Examining the Connection: Traumatic Life Events, Substance Use, and Service Utilization Among Persons Admitted to Inpatient Psychiatry in Ontario

by

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EXAMINING COMMITTEE MEMBERSHIP

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

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Author's Declaration

I hereby declare that this thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in 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.

Statement of Contributions

This thesis consists in part of three manuscripts written for publication.

Exceptions to sole authorship of material are as follows:

Chapter 2: Fearon, D., Perlman, C.M., Hirdes, J., Leatherdale, S., & Dubin, J. (2023). Classification of traumatic life events and substance use among persons admitted to inpatient psychiatry in Ontario, Canada: A population-based retrospective cohort study.

Chapter 3: Fearon, D., Perlman, C.M., Leatherdale, S., & Hirdes, J. (2023). Service Complexity Among Latent Classes of Individuals with Traumatic Life Events and Substance Use in Inpatient Psychiatry.

Chapter 4: Fearon, D., Perlman, C.M., Leatherdale, S., & Hirdes, J. (2023). Early Leaves from Inpatient Care Among Individuals with Traumatic Life Events in Ontario.

As lead author of these three chapters, I was responsible for conceptualizing the study design and methodology. I analyzed the data, led the interpretation of findings, and drafted the manuscripts under the direction of Dr. Perlman. My co-authors provided guidance in interpretation, analytic methods, and feedback on draft manuscripts.

Note: There may be overlap in the contents of this dissertation, particularly the description of methods and some background materials from the literature reviews, because the research was designed as three separate manuscripts for journal submission.

Abstract

Background

Experiencing traumatic life events and the symptoms that follow have been associated with an increased risk for other mental health conditions. Among individuals who have experienced traumatic life events, comorbidities such as substance use disorder are particularly common. Individuals with co-morbid trauma and substance use may be less responsive to treatment, are prone to relapses, and increased hospitalizations. Gaps in care for individuals with co-occurring trauma and substance use reflect the growing need to understand associations between trauma experiences and substance use to identify opportunities for improving care and outcomes. Using data from persons who experienced trauma prior to admission to inpatient psychiatry, the purposes of this dissertation are to (1) identify the classifications of both trauma and substance use, (2) examine the service complexity received by persons with trauma, and (3) examine whether trauma classifications, and the presence of social relationships are associated with early leaves from inpatient care.

Methods

A population based retrospective cohort was developed using interRAI Mental Health (RAI-MH) assessment data from all inpatient psychiatric assessments in Ontario, Canada between January 1, 2015, to December 31, 2019. The RAI-MH is a comprehensive assessment tool completed by clinical staff overseeing the care of the person. Completion of the assessment draws on multiple sources of information such as a review of the patient's clinical records, interviews and observations, consultation with other clinical staff, family, and first responders (CIHI, 2023). The cohort included all persons in non-forensic and non-geriatric beds who were over the age of 18, and who had experienced a traumatic life event at some point prior to admission. Modelling and analyses were all conducted using SAS 9.4.

Study 1: Data were included for individuals with an index admission stay of 72 hours or longer during the observational window. Patients were excluded if they were admitted from another psychiatric hospital or if their first episode was not an admission assessment. Patients were included if they triggered the Traumatic Life events CAP of the RAI-MH (N=10,125).

Latent class analysis was used to determine underlying subgroups of patients based on their patterns of traumatic life events and substance use behaviour. An 8-class solution was selected based on comparisons of Akaike information criteria, Bayesian information criteria, adjusted Bayesian criteria, and entropy values.

Study 2: Data from the Ontario Mental Health Reporting System were included for patients who triggered the Traumatic Life events CAP with no recent psychiatric assessments (i.e., no admissions within the last two years) (N=7,871). A service complexity variable was created based on length of stay (from date of admission to date of discharge, measured in days), the frequency of non-nursing formal care use, and nursing interventions in the prior 7 days. Descriptive statistics and bivariate associations between all demographic characteristics and level of service complexity were conducted. Logistic regression modelling was then used to assess the association between latent classes and the outcome (i.e., service complexity: low/moderate versus high service complexity). Odds ratios (unadjusted and adjusted), and 95% confidence intervals were reported for the initial and final models.

Study 3: All records for individuals who triggered the Traumatic Life events CAP with an index admission over 72 hours between January 1, 2015 and December 31, 2019 were included (N=11,043). Early leaves were defined based on discharge status. The variable was coded into three different levels including unplanned leaves (patients who were discharged due to an absence without an approved leave, and persons discharged against medical advice), early leave (patients with short length of stays), and no early leave. Chi-squared tests were used to understand associations between demographic and clinical characteristics, and early leaves from inpatient stays. Multinomial logistic regression modelling was then used to assess the association between latent classifications of trauma and substance use, Clinical Assessment Protocols, demographic and clinical characteristics, the multi-level outcome of early leaves (i.e., unplanned, or short length of stay), and those who did not discharge prematurely.

Results

Study 1: Using latent class analysis, eight classifications of trauma and substance use were

identified, ranging from low (i.e., Class 1: Interpersonal Issues, Without Substance use) to high (i.e., Class 8: Widespread Trauma, Alcohol & Cannabis Addiction) complexity patterns of traumatic life events and substance use indicators. Classes with similar profiles of trauma were differentiated by variations in substances use patterns. Furthermore, substance use patterns ranged from use of specific substances to widespread use and show variation in the presence of indicators of problematic use. Multinomial logistic regression models highlighted additional factors associated with class membership such as homelessness, where those who were homeless were estimated to be 1.71-3.02 more likely to be in Class 3: Safety & Relationship Issues, Alcohol & Cannabis use, and 2.09-4.02 times more likely to be in Class 6: Widespread Trauma & Substance Addiction.

Study 2: Service complexity ranged from 1 to 13, with the most common services being psychiatrist (84.3%), nurse practitioners or medical doctors (non-psychiatrists) (64.1%), and social workers (59.7%). High service complexity, defined as the upper quintile of formal care service use (scores of greater than or equal to 9), nursing interventions, and longer length of stay was observed in 18.1% of individuals with trauma. Compared to patients with few trauma experiences and no substance use, patients with more widespread trauma experiences and indicators of alcohol and cannabis addiction were 2.1 times (95% CI: 1.68-2.50) more likely to have high service complexity. Patients with safety and relationship traumas with alcohol and cannabis use, were less likely to have high service complexity compared to patients with interpersonal issues, without substance use (adj. OR: 0.70, 95% CI: 0.54-0.91). Characteristics such being female, having greater education, and being employed were associated with higher service complexity.

