sight of the purpose of the system: to provide care. If an individual with schizophrenia needs to be in hospital 5 times over the course of 5 years, then that individual needs to be there. That said, a distinction should be made between inpatient services and care provision. It is possible that those individuals who need to be in hospital 5 times over 5 years require a high degree of care, but not necessarily or specifically the care provided in hospital. Given the limitations described above, this research cannot truly describe care provision beyond inpatient usage. That said, if future research demonstrates that inpatient services are being used due to the lack of other services, that is an issue that needs to be addressed.

While it is unclear whether inpatient services are being used due to lack of other services, what is clear is that the primary driver of high intensity service use is schizophrenia and its related symptomology. This finding provides further emphasis on the need for effect treatment and management strategies for individuals experiencing schizophrenia. One interesting and novel finding here is that there is an interaction between marital status and positive symptoms. This finding may ultimately provide new avenues for intervention for care providers. While it is probably not feasible to have a wedding for every individual who comes into hospital, if marital status is indeed indicative of social support deficits, this could be a useful leverage point for care providers to address.

The contextual factors examined here, residential instability, ethnic concentration, material deprivation and dependence were either not statistically significant, or had weak associations when compared with individual factors. Given these findings, and the large costs that area level interventions would require, addressing these issues does not appear feasible.

However, this research did not investigate measures of service provision, area level factors that have previously been found to be associated with MHSU. Distribution of services represents a more readily accessible leverage point than marginalization. Therefore, if future research shows service distribution to be associated with MHSU, action should be taken to address issues.

Future Research

Future research should do several different things:

Link to other areas of the care continuum.

Future research should examine the service use of individuals across the care continuum. Linking OMHRS with other databases such as the Ontario Health Insurance Plan billing data and data from other care settings will allow researchers to better understand the role that other types of care have on inpatient mental health service use, and high intensity use (at any level of service provision). Further, linking with the rest of the care continuum will allow researchers to further determine the different patterns and trajectories of care.

Capture the effects of change over time via longitudinal research

Longitudinal research will add a degree of granularity to the datasets that will allow researchers to begin to examine questions that consider the change of status in independent variables and how this relates to service use. This would require consistent data from across the care continuum, such as data from community mental health that is consistent with inpatient mental health settings.

Refine and expand contextual effects research

The ON-MARG variables are only one way of conceptualizing area effects. Built environment, food environment, green space, neighbourhood social capital, and health service provision have all been tied to mental health outcomes in some way. It is possible they also

relate to service use. Further, the areas examined with the ON-MARG here were larger than its developers suggest using (85). Privacy issues prevented the use of smaller areas, but if these concerns could be addressed, ON-MARG should be further tested.

Explore novel ways to examine the tenets of intersectionality theory.

The approach for testing intersectionality theory via interactions was adopted from other research (20,51,52), but other research has utilized different methods (26), which may be more appropriate for testing intersectionality, and could be adopted for use in OMHRS related research guided by intersectionality theory.

Conclusion

The current research combined two sources of data—OMHRS and the ON-MARG—to create a novel dataset which contained items to test every aspect of Andersen's Behavioural Model (7,8) in relation to high intensity inpatient service use over 5 years following index admission. Despite limitations—such as only having access to inpatient data, and lack of certain variables of interest—this research utilized a large sample size ostensibly containing all individuals using inpatient mental health services in Ontario for the first time between 2006 and 2009 to definitively show that schizophrenia and its related symptomology is the primary driver of both episodic and daily high intensity service use. Further, this research began to explore the role of contextual factors, demonstrating that they (at least those investigated here) may not represent ideal avenues for intervention given the small effect sizes, relative importance to service use, and difficulty and expense of such an undertaking (105). Future research should build upon these findings by linking inpatient data with other services along the continuum of care, supplementing data with additional external sources, consider the effect of time, and explore novel research methodologies.

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Appendix A: Andersen's Behavioural Model

Obtained from (7), p. 651.