Study 3: Multinomial logistic regression revealed that individuals in latent classes with patterns of substance use (e.g., Class 6: Widespread Trauma & Substance Addiction) were more likely to have unplanned early leaves compared to those without substance use (adj. OR: 4.17, 95% CI: 2.72-6.39). Individuals with interpersonal conflict (i.e., conflict in relationships and widespread interpersonal conflict) had increased odds of having early leaves that were unplanned. Persons in Class 4: Immigration with Interpersonal Issues, Alcohol & Cannabis Addiction (adj. OR: 0.68, 95% CI:0.56-0.83), and Class 8: Widespread

Trauma, Alcohol & Cannabis Addiction (adj. OR:0.73, 95% CIL 0.60-0.89) were less likely to have early leaves that were short length of stays compared to all other classes.

Discussion

The findings highlight multi-dimensional experiences of both trauma and substance use. That is, experiences of trauma and patterns of substance use vary among patients with trauma admitted to inpatient psychiatry. Patterns of service use, and discharge status also varied. Differences identified suggest the need to consider the nuances of trauma to support patients, consider ongoing prevention of substance use, and address barriers in maintaining treatment.

Study 1: When considering traumatic life events across the latent classes, experiences of trauma were diverse among inpatients: from those with a few traumatic life experiences centered around health and loss (Class 1) to those with widespread experiences that include accidents, health challenges, grief and loss, and other social circumstances (Class 8). In Ontario, there are few specialized programs in place for supporting trauma, except for several tertiary hospitals. Advances in publicly funded services outlined in provincial strategic plans may hold promise, such as the introduction of structured psychotherapy programs and specific resources to support the military and first responders (Ministry of Health, 2022). Increasingly, dual treatment options for both trauma and substance use (e.g., Concurrent Treatment of PTSD and Substance Use Disorders (COPE)) should be further explored (Persson et al., 2017). Further research should explore patterns of trauma and substance use in community mental health settings, and supporting clinician confidence in discussing traumatic life events with patients.

Study 2: Nuances were observed when considering the relationship between latent classes of trauma and level of service complexity. Patients with indicators of substance addiction were more likely to have high service complexity. Findings highlight the importance of ensuring funding is allocated to public services for the continuation of care post-discharge. The RAI-MH can identify specific experiences and needs of persons with trauma that may be useful for informing further analyses on resource utilization and service planning. Given that economic costs data were not available, future research may consider the use of resource

measurement and cost data to validate observed differences in service complexity.

Study 3: The results of study 3 point to differences between early leaves that are unplanned versus short length of stays. Both discharge statuses reflect an important period for providing treatment and recognizing substance use. Latent classes with the highest likelihood of unplanned early leaves generally included indicators of substance use. An eagerness to return to the community to utilize substances may reflect early unplanned discharges in this study. Inpatient admissions highlight an important timeframe to intervene in ongoing substance use. Unplanned early leaves may also reflect individuals with complex trauma that would better be supported in longer-term specialized treatment programs. Other factors such as interpersonal conflict, and eating disorders were associated with early discharge status. Future studies should assess the association between social relationships, formal supports, and early leaves.

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Dedication

Blake, Ada, and Otto Madill:

May this work inspire you to always chase your dreams,
just as you've always encouraged me to follow mine.

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List of Abbreviations

A-BIC	Adjusted Bayesian Information Criterion
adj. OR	Adjusted Odds Ratio
AIC	Akaike Information Criteria
APA	American Psychiatric Association
ASD	Acute Stress Disorder
BIC	Bayesian Information Criteria
CAGE Screener	Substance use screener assessing the need to **C**ut down, **A**nger about criticism from others, **G**uilt, and "**E**ye-opener" substance use.
CAMH	Centre for Addiction and Mental Health
CAP	Clinical Assessment Protocol
CI	Confidence interval
CIHI	Canadian Institute for Health Information
Class	Classification
CMHA	Canadian Mental Health Association
COPE	Concurrent Treatment of PTSD and Substance Use Disorders using Prolonged Exposure
CPS	Cognitive Performance Scale
DRS	Depression Rating Scale
HQO	Health Quality Ontario
ICES	Institute for Clinical Evaluative Sciences
LCA	Latent Class Analysis
LOA	Leave of absence
LOS	Length of stay
MD	Medical doctor
OMHRS	Ontario Mental Health Reporting System
OPS	Ontario Structured Psychotherapy
OR	Odds Ratio
PTSD	Post-traumatic stress disorder
RAI-MH	interRAI-Mental Health assessment
RHO	Risk of Harm to Others
SD	Standard deviation
SOS	Severity of Self-harm Scale
SUD	Substance Use Disorders
Trauma CAP	Traumatic Life events CAP
USD	United States dollar

Chapter 1
Introduction

1.1 Background

Trauma has become a major focus within many facets of the public health system. Psychological trauma refers to the experience of one or more events having lasting adverse effects on an individual's mental and physical well-being (Perrotta, 2019). Exposure to trauma is highly prevalent. Global estimates suggest that 70-90% of populations having been exposed to traumatic life events throughout their lifetime (Benjet et al., 2016; Kilpatrick et al., 2013). When exposed to trauma, some individuals respond with resilience. However, others may experience lasting psychological and physical effects characteristic of formal clinical diagnoses (Koenen et al., 2017).

Acute Stress Disorder (ASD; American Psychiatric Association [APA], 2023) occurs in the three days to a month following exposure to a traumatic event. Among individuals with ASD, reliving the traumatic events through nightmares or flashbacks, numbing and detachment are common (American Psychiatric Association [APA], 2023). ASD often occurs among individuals who have experienced interpersonal violence (e.g., physical, or sexual abuse). Lasting symptoms such as intrusive thoughts, avoidance behaviours, alterations in cognition, mood disturbances, and arousal may be indicative of Post-Traumatic Stress Disorder (PTSD; APA, 2023). PTSD symptoms usually develop within three months of exposure to trauma (APA, 2023). However, symptoms may persist for years following (APA, 2023). In Canada, the lifetime prevalence of PTSD is approximately 9.2% (Koenen et al., 2017). Substantial societal and economic burden can be attributed to trauma. In the United States, it is estimated that per individual with trauma, the total economic burden equates to $19,630 USD in direct costs annually (Davis et al., 2022). Higher health care costs, increased health service utilization, weaker clinical outcomes, and prolonged inpatient length of stays have all been associated with trauma (Hilberdink & Bui, 2023; Lewis et al., 2018).

Understanding genetic, psychological, and environmental risk factors is crucial to our understanding of mental disorders (Nolen-Hoeksema & Watkins, 2011). Genetic vulnerability in addition to environmental factors make some individuals particularly prone to the effects of traumatic stress (Maercker & Horn, 2013). Neurobiological symptoms (such

as the hypothalamic pituitary adrenal axis, dopaminergic system, and serotonergic system) have been documented as increasing susceptibility to trauma (Mehta & Binder, 2012). The hypothalamic pituitary adrenal axis is known to regulate physiological stress and releases hormones that in turn increase cortisol in humans from the adrenal glands (Mehta & Binder, 2012). Intracellular receptors (e.g., glucocorticoid and mineralocorticoid) promote adaptation and recovery from exposure to stress. Any dysregulation in this underlying complex system of cortisol regulation can cause increase an individual's vulnerability or reduce their resilience to traumatic stress (Blacker et al., 2019; Hogg et al., 2023; Mehta & Binder, 2012). Alterations in the hypothalamic pituitary adrenal axis have consistently been found with respect to PTSD (Blacker et al., 2019). Studies also suggest that differences in biological responses to stress are hereditary, and children of mothers with trauma can display similar biological effects even without having experienced the event themselves (Perrotta, 2019; Yehuda et al., 2005). Other factors such as societal influences, social networks, socioeconomic status, childhood environment, and cultural values all influence one's likelihood of trauma (Blacker et al., 2019; Maercker & Horn, 2013).

While experiencing a traumatic event is a pre-requisite for diagnosis of stress-related disorders, it is also related to many other mental health conditions (Hogg et al., 2023). Co-occurring conditions such as mood disorders, anxiety disorders, substance use disorders, and psychosis have all been associated with trauma (Galatzer-Levy et al., 2013; Hogg et al., 2023; Worthington et al., 2020). Having a prior diagnosis of major depressive disorder, anxiety disorder or borderline personality disorder increase individuals' relative risk of formal trauma diagnoses (Worthington et al., 2020). It is no surprise, then that emerging research has considered trauma as a transdiagnostic risk factor for other conditions (Nolen-Hoeksema & Watkins, 2011). Transdiagnostic risk factor models suggest that there are underlying dysfunctional processes that go beyond diagnostic categorization and underly multiple disorders (Nolen-Hoeksema & Watkins, 2011). These models support our understanding of comorbidity among mental disorders and increase our recognition that certain disorders cluster together, meaning there are common risk factors that reflect shared symptoms across disorders (Hogg et al., 2023; Noelen-Hoeksema & Watkins, 2011).

1.2 Co-occurring Substance Use

Substance use disorder commonly co-occurs among individuals with trauma. The prevalence of substance use disorder among individuals with diagnosed trauma ranges from 19-35% (Roberts et al., 2015). Substance use disorder refers to a complex condition whereby an individual utilizes substances (i.e., alcohol or drugs) despite impairments and harmful consequences to daily life (APA, 2023). Addiction may occur among individuals with repeated substance use. Substance use can have negative effects on an individual's behaviour, decision making processes, and personality (Gómez-Bujedo et al., 2020). The most commonly co-occurring substance use disorder is alcohol use disorder, with high prevalence rates ranging from 36% to 52% among individuals with trauma (Roberts et al., 2015). However, episodic use of cannabis is highly associated with later usage of illicit substances; and polysubstance users are more likely to have substance use disorders (Merikangas & McClair, 2012). Individuals with co-occurring trauma and substance use are at increased risk for other psychiatric conditions, increased morbidity, unemployment, and social impairment (Flanagan et al., 2016). Weaker outcomes such as longer duration of treatment, poor treatment adherence, and relapses in substance use are common among individuals with co-occurring trauma and substance use (Flanagan et al., 2016; Roberts et al., 2015). Symptoms of one disorder may also interfere with the management, diagnosis, and treatment of the other (Debell et al., 2014).

There are several models commonly used to understand the association between trauma and substance use. Susceptibility models suggest that while an individual is utilizing substances, they may place themselves in precarious situations that increase their likelihood of being exposed to traumatic events (Loryte et al., 2021; Morisano et al., 2014). While sustaining substance use, riskier activities and repetitive exposure to dangerous situations heighten possible exposure to trauma (e.g., assault) (Loryte et al., 2021). Chronic substance use can increase arousal and neurobiological stress that can further amplify vulnerability to symptoms of trauma following exposure (Roberts et al., 2015).

Self-medicating models provide a secondary explanation for the relationship between co-occurring trauma and substance use. These models suggest that individuals with trauma seek to relieve, medicate, or mitigate their symptoms through the use of substances (Flanagan

et al., 2016; Roberts et al., 2015). Self-medicating models of co-occurring trauma and substance use have been strongly supported through research (Flanagan et al., 2016). These models are supported by empirical evidence that suggests the primary reason for substance use is symptom management among individuals with co-occurring trauma and substance use (Debell et al., 2014; Flanagan et al., 2016). Some studies also suggest that the severity of trauma-related symptoms and the severity of substance use are correlated (Debell et al., 2014; Leeies et al., 2010). Parallel escalations in the use of substances in response to escalations in trauma-related symptoms further support this model (Debell et al., 2014).

Another model to understand the common co-occurrence of trauma and substance use is the Common Variable Theory. Common Variable Theory proposes that individuals can share a common factor that predisposes or increases vulnerability to both trauma and substance use (Leeies et al., 2010). Shared genetic risk, or genetic vulnerability, such as high levels hypothalamic corticotropin-releasing hormone from the adrenals, are a notable characteristic that has been documented with relation to both trauma and substance related states (i.e., withdrawal) (Blacker et al., 2019; Mehta & Binder, 2012). Overlaps in neural networks related to both trauma and substance use have also been explored as a common variable (Blacker et al., 2019). Certain personality traits (e.g., impulsivity), and symptoms of trauma (e.g., avoidance, numbing, and hyperarousal) have also been consistently associated with substance use highlighting many overlapping features (Debell et al., 2014). It is important to note, that not all common variables are biologically driven. Shared traumatic exposures or environmental factors (e.g., experiencing war, natural disasters) are also considered common variables among Common Variable theorists (Kline et al., 2014).

The interplay between trauma and substance use has prompted numerous theories to understand their relationship. These theories of increased susceptibility, self-medication, transdiagnostic risk factors, and Common Variable Theory, all reflect the complexities of understanding this co-occurrence. Socio-environmental, psychological, and, physiological factors can exacerbate the challenges faced by individuals with co-occurring trauma and substance use. Recognizing and addressing the complex nature of this co-occurrence requires a holistic and integrated mental health system. In Ontario, Canada, a network of health care services exist to address co-occurring trauma and substance use.

1.3 Mental Health Care System in Ontario

The Canada Health Act is the overarching policy governing Canadian Medicare. The Canada Health Act contains key pillars including public administration, comprehensiveness, universality, portability across provinces, and accessibility (Health Canada, 2023). The aim of the Act is to ensure that all Canadians have reasonable access to medically necessary hospital, physician, and surgical-dental services in hospital settings without charges related to health care services (Health Canada, 2023). As a component of the act, the Canada Health Transfer ensures that shared funding transfers occur between the federal government and provinces and territories to subsidize costs associated with providing health insurance (Health Canada, 2023). However, the public administration, management, and delivery of health services is largely a responsibility of the provinces and territories.