 Andersen RM. National health surveys and the behavioral model of health services use. Medical care. LWW; 2008;46(7):647–653.
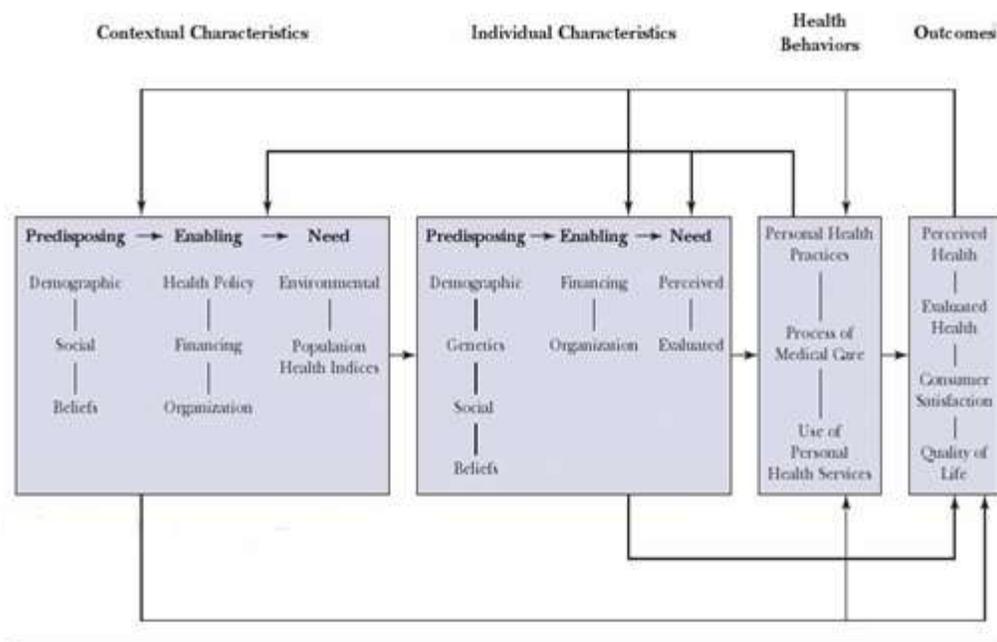
Figure 6. Andersen's Behavioural Model-6th Revision

Appendix B: Additional Scale Information

Obtained from :

Canadian Institute of Health Information (CA). Cognitive Performance Scale [Internet]. Toronto: CIHI; [cited 2017 Mar 7]. Available from: https://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjbidz_wcDLAhXJrYMKHdxBA0cQFgghMAA&url=http%3A%2F%2Fwww.interrai.org%2Fassets%2Ffiles%2FScales%2FCognitive%2520Performance%2520Scale.pdf&usg=AFQjCNGjDAP01xaRkG5PFkknfov0V7-k-Q&cad=rja
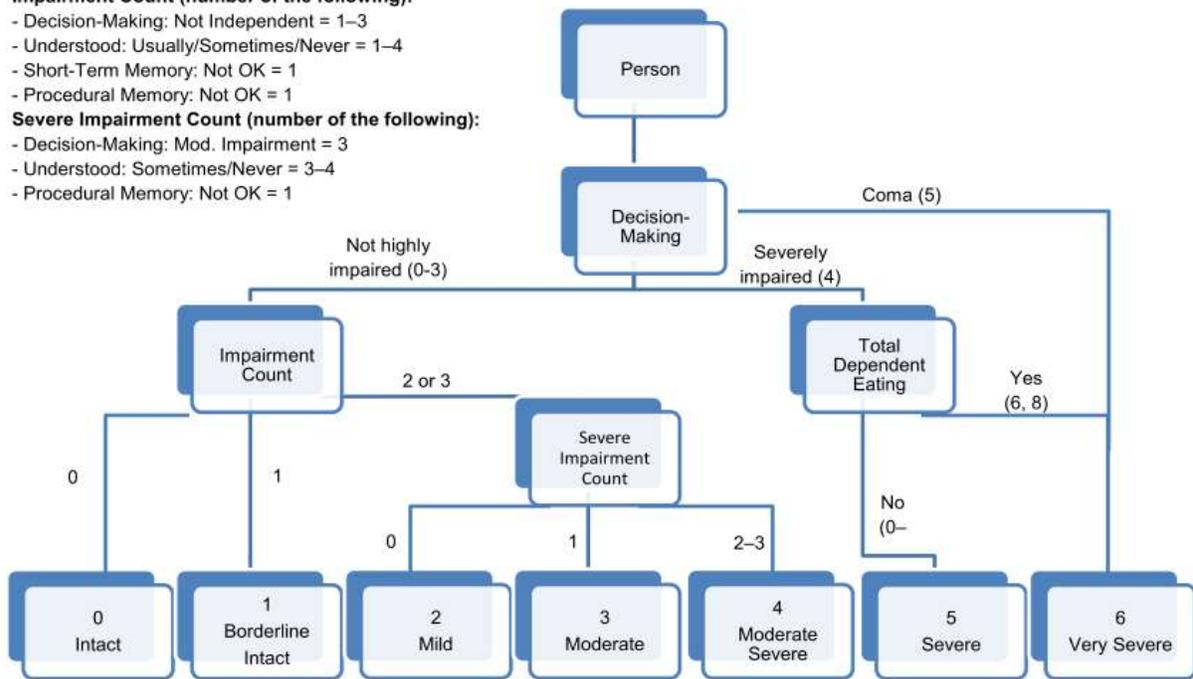
Figure 7. CPS Decision Tree

Table 25. RHO and SOS scale description.

Scale	Description
Risk of Harm to Others	Combination of: presence of delusions; insight into mental health; difficulty falling asleep; PSS; ABS; sleep problems due to hypomania; indicators of violence. Scores range from 0 to 6. Higher scores indicate increased risk of harm to others.
Severity of Self-harm	Combination of: self-injurious act; intent of any self-injurious act was to kill self; DSI; Family/others concerned about person's risk for self-injury; PSS; CPS; Suicide plan. Scores range from 0 to 6. Higher scores indicate increased risk of self-harm.

Appendix C: Block modelling results.

Table 26. Full block modelling high use outcomes with all independent variables. Statistically significant (P<0.05) odds ratios displayed.

Variable	Level	High Use Days Model Fit: QICu=13289.9673				High Use Episodes Model Fit: QICu=15027.0394			
		O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Age (Ref= 25-34)	45-54	1.45	1.05	2.00	0.0245	--	--	--	--
	55-64	1.69	1.19	2.39	0.0032	--	--	--	--
	65+	2.78	1.71	4.52	<0.0001	--	--	--	--
Education (Ref= High school)	Less than High school	--	--	--	--	0.88	0.78	1.00	0.0455
	More than High school	--	--	--	--	0.88	0.80	0.98	0.0154
Schizophrenia	Diagnosis	1.46	1.02	2.10	0.0407	1.70	1.17	2.46	0.0052
Time since contact with community mental Health (Ref=No Contact)	30 Days or less	1.15	1.02	1.28	0.0180	1.13	1.02	1.25	0.0238
Age at first hospitalization (Ref= 15-24)	45-64	0.48	0.31	0.72	0.0005	0.65	0.44	0.96	0.3030
	65+	0.23	0.14	0.39	<0.0001	0.16	0.20	0.59	0.0001
Left against medical advice (Ref=No)	Yes	--	--	--	--	1.36	1.05	1.76	0.0182
Social Relationships CAP (Ref= Not Triggered)	Improve relationships	--	--	--	--	1.12	1.00	1.24	0.0435
PSS (Ref=0)	3-5	--	--	--	--	1.34	1.17	1.54	<0.0001
	6+	1.19	1.01	1.42	0.0437	1.45	1.24	1.69	<0.0001
SWS (Ref=0)	1-2	--	--	--	--	1.16	1.02	1.32	0.0275
	3-5	1.20	1.03	1.40	0.0193	1.25	1.08	1.44	0.0020
	6+	1.24	1.02	1.50	0.0313	1.26	1.06	1.50	0.0100
Lives Alone (Ref=No)	Yes	1.16	1.03	1.31	0.0148	1.14	1.03	1.27	0.0141
Adjustment (Ref= No Diagnosis)	Diagnosis	0.48	0.28	0.80	0.0055	--	--	--	--
Eating	Diagnosis	1.92	1.14	3.22	0.0135	--	--	--	--
Substance	Diagnosis	0.48	0.31	0.76	0.0015	--	--	--	--
Concurrent	Diagnosis	1.97	1.42	2.74	<0.0001	--	--	--	--
Concurrent Secondary	Diagnosis	0.48	0.33	0.70	0.0001	--	--	--	--
Number of drinks in 1 sitting in last 2 weeks (Ref: No drinks in last 14 days)	1 drink in last 14 days	0.76	0.59	0.97	0.0278	--	--	--	--
Opiates	Last 3 months	0.67	0.50	0.91	0.0920	--	--	--	--
Risk of Harm to Others CAP	High Risk Triggered	1.27	1.06	1.52	0.0080	--	--	--	--
Self Care CAP	Moderate Risk Triggered	1.23	1.08	1.41	0.0027	--	--	--	--