In Ontario, the mental health care system consists of a variety of related services and treatment options offered through community (primary and secondary care), inpatient, outpatient, and emergency settings. Evidence suggests that emergency department visits are often the first contact for individuals with mental health and addictions-related needs (Kurdyak et al., 2021). Between 2010 and 2018, approximately half of adults who visited emergency departments with a mental health or addictions challenges had not received outpatient care within the last two years (Kurdyak et al., 2021). For others, general practitioners are often key care providers and are also the point of referral to other health professionals who specialize in the treatment of mental disorders (Brown, 2018). In Ontario, services provided by general practitioners and psychiatrists can be billed to provincial health insurance (Government of Ontario, 2023). However, many community-based mental health services provided by psychologists, social workers, and other non-physician providers are not covered under provincial health insurance (Bartram, 2019). It is estimated that two-thirds of Canadians have access to a benefits program that provides some coverage of non-physician mental health services (Bartram, 2019). However, those without employment-based benefits may seek mental health services through publicly funded sources, or pay-out-of-pocket (Bartram, 2019). Wait times to access mental health services in the community can range between six months to a year (Moroz et al., 2020). Other barriers such as shortages of available and accessible mental health professionals, a lack of service integration, and

demographic distribution of services further impede access to mental health care in Ontario (Moroz et al., 2020). Related to barriers in accessing mental health services, approximately one third of Canadians are affected by mental illness; however, only 15% use health services for mental illness each year (Statistics Canada, 2012).

Integrated approaches, that is treatment that targets both trauma and substance use at the same time, is considered best practice for care of co-occurring trauma and substance use. In Ontario, community and inpatient services vary for substance use disorders but involve a continuum of treatment ranging from detoxification or withdrawal management, psychosocial and behavioural interventions, and pharmacological approaches (Lin et al., 2015; Ministry of Health, 2018). Trauma-focused approaches such as cognitive behavioural therapy (e.g., focusing on strategies such as cognitive restructuring, eye movement desensitization, arousal management) are used to treat trauma (Katzman et al., 2014). The use of pharmacological interventions (i.e., antidepressants) are secondary-line treatment options for traumatic stress (Katzman et al., 2014).

In the event of acute psychiatric needs, emergency departments assist in providing essential mental health services. In Ontario, it is estimated that one-third of emergency department visits for mental health and addictions are by individuals who have never been accessed or been treated by a physician (HQO & ICES, 2015). Emergency departments can provide assessment and triage to inpatient care where diagnosis and treatment of acute symptoms by psychiatric teams may occur (i.e., psychiatrists, psychiatric nurses, medical doctors), followed by discharge to community follow-up (Lofchy et al., 2015). In Ontario, most inpatient psychiatric care is provided in acute settings with several hospitals providing more specialized services. (Ministry of Health, 2023). There are four psychiatric hospitals (i.e., Centre for Addiction and Mental Health (CAMH), Ontario Shores Centre for Mental Health Sciences, Royal Ottawa Health Group, and Waypoint Centre for Mental Health Care) able to provide specialty psychiatric care and hold 1,389 mental health beds (Ministry of Health, 2017). Additionally, there are several other large inpatient facilities in Ontario that may provide some degree of specialized services in addition to acute crisis stabilization, assessment, and psychosocial rehabilitation. This includes one privately owned facility that receives referrals from across Canada.

Across care settings, it is imperative to have a shared understanding of patient's multifaceted needs. Standardized frameworks are needed for quality assurance, patient-centred care, improving care planning, and resource allocation. The interRAI MH is a comprehensive tool able to reflect a spectrum of a patient's physical, mental, and social health needs in inpatient psychiatry (Hirdes et al., 1999; Hirdes et al., 2020). In 2005, the RAI-MH was mandated by the Ontario Ministry of Health and Long-Term Care in conjunction with the Ontario Hospital Association.

1.4 interRAI Mental Health Assessment in Inpatient Psychiatry

The interRAI suite of assessment instruments provides comprehensive, patient-centered tools that are easy to use and inform caregivers of clinically relevant information to improve decision making (Hirdes et al., 1999). One of these assessment instruments is the interRAI Mental Health (RAI-MH) assessment. The RAI-MH is completed at admission, discharge (if discharge occurred 7 days following admission), and repeated every 90 days depending on the duration of the individual's inpatient stay (Hirdes et al., 2020). Completion of the instrument is required for any individual aged 18 years or older in acute or long-term admissions. The assessment instrument is completed by clinical staff that are overseeing the care of the individual based on their clinical record, interviews, observations, and consultations with family or other staff members (Hirdes et al., 2020). The RAI-MH contains 396 items with a variety of domains that assess demographic characteristics, mental status, substance use or addictions, harm to self or others, behaviour, cognition, functional abilities, physical health, trauma, nutrition, control interventions, social relations, living circumstances and diagnoses (Hirdes et al., 2019; Hirdes et al., 2020). Guidelines for completion, and data collection standards are maintained in the RAI-MH Resource Manual (Hirdes et al., 2019). The instrument has been tested extensively to ensure validity and reliability across applications (Hirdes et al., 2002; Hirdes et al., 2008). By 2020, approximately 1.4 million assessments were completed on 320,000 different individuals across Canada (Hirdes et al., 2020).

Within the RAI-MH, Clinical Assessment Protocols (CAPs) highlight clinical issues and are used to support clinical decision making. The RAI-MH includes 26 CAPs and are

organized into a number of themes for care planning, such as Safety CAPs (e.g., harm to others, suicidality, self-harm, self-care), Social Life CAPs (e.g., social relationships, informal support, support for discharge, interpersonal conflict, traumatic life events), Economic Issues CAPs (e.g., control interventions, medication management and adherence), and Health Promotion CAPs (e.g., substance use, smoking, weight management, exercise, pain, sleep disturbance) (Hirdes et al., 2019; Perlman et al., 2015). Through algorithms, CAPs can be "triggered" that flag a set of care planning guidelines to summarize best practices for each care issue (Hirdes et al., 2011). Description of CAPs and integrated RAI-MH scales are provided in Appendix A.