Table 27. Predisposing block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

Variable	Level	High Use Days Model Fit: QICu=13671.4906				High Use Episodes Model Fit: QICu=15457.1578			
		O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Age (Ref= 25-34)	<=24	1.18	1.01	1.39	0.0384	--	--	--	--
	55-64	1.33	1.11	1.59	0.0017	--	--	--	--
	65+	1.35	1.15	1.60	0.0004	0.54	0.46	0.64	<0.0001
Marital (Ref= Married or partner)	Never Married	1.30	1.15	1.47	<0.0001	1.15	1.04	1.28	0.0086

Table 28. Diagnoses block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

Variable	Level	High Use Days Model Fit: QICu=13351.9009				High Use Episodes Model Fit: QICu=15186.6676			
		O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Adjustment (Ref= No Diagnosis)	Diagnosis	0.36	0.21	0.60	<0.0001	--	--	--	--
Dementia	Diagnosis	--	--	--	--	0.54	0.36	0.81	0.0024
Schizophrenia	Diagnosis	1.55	1.09	2.20	0.0145	2.20	1.54	3.16	<0.0001
Substance	Diagnosis	0.28	0.18	0.43	<0.0001	--	--	--	--
Concurrent mental illness and substance use	Diagnosis	2.12	1.53	2.93	<0.0001	--	--	--	--
Concurrent substance use secondary	Diagnosis	0.39	0.27	0.56	<0.0001	--	--	--	--

Table 29. Symptoms block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

Variable	Level	High Use Days Model Fit: QICu=13505.0873				High Use Episodes Model Fit: QICu=15240.1094			
		O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
ADL-H (Ref=0)	1-2	1.25	1.08	1.45	0.0030	--	--	--	--
	3+	--	--	--	--	0.76	0.61	0.95	0.0139
CPS (Ref=0)	1-2	1.16	1.04	1.31	0.0098	--	--	--	--
	3-4	--	--	--	--	0.75	0.61	0.92	0.0048
	5+	--	--	--	--	0.74	0.56	0.96	0.0228
DSI (Ref=0)	1-2	0.86	0.74	--	0.0044	--	--	--	--
	3-5	0.79	0.68	0.91	0.0018	--	--	--	--
	6+	--	--	--	--	0.85	0.74	0.98	0.0212
Mania Scale (Ref=0)	9+	--	--	--	--	1.23	1.03	1.32	0.0234
PSS (Ref=0)	1-2	1.25	1.07	1.47	0.0044	1.23	1.07	1.42	0.0039
	3-5	1.55	1.36	1.78	<0.0001	1.69	1.50	1.91	<0.0001
	6+	1.80	1.56	2.06	<0.0001	2.11	1.86	2.40	<0.0001
SWS (Ref=0)	1-2	--	--	--	--	1.26	1.11	1.43	0.0003
	3-5	1.35	1.17	1.55	<0.0001	1.40	1.23	1.59	<0.0001
	6+	1.35	1.13	1.62	0.0010	1.39	1.18	1.64	0.0001

Table 30. Addictive behaviours block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

Variable	Level	High Use Days	High Use Episodes

		Model Fit: QICu=13568.0551				Model Fit: QICu=15542.6991			
		O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Number of drinks in 1 sitting in last 2 weeks (Ref: No drinks in last 14 days)	1 drink in last 14 days	0.72	0.57	0.92	0.0084	--	--	--	--
	2 to 4 drinks in last 14 days	0.83	0.70	0.99	0.0328	--	--	--	--
	5 or more drinks in last 14 days	0.77	0.65	0.92	0.0046	--	--	--	--
Cannabis (Ref: Never/more than 1 year)	History of Use	--	--	--	--	1.46	1.14	1.86	0.0025
	Recent: within the last 3 months	--	--	--	--	1.18	1.02	1.36	0.0245
Cocaine and Crack	History of Use	--	--	--	--	--	--	--	--
	Recent: within the last 3 months	0.70	0.55	0.89	0.0034	--	--	--	--
Hallucinogens (Ref: Never/more than 1 year)	Recent: within the last 3 months	1.51	1.03	2.22	0.0361	1.42	1.04	1.94	0.0255
Opiates (Ref: Never/more than 1 year)	History of Use	--	--	--	--	--	--	--	--
	Recent: within the last 3 months	0.58	0.44	0.77	0.0002	--	--	--	--
Tobacco use (Ref= No use)	Yes	--	--	--	--	1.19	1.03	1.38	0.0196
	Yes, but not in last 2 weeks	0.76	0.67	0.86	<0.0001	--	--	--	--
Subuse CAP (Ref=Not triggered)	History of use	0.80	0.68	0.94	0.0077	--	--	--	--

Table 31. Needs CAPS block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

		High Use Days Model Fit: QICu=13530.4216				High Use Episodes Model Fit: QICu=15526.5126			
Variable	**Level**	O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Medication Adherence Cap (Ref=Not triggered)	Adherence due to symptoms	1.36	1.09	1.69	0.0059	--	--	--	--
	Adherence due to side-effects	1.24	1.10	1.39	0.0003	--	--	--	--
Risk of Harm to Others CAP	High Risk Triggered	1.30	1.12	1.50	0.0005	--	--	--	--
Self Care CAP	Moderate Risk Triggered	1.39	1.24	1.55	<0.0001	1.17	1.06	1.29	0.0021
	High Risk Triggered	1.68	1.24	1.55	<0.0001	1.56	1.29	1.88	<0.0001
Self-Harm CAP	High Risk Triggered	0.71	0.62	0.82	<0.0001	0.80	0.71	0.90	0.0003

Table 32. Income sources block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

		High Use Days Model Fit: QICu=13655.5391				High Use Episodes Model Fit: QICu=15522.5134			
Variable	**Level**	O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Employment (Ref=Not a Source of Income)	Source of Income	0.74	0.63	0.87	0.0003	--	--	--	--
Pension (Ref=Not a Source of Income)	Source of Income	--	--	--	--	0.67	0.57	0.78	<0.0001

Table 33. Enabling Factor CAPS block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

		High Use Days Model Fit: QICu=13660.5274	High Use Episodes Model Fit: QICu=15592.5091
Variable	**Level**		