Overall, the RAI-MH provides a common assessment and common data platform for supporting persons with trauma who are admitted to inpatient settings in Ontario, Canada. In 2023, the Ontario Health Centre for Excellence in Mental Health and Addictions recognized that the RAI-MH satisfies the quality standard for comprehensive assessment of persons in hospital settings (Health Quality Ontario, 2023). The RAI-MH is supported by Ontario Mental Health Reporting System (OMHRS) at Canadian Institute for Health Information (CIHI). This means that all organizations using this instrument receive rigorous data quality monitoring as well as quarterly comparative reports whereby organizations can view the clinical characteristics and outcomes over time and in comparison, to other organizations, a function that has led the grassroots quality improvement initiatives like the Mental Health and Addictions Quality Initiative (Prince & Willett, 2014). The broad implementation and rigorous data standards for the RAI-MH provide an evidence-based tool for effectively evaluating patients' multifaceted needs.

1.5 Gaps in care for individuals with co-occurring trauma and substance use

Within the context of a fragmented mental health system, many individuals with co-occurring trauma and substance use are not receiving comprehensive care that addresses their complex needs. There are many system level barriers that reduce access to specialized services able to treat co-occurring trauma and substance use (Priester et al., 2016). Barriers such as wait-times, costs, and availability all reduce the ability to access appropriate services (Moroz et al., 2020; Priester et al., 2016). Despite the established relationship between

trauma and substance use, treatment often occurs within inpatient settings where the goal of care is to stabilize and release the individual back into the community; and providers may not be trained in validated treatment approaches for co-occurring trauma and substance use (Hirsh, 2023). Particularly, in inpatient settings, addiction treatment is the primary objective, while underlying trauma is under-detected. Studies have reported that many patients observe that their trauma symptoms worsen after abstaining from substance use (Reynolds et al., 2005). Poor health outcomes reflect the need to improve recognition of co-occurring trauma and substance use, in addition access to integrated treatment options (Hirsh, 2023; Priester et al., 2016).

Some advances have been made to promote and improve care for individuals with co-occurring trauma and substance use. Accreditation standards encouraging trauma-informed care for mental health and addictions exists (Health Standards Ontario, 2023). Additionally, some publicly funded services such as the introduction to structured psychotherapy programs may assist in providing new care options (Ministry of Health, 2022). However, there are still gaps in treatment for individuals with co-occurring trauma and substance use. The heightened use of acute care services reflects the urgent need to understand ways in which trauma and substance use cluster together. By using robust definitions of both trauma and substance use, more targeted care interventions and specific treatment approaches can be inferred. Existing studies examining clusters of trauma or substance use have primarily focused on very select populations (e.g., veterans, younger adults, women). Trauma and substance use can be expanded upon by assessing patterns at a health systems level. Within the public health system, there is also a need to understand the services received in inpatient settings, and how they vary across individuals with trauma and substance use. Understanding factors that contribute to relapses, unmet care needs, and readmissions may assist in our understanding of how best to support individuals with co-occurring trauma and substance use.

1.6 Dissertation overview

The main goal of this dissertation is to address some of the identified gaps within inpatient psychiatric care for persons with co-occurring trauma and substance use. Broadly, the purpose of this dissertation is to identify patterns of trauma and co-occurring substance use among inpatients, and explore variations and factors associated with their care. Based on RAI-MH assessment data, the following three chapters aim to address the following objectives:

1. To identify the classifications of both trauma and substance use among inpatients, and to examine the demographic and clinical characteristics associated with class membership.

2. To examine the service complexity received by persons with trauma during inpatient psychiatric care; and examine whether persons with trauma experience variations in formal care and length of stay depending on their membership in various classifications of trauma and substance use.

3. To examine how trauma classifications and social relationships are associated with early leaves from inpatient care.

Chapter 2

Classification of traumatic life events and substance use among persons admitted to inpatient psychiatry in Ontario, Canada: A population-based retrospective cohort study

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Abstract

Background: Trauma is commonly overlooked or undiagnosed in clinical care settings. Undetected trauma has been associated with elevated substance use highlighting the need to prioritize identifying individuals with undetected trauma through common characteristics.

Objective: To understand the classifications of both trauma and substance use among individuals admitted to inpatient psychiatry as well as demographic and clinical characteristics associated with class membership.

Study Design and Methods: A population-based retrospective cohort study was conducted using interRAI Mental Health (MH) assessment data. Individuals were included who triggered the Traumatic Life events Clinical Assessment Protocol (N=10,125), in Ontario, Canada between January 1, 2015, to December 31, 2019, were identified.

Results: Eight latent classes were identified that ranged from low (i.e., Class 1: Interpersonal Issues, Without Substance use) to high (i.e., Class 8: Widespread Trauma, Alcohol & Cannabis Addiction) complexity patterns of traumatic life events and substance use indicators. Classifications with similar trauma profiles were differentiated by patterns of

substance use, clinical and demographic characteristics. For example, individuals in Class 2: Safety & Relationship Issues, Without Substance use and Class 3: Safety & Relationship Issues, Alcohol & Cannabis both had many estimates centered around the experience of victimization (e.g., victim of sexual assault, victim of physical assault, victim of emotional abuse). Multinomial logistic regression models highlighted additional factors associated with class membership such as homelessness, where those who were homeless were estimated to be 1.71-3.02 more likely to be in Class 3: Safety & Relationship Issues, Alcohol & Cannabis use, and 2.09-4.02 times more likely to be in Class 6: Widespread Trauma & Substance Addiction.

Interpretation: Trauma exposures are complex and varied among persons in inpatient psychiatry and can be further differentiated by substance-use patterns. These findings provide a population-based estimate of the trauma experiences of persons in inpatient settings in Ontario, Canada. These findings demonstrate the importance of using comprehensive assessment to support clinical decision making in relation to trauma and substance use among psychiatric inpatients.

Keywords: Trauma, interRAI, post-traumatic stress disorder, substance use, Latent Class Analysis, care planning, assessment, inpatient

2.1 Introduction

Trauma is a pervasive and widely recognized psychological challenge that can develop following exposure to a variety of life events. Although most individuals will experience some form of trauma over their lifetime, only a small proportion develop post-traumatic stress disorder (PTSD). In the United States, of those who have experienced traumatic life events – 10% experience continual fear indicative of post-traumatic stress disorder (PTSD) (María- Ríos & Morrow, 2020). In Canada, lifetime PTSD is estimated to be 9.2% (over 3 million individuals) (Katzman et al., 2014; Van Amerigen et al., 2008). These are likely underestimates of the true prevalence of PTSD given that many who experience trauma do not seek formal treatment (Goldmann & Galea, 2014). Koenen et al. (2017) suggest that only half of those with PTSD seek formal treatment, and of these individuals, only 58% receive care.

During clinical assessments, trauma is often undetected due to symptom overlap and high comorbidity with other mental health conditions. Symptoms such as numbing and dysphoria are consistent with both trauma and major depressive disorder (Gros et al., 2012; American Psychiatric Association, 2022). Population based surveys indicated 62% to 92% comorbidity between PTSD and related disorders (Gross et al., 2012). Complex trauma, that is involving similar symptoms to both PTSD and other mental health diagnoses is readily recognized but has yet to be identified as a separate diagnosis in Diagnostic Statistical Manual of Mental Disorders (American Psychiatric Association, 2023). Undetected and complex psychological trauma are clinical care concerns that have been associated with greater medical and psychiatric service use in addition to elevated alcohol and substance use (Lewis et al., 2018).

Exposure to potentially traumatic events can have harmful effects on an individual's social, emotional, physical, and neurological well-being (Bailey et al., 2018; Champine et al., 2019). Thus, there has been improved recognition and application of trauma-informed care and practices within mental healthcare. Trauma-informed care models focus on creating environments that mitigate the damage of trauma through therapeutic activities at the individual, caregiver, community, and organizational levels (Bailey et al., 2018). However, trauma-informed practices vary across disciplines and settings (e.g., psychology, education,

social work), and lack of standardization of trauma-informed practice presents challenges in terms of its effectiveness (Brewin, 2005; Hanson et al., 2018). Additional challenges with trauma-informed approaches are their primary focus on individuals with acute trauma, and the limited focus on individuals with comorbidities such as depression or substance (Bisson et al., 2013, Champine et al., 2019).

Among individuals who have experienced traumatic life events, substance use commonly co-occurs (Back et al., 2014). The co-occurrence of trauma and substance use are challenging in clinical contexts, particularly in the prioritization of treating either occurrence. Those with co-occurring trauma and substance use are likely to have more hospitalizations and be less responsive to treatment due to relapses and elevated non-compliance to treatment regimens (Hien et al., 2021; Lopez-Castro et al., 2021; Schäfer & Najavantis, 2007). While there are interventions and empirically supported treatment options that exist separately for either trauma or substance use, few treatment options recognize undetected trauma and make little mention of appropriate protocols for those with trauma and co-occurring substance use (Chapine et al., 2018; Hien et al., 2021). Part of this challenge is that research has often focused on those with formal diagnoses, not more broadly on the impact of trauma experiences or co-occurring use of substances. The effectiveness of interventions aimed at both trauma and substance use is further reduced by low attendance (Lopez-Castro et al., 2021). Those with both trauma and substance use tend to pass between services for either disorder with little to no co-ordination (Roberts et al., 2015; Schäfer & Najavantis, 2007). Gaps in care for individuals with trauma and substance use highlight the need to better understand individual differences, and to provide a continuous care model that appropriately matches treatment to recipient. While existing studies have examined subgroups of comorbid formal diagnoses of trauma or substance use among select populations such as military veterans, young adults, and a sample of adult women (Apsley et al., 2023; Mefodeva et al., 2022; Panza et al., 2021). However, more robust definitions of trauma also need to be assessed at a health systems level.

The present study uses population-based data on psychiatric hospitalizations to identify the classifications of both trauma and substance use among inpatients and to examine the demographic and clinical characteristics that are associated with class

membership. The objectives will support clinical decision making and policy practices on differential treatment for individuals with co-occurring trauma and behavioural indicators of substance use.

2.2 Methods

A retrospective cohort design was used to identify a population of persons with trauma admitted to inpatient psychiatric beds in Ontario, Canada between January 1, 2015, and December 31, 2019. The data were based on the Ontario Mental Health Reporting System (OMHRS) managed by the Canadian Institute for Health Information (CIHI). The OMHRS data include records of the RAI-MH assessment tool that is mandated to be completed for every person in designated inpatient psychiatric beds in Ontario at admission, discharge, and every 90 days for longer stays. Data were included for the index record of all persons who were 18 years of age or older during the observational window. Patients with a length of stay of less than 72 hours were excluded as full RAI-MH assessment data are not available until day 3 of admission. Patients were excluded if they were admitted from a psychiatric hospital. Data were retained for patients who were aged 18 years and older with an initial assessment at an Ontario inpatient psychiatric bed between January 1, 2015, to December 31, 2019 resulting in an initial cohort of 60,524 patients.

2.3 Assessment Instrument

The RAI-MH assessment (called the interRAI MH internationally) that populates the OMHRS data includes 396 items that that assess living arrangements, education and employment, mental health status, substance use and addiction, risk of harm to self and others, physical health, functioning, cognitive performance, social support and relationships, and health service utilization (Hirdes et al., 2020; Martin & Hirdes, 2009). The RAI-MH is completed by clinical staff overseeing the care of the person and is based on interviews, observations, consultations with other staff (including first-responders) and family, and review of the clinical record. The RAI-MH has undergone extensive testing to ensure reliability and validity across applications (Hirdes et al., 2002; Hirdes et al., 2020). Each of the 70 facilities (such as hospitals, specialized psychiatric and adult inpatient mental health units) in Ontario that use the RAI-MH submit the data to CIHI on a quarterly basis where

data is assessed for completeness and data quality (CIHI, 2023). Anonymized data are shared with interRAI Canada at the University of Waterloo through a sharing agreement.

2.4 Identification of the Trauma Cohort

Participants were included if they triggered the Traumatic Life events CAP (Trauma CAP) that is embedded in the RAI-MH. The Trauma CAP is based on a range of life events or experiences that disrupt or threaten an individual's routine and may be indicative of trauma (Table 1). Each life event is coded based on whether or not the individual experienced the event within the last three days to over a year ago. Patients are then assessed for whether any of these events evokes a sense of horror or fear. The Trauma CAP identifies individuals who are experiencing ongoing impact due to a historic traumatic life event (experienced any life event in **Table 1** more than 7 days ago), and individuals with immediate safety concerns (having experienced a traumatic life event within 7 days prior to assessment) (Mathias et al., 2010; Hirdes et al., 2011). Traumatic life events must also provoke a sense of horror/fear to trigger the Trauma CAP (Mathias et al., 2010; Hirdes et al., 2011, Hirdes et al., 2019). In the present study, individuals with immediate safety concerns or historic trauma were used for further analysis (N=10,125).