		O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Criminal Activity CAP (Ref=No risk)	Risk of criminal behaviour	--	--	--	--	1.21	1.08	1.36	0.0008
Finances CAP (Ref= Not Triggered)	Economic Hardship	1.37	1.21	1.54	<0.0001	0.83	0.73	0.94	0.0024
Social Relationships CAP (Ref= Not Triggered)	Improve relationships	1.14	1.02	1.28	0.0175	1.16	1.05	1.29	0.0027

Table 34. Contextual factor block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

		High Use Days Model Fit: QICu=13696.8144				High Use Episodes Model Fit: QICu=15575.7551			
Variable	**Level**	O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Dependency (Ref= Lowest score)	second lowest	--	--	--	--	1.19	1.01	1.40	0.0361
	mid	1.34	1.11	1.62	0.0028	1.35	1.13	1.62	0.0010
	second highest	--	--	--		1.26	1.03	1.54	0.0230
	highest score	1.36	1.09	1.69	0.0028	1.37	1.11	1.69	0.0038
Deprivation (Ref= Lowest score)	mid	1.24	1.46	1.47	0.0170	--	--	--	--
Ethnic Concentration (Ref= Lowest score)	mid	1.26	1.05	1.50	0.0112	1.29	1.10	1.52	0.0020
	second highest	--	--	--	--	1.24	1.05	1.47	0.0124

Table 35. Service use block modelling high use outcomes. Statistically significant (P<0.05) odds ratios displayed.

		High Use Days Model Fit: QICu=13685.1560				High Use Episodes Model Fit: QICu=15453.0009			
Variable	**Level**	O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Age at first hospitalization (Ref= 15-24)	25-44	0.75	0.66	0.86	<0.0001	0.80	0.71	0.89	<0.0001
	45-64	0.77	0.67	0.88	0.0001	0.68	0.61	0.77	<0.0001
	65+	0.78	0.66	0.91	0.0019	0.40	0.34	0.47	<0.0001
Left against medical advice (Ref=No)	Yes	--	--	--	--	1.41	1.11	1.79	0.005
Legal Guardian (Ref=No)	Yes	1.36	1.16	1.60	0.0002	--	--	--	--
Time since contact with community mental Health (Ref=No Contact)	30 Days or less	1.15	1.04	1.28	0.0079	--	--	--	--

Table 36. Interactions tested. Odds ratios that are statistically significant at < 0.05 included.