Table 1. Life events included in the Traumatic Life Events CAP (Mathias et al., 2011)

Life Event	Definition
Serious accident or physical impairment	Any serious accident or impairment experienced by the individual (definition does not include mental illness).
Distress about the health of another person	Stress associated with someone in one's social network with an ongoing health challenge (includes mental illness)
Death of close family or friend	Death of someone an individual considers a close family member or friend
Child custody, or adoption-related issues	Disputes related to child custody, birth, or adoption
Conflicting or severed relationships (such as divorce)	Ongoing conflict related to a significant relationship
Failing or dropping out of an educational program	Having not completed or failed an educational program
Loss of income or economic hardship	An individual having to severely change their standard of living (e.g., selling property) as a result of a major economic or income change
Review hearing	An individual has experienced a review hearing (e.g., forensic review, appeal of certification, assessment of capacity)
Immigration (including refugee)	An individual immigrated to Canada (includes refugee, landed immigrants or permanent residents)
Living in a war zone or conflict zone	Having experienced living in a war zone or area of conflict through active (military, paramilitary, rebel groups, combatants) or non-active participation
Witnessing a severe accident, terrorism, violence	Having first-hand witnessed a severe disaster, accident, terrorism, violence, or abuse (e.g., tornado, homicide)
Victim of crime	An individual has been the victim of a crime (e.g., robbery, vandalism, excluding physical assault
Victim of sexual abuse	An individual has experienced any form of sexual abuse or assault, regardless of age
Victim of physical abuse	An individual has experienced an incident such as physical confinement, excessive physical discipline, or any incident that results in a non-accidental injury
Victim of emotional abuse	An individual has experienced a hostile emotional environment where an abuser

	reduces their self-esteem, identity, energy as means of control
Parental abuse of substances	One or more of an individual's parents (i.e., biological, or otherwise) have a drug and/or alcohol-related

2.5 Substance Use Variables

The RAI-MH assesses the time since the last use of a range of substances from the prior 3 days to within the last year (inhalants, hallucinogens, cocaine, cannabis, opioids, stimulants) as well as signs or symptoms of withdrawal symptoms, the amount of alcohol consumed in a single sitting in the prior two weeks (with 5 or more indicative of problematic alcohol use) and behavioural indicators of problematic substance use present in the prior 90 days, such as guilt/shame, being told to cut down, and needing to use upon waking (Hirdes et al., 2011, Hirdes et al.,, 2019). Time since substance use variables were dichotomized into never (or more than one year ago) and use within the last three days to year. Signs or symptoms of withdrawal were collapsed as either not present or present (at mild, moderate, or severe levels).

2.6 Other Covariates

Demographic characteristics were assessed to describe the sample and used as covariates for classification membership. Sex was coded as male or female. Approximate age was clustered into a four-level variable based on the year of birth: ages 18-24, 25-44, 45-64, and 65 years of age or older, respectively. Homelessness was based on the location an individual was admitted from and their place of usual residence being coded as “homeless”. Employment status was based on an individual’s current employment status and included employed or unemployed/unknown. Psychiatric diagnoses were based on the Diagnostic and Statistical Manual, version 5 (APA, 2023), with the category coded on the discharge assessment by the psychiatrist overseeing the care of the person. These include affective disorders, non-affective psychotic disorders, personality disorder, anxiety disorder, eating disorder, and post-traumatic stress disorder. A category called “Other” was created to capture diagnoses present in 5% or less of the sample, including: neurodevelopmental disorders of childhood or adolescence, delirium, dementia, cognitive disorders, mental disorders related to general medical conditions, somatoform, factitious, dissociative disorders, sexual and gender identity, sleep disorders, impulse-control, and adjustment. Other clinical, social, and functional needs were included based on other CAPs embedded in the RAI-MH, including themes of Health Promotion, Safety, Social Life, Economic Issues and Autonomy (Hirdes et al., 2011; Hirdes et al., 2020).

2.7 Data Analysis

Analyses were completed using SAS 9.4. Latent Class Analysis (LCA) was used to identify unobserved subgroups based on the patterns of life events/experiences and substance use behaviour variables among inpatient participants. LCA considers two key parameters, the probability of class membership and the frequency or commonness of each class. LCA was used to examine and provide estimates of the proportion of individuals among each class. Both statistical comparison and functional considerations were used to determine the total number of latent classes. First, to determine the appropriate number of classes for the given data, the lowest values among three criteria (i.e., Akaike information criteria (AIC), Bayesian information criteria (BIC) and adjusted BIC (A-BIC)) were used, in addition to entropy, which is used to measure certainty of classifications where values close to 1 indicate higher class separation and accuracy. AIC, BIC, A-BIC, and entropy were all compared for up to 8 classes function, to consider both model fit and interpretability of findings (Nylund et al., 2007). An 8-class solution was selected as the best fitting among the models considered.

To model the log odds of latent class membership, multinomial logistic regression models were performed using baseline demographic characteristic variables. Multinomial logistic regression considers covariate estimates that influenced the log-odds of given characteristics belonging to a particular group. The log odds of class membership in comparison to the first class were determined across classes described in the Results.

2.8 Results

Sample characteristics and their association with triggering the Trauma CAP can be found in **Table 2** and Appendix B. Greater than high school education was observed in 58.7% of the population. The average age among those with trauma was 40.6 years among the total sample of individuals that triggered the Trauma CAP. Approximately 59.01% of the population identified female as their sex. The most common marital status among the sample population was never married (51.4%).

Table 2. Demographic characteristics among individuals with traumatic life events in Ontario inpatient psychiatry beds.

	N (%) within the study sample (Total Sample: N=10,125)
Characteristic	
Age (mean (SD))	40.59 (16.67)
Sex N (%)	
male	4,150 (40.99)
female	5,975 (59.01)
Education	
< high school	1,757 (17.35)
high school	2,421 (23.91)
>high school	5,947 (58.74)
Employment	
not/unknown	6,736 (66.53)
employed	3,389 (33.47)
Marital	
never married	5,200 (51.36)
married	3,042 (30.04)
widowed/separated/divorced	1,883 (18.60)
Homeless	
no	9,473 (93.56)
yes	652 (6.44)
Lived Alone	
did not live alone	7,387 (72.96)
lived alone	2,738 (27.04)

Based on the AIC and A-BIC values, an 8-class model was utilized. **Table 3** provides the fit statistics for each of the LCA model solutions. The final 8-class model had an entropy value of 0.81 and A-BIC value of 79097.21, respectively. Although a 1-class, 2-class and 3-class solutions provided higher entropy values, some of the nuances of interpreting differences in traumatic life events and substance use were lost. For instance, specific patterns such as types of substances used were clustered in one latent class. Additionally, an 8-class solution provided the lowest AIC, BIC, and adjusted BIC values while maintaining an entropy value above 0.8. The final 8-class solution was refitted using a randomized set of 50 starting values to ensure consistency in class determination and likelihood function (Nylund et al., 2007).