Interactions	High Use Days				High Use Episodes			
	O.R	LCL	UCL	P value	O.R	LCL	UCL	P value
Male*35-44	0.65	0.47	0.88	0.0056	0.67	0.52	0.87	0.0020
Male*45-54	0.65	0.46	0.85	0.0029	0.62	0.48	0.81	0.0003
Male*Dementia	1.70	1.23	2.36	0.0014	1.66	1.12	2.46	0.0110
Male*Anxiety	--	--	--	--	1.66	1.09	2.52	0.0183
Male*Childhood	--	--	--	--	3.46	1.05	11.38	0.0406
Male*Schizophrenia	--	--	--	--	1.37	1.12	1.68	0.0027
Male*Social Discharge CAP	1.31	1.07	1.60	0.0080	1.19	1.00	1.43	0.0499
Male*CPS (3-4)	1.52	1.01	2.29	0.0435	--	--	--	--
Male*CPS (5+)	3.20	1.91	5.36	<0.0001	--	--	--	--
Male*Self care (Moderate)	1.33	1.07	1.65	0.0112	--	--	--	--
Never married*ADL-H (1-2)	1.67	1.18	2.36	0.0039	--	--	--	--
Widowed/Separate/Divorced*CPS (5+)	0.46	0.24	0.90	0.0239	--	--	--	--
Never married*PSS (1-2)	--	--	--	--	1.41	1.02	1.95	0.0355
Never married*PSS (3-5)	1.81	1.33	2.45	0.0001	1.70	1.29	2.24	0.0001
Never married*PSS (6+)	1.92	1.39	2.66	<0.0001	1.54	1.15	2.06	0.0035
Widowed/Separate/Divorced*Dementia	0.64	0.44	0.93	0.0189	--	--	--	--
Never married*Schizophrenia	1.67	1.26	2.20	0.0003	1.46	1.14	1.86	0.0025
Widowed/Separate/Divorced*Eating	--	--	--	--	5.06	1.12	22.86	0.0352
Widowed/Separate/Divorced*Economic Hardship	0.72	0.53	0.97	0.0317	--	--	--	--
Never married*Side-effects causing medication adherence issues	1.37	1.06	1.77	0.1680	--	--	--	--
Never married*Self care (High)	1.75	1.28	1.09	0.0209	--	--	--	--
Never married*Self-Harm(High)	0.72	0.52	0.99	0.0400	--	--	--	--
Never married*Concurrent Secondary	--	--	--	--	0.46	0.25	0.85	0.0125
Widowed/Separated/Divorced*Concurrent Secondary	--	--	--	--	0.45	0.21	0.95	0.0358
Widowed/Separate/Divorced*Multiple Diagnoses	--	--	--	--	0.65	0.49	0.86	0.0025
Widowed/Separate/Divorced*Cannabis (Recent)	--	--	--	--	0.68	0.38	0.85	0.0067
never married*interpersonal conflict cap (Specific relationship)	--	--	--	--	1.47	1.07	2.02	0.0163
Widowed/Separate/Divorced*Self-Harm (Moderate)	--	--	--	--	0.70	0.50	0.99	0.0439
65+*CPS (3-4)	--	--	--	--	0.44	0.22	0.88	0.0199
65+*CPS (5+)	--	--	--	--	0.28	0.11	0.75	0.0048
65+*ADL-H (3+)	0.40	0.18	0.88	0.0219	--	--	--	--

35-44*DSI (6+)	1.75	1.03	2.99	0.0393	--	--	--	--
45-54*DSI (6+)	2.06	1.22	3.44	0.0069	1.72	1.11	2.65	0.0144
65+*DSI (6+)	1.93	1.16	3.19	0.0108	--	--	--	--
65+*PSS (3-5)	0.57	0.37	0.86	0.0075	0.55	0.36	0.83	0.0046
65+*PSS (6+)	0.61	0.38	0.97	0.0371	--	--	--	--
<=24*PSS (1-2)	2.22	1.21	4.06	0.0100	2.45	1.48	4.06	0.0005
55-64*SWS (1-2)	--	--	--	--	1.68	1.01	2.79	0.0471
65+*SWS (3-5)	0.58	0.37	0.92	0.0215	--	--	--	--
<=24*SWS (3-5)	0.55	0.34	0.91	0.0188	--	--	--	--
<=24*SWS (6+)	0.37	0.19	0.73	0.0039	--	--	--	--
65+*Dementia	--	--	--	--	0.22	0.07	0.73	0.0134
35-44*Schizophrenia	0.60	0.41	0.88	0.0085	0.55	0.40	0.76	0.0004
45-54*Schizophrenia	0.65	0.44	0.96	0.0310	0.57	0.41	0.80	0.0012
65+*Schizophrenia	0.43	0.29	0.66	<0.0001	0.44	0.29	0.67	<0.0001
55-64*Substance	--	--	--	--	0.43	0.22	0.85	0.0145
55-64*Concurrent	--	--	--	--	3.59	1.38	9.31	0.0087
55-64*Concurrent Secondary	--	--	--	--	0.24	0.08	0.74	0.0127
65+*Multiple Diagnoses	0.64	0.45	0.91	0.1220	0.69	0.49	0.98	0.0375
65+Pension	0.38	0.19	0.75	0.0050	--	--	--	--
65+*Employment Insurance as income	3.37	1.23	9.27	0.0184	--	--	--	--
65+*Social Discharge CAP	0.67	0.48	0.93	0.0179	--	--	--	--
45-54*Risk of Unemployment/dropout	0.51	0.29	1.12	0.0191	--	--	--	--
55-64*Risk of Unemployment/dropout	0.39	0.18	0.83	0.0142	--	--	--	--
65+*Economic Hardship	0.58	0.37	0.91	0.0167	--	--	--	--
55-54*Dependency	0.77	0.62	0.96	0.0202	--	--	--	--
55-64*Deprivation	0.53	0.32	0.86	0.0109	--	--	--	--
65+*Deprivation	0.57	0.36	0.88	0.0107	--	--	--	--
<=24*Social Assistance	--	--	--	--	2.32	1.39	1.22	0.0104
35-44*Social Assistance	--	--	--	--	2.47	1.37	4.46	0.0028
45-54*Social Assistance	--	--	--	--	1.94	1.05	3.57	0.0331
35-44*Employment Income	--	--	--	--	1.58	1.23	1.05	0.0042
35-44*Employment Insurance	--	--	--	--	1.95	1.12	3.41	0.0190
45-54*Employment Insurance	--	--	--	--	1.90	1.34	1.07	0.0283
55-64*Employment Insurance	--	--	--	--	2.09	1.43	1.04	0.0390
65+*Employment Insurance	--	--	--	--	3.13	1.60	10.62	0.0033
55-64*Manage Finances	--	--	--	--	2.23	1.17	4.23	0.0145
65+*Economic Hardship	--	--	--	--	0.53	0.34	0.82	0.0049
<=24*Economic Hardship	--	--	--	--	1.78	1.12	2.81	0.0145
<=24*Widespread Conflict	--	--	--	--	1.65	1.21	2.25	0.0017
55-64*Area Ethnic Concentration	--	--	--	--	1.42	1.03	1.95	0.0311
55-64*Area Dependency	--	--	--	--	0.73	0.60	0.88	0.0012

65+*Area Deprivation	--	--	--	--	0.59	0.38	0.91	0.0173
65+Side-effects causing medication adherence issues	--	--	--	--	0.50	0.34	0.73	0.0003
45-54*High risk to harm others	--	--	--	--	0.54	0.32	0.90	0.0175
55-64*High risk self harm	--	--	--	--	0.60	0.38	0.95	0.0298
<HS*Area Dependency	1.18	--	1.38	0.0459	--	--	--	--
>HS*Lives alone	0.78	0.62	--	0.0477	--	--	--	--
>HS*Mania (9+)	--	--	--	--	0.56	0.37	0.86	0.0071
<HS*Hallucinogen (History of Use)	--	--	--	--	2.57	1.04	6.34	0.0399
<HS*Tobacco	--	--	--	--	1.64	1.10	2.46	0.0158
>HS*Cannabis(Recent)	--	--	--	--	0.71	0.51	0.99	0.0453
<HS*Prior Trauma	--	--	--	--	1.66	1.05	2.60	0.0284
Other Language*Unemployment/Drop out	0.12	0.02	0.95	0.0449	--	--	--	--
French*Economic Hardship	2.33	1.02	5.32	0.0439	2.72	1.22	6.09	0.0148
French*Social Withdrawal(1-2)	0.06	0.01	0.54	0.0119	--	--	--	--
French*Tobacco use	--	--	--	--	3.35	1.26	8.87	0.0150
OtherLang*Economic Hardship	--	--	--	--	0.59	0.37	0.95	0.0313
Aboriginal*DSI(1-2)	3.35	1.12	10.00	0.0305	--	--	--	--
Aboriginal*Cannabis(Recent)	0.24	0.07	0.84	0.0258	--	--	--	--
Aboriginal*Individual Residential Instability	0.10	0.02	0.64	0.0152	0.19	0.07	0.53	0.0016
Aboriginal*Homeless	32.81	2.00	537.97	0.0144	--	--	--	--
Aboriginal*Economic Hardship	--	--	--	--	2.34	1.47	1.11	0.0263
Aboriginal*Self-harm (Moderate)	--	--	--	--	2.50	1.21	5.16	0.0134