Table 3. Fit statistics for model selection criteria

Model	AIC	BIC	CAIC	Adjusted BIC	Entropy
1-class solution	119505.14	119707.38	119735.38	119618.40	1.00
2-class solution	92457.17	92868.87	92925.87	92687.73	0.94
3-class solution	87081.04	87702.20	87788.20	87428.91	0.86
4-class solution	84389.36	85219.98	85334.98	84854.53	0.82
5-class solution	82184.00	83224.08	83368.08	82766.47	0.80
6-class solution	80349.44	81598.98	81771.98	81049.21	0.79
7-class solution	79189.67	80648.67	80850.67	80006.75	0.80
8-class solution	78162.84	79831.30	80062.30	79097.21	0.81

Table 4 presents the item response probabilities characterized by the 8 latent classes identified through LCA. Classes were arranged from the lowest to highest number of traumatic life events. Estimates for traumatic life events suggest having a severed relationships (>0.41 across all Classes) and being a victim of emotional abuse (>0.41 among Classes 2 through 8) were particularly common stressors. Class 1 was distinct in only presenting three major stressors: health distress (0.45), death of a close family member or friend (0.58), and severed relationship (0.41). Notably, having lived in a war zone had high estimates in Class 5 and Class 8 (Class 5: 0.87, Class 8: 0.97). However, only Class 5 (0.74) and Class 4 (0.86) present immigration as a key stressor. More widespread traumatic life events (e.g., accidents, health distress, loss of income, victim of sexual or physical assault, etc.) were evident among Classes 6, 7, and 8.

As we move from Class 1 through to Class 8, substance use varies. In **Table 4**, indicators of substance use were evident in Classes 3, 4, 6, and 8. In Class 3 estimates highlighted cannabis (0.84) and alcohol (0.50) use as the predominant substances. In addition to alcohol and cannabis estimates, Class 8 also presented many behavioural indicators of addiction (i.e., told to cut down (0.98), bothered by criticism about drug use by others (0.82), and guilt about use (0.79)). Class 8 had similar estimates related to substance use when compared to Class 6. However, Class 4 had a higher estimate for alcohol usage (0.73), and slightly lower estimates for cannabis (0.46) and other behavioural indicators of addiction.

When comparing both traumatic life events and indicators of substance use across classes, there are notable differences. Class 2 and Class 3 have similar traumatic life events (e.g., severed relationships and victimization). However, only Class 3 presents patterns of substance use. Similarly, Class 6 and Class 7 also suggest similar experiences of traumatic life events. Class 6 had high estimates for recent substance use such as alcohol (0.67), cocaine (0.91), stimulants (0.68), opiates (0.61) and cannabis (0.91); whereas Class 7 does not present indicators of substance use.

Table 4. Conditional response probabilities and the prevalence of traumatic life events and substance use among inpatient psychiatry in Ontario, 2015-2019 (N=10,125)

	Class							
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***
	Interpersonal Issues, Without Substance use	Safety & relationship Issues, Without Substance use	Safety & Relationship Issues, Alcohol & Cannabis use	Immigration with Interpersonal Issues, Alcohol & Cannabis Addiction	War & Immigration Trauma, Without Substance use	Widespread Trauma & Substance Addiction	Widespread Trauma, Without Substance use	Widespread Trauma, Alcohol & Cannabis Addiction
	22.9% (N=2,315)	18.5% (N=1,875)	10.5% (N=1,066)	12.7% (N=1,287)	4.6% (N=463)	5.6% (N=570)	13.5% (1,363)	11.7% (1,186)
Traumatic Life Events:								
Serious Accident				0.40	0.41	0.42	0.57	0.51
Health Distress	0.45			0.53	0.57	0.59	0.82	0.72
Death of family/friend	0.58			0.66	0.70	0.68	0.87	0.79
Child Custody Issues							0.42	0.50
Severed Relationship	0.41	0.55	0.57	0.51	0.49	0.58	0.74	0.72
Failed education			0.41			0.62	0.51	0.44
Major loss of income						0.55	0.63	0.50
Review hearing								
Immigration				0.86	0.74			
Lived in a War Zone					0.87			0.97
Witnessed severe accident					0.80	0.42	0.54	0.57
Victim of Crime								
Victim of Sexual assault		0.65	0.55			0.58	0.71	0.71
Victim of physical assault		0.83	0.64		0.40	0.72	0.85	0.92
Victim of emotional abuse		0.93	0.77	0.41	0.49	0.80	0.96	0.99

Parental Substance abuse						0.55	0.57	0.66
Substance Use:								
Alcohol			0.50	0.73		0.67		0.68
Inhalants								
Hallucinogens								
Cocaine						0.91		
Stimulants						0.68		
Opiates						0.61		
Cannabis			0.84	0.46		0.91		0.52
Behavioural Indicators of Substance Use:	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Withdrawal				0.50		0.59		0.48
Told to cut down			0.43	0.98		0.96		0.98
Bothered by criticism of use				0.80		0.84		0.82
Guilt about use				0.78		0.74		0.79
Eye opener				0.59		0.75		0.64

Note: Estimates below 0.40 were removed from Table 2

Table 5 presents adjusted odds ratio estimates of demographic characteristics among Class 2 through to Class 8, with reference to latent Class 1. In this final model, individuals in Class 2 were more likely to be female (adjusted OR: 2.15, 95% CI: 1.87-2.47), in a younger age group (18-24), and 1.65 times (95% CI: 1.17-2.33) more likely to have personality disorder. Being homeless was 2.28 times (95% CI: 1.71-3.02) more likely in Class 3. Higher odds of homelessness were also evident in Class 6, Class 7, and Class 8. Individuals were 1.62 times (95% CI: 1.32-1.99) more likely to be between the ages of 25 to 44 in Class 4. Being 65 years of age or older (adj. OR: 2.71, 95% CI: 1.86-3.95) was highly associated with Class 5. Non-affective psychotic disorder (adj. OR: 1.40, 95% CI: 1.10-1.80) also had increased odds in Class 5. Post-Traumatic Stress Disorder had the highest odds of being in Class 5 (adj. OR: 3.03, 95% CI: 2.28-4.02), followed by Class 7 (adj. OR: 2.61, 95% CI: 2.15-3.16).

Table 5. Multinomial logistic regression, factors associated with latent class membership

	Adjusted Odds Ratio Estimates (All classes in comparison to the First Class)						
	Class 2 Safety & Relationship Issues, Without Substance use	**Class 3** Safety & Relationship Issues, Alcohol & Cannabis use	**Class 4** Immigration with Interpersonal Issues, Alcohol, & Cannabis use	**Class 5** War & Immigration Trauma, Without Substance use	**Class 6** Widespread Trauma & Substance Addiction	**Class 7** Widespread Trauma, Without Substance use	**Class 8** Widespread Trauma, Alcohol & Cannabis Addiction
	Estimate (95% CI)	*Estimate (95% CI)*	*Estimate (95% CI)*	*Estimate (95% CI)*	*Estimate (95% CI)*	*Estimate (95% CI)*	*Estimate (95% CI)*
Sex (female vs. male)	**2.15 (1.87-2.47)**	0.93 (0.80-1.09)	**0.36 (0.32-0.42)**	**0.54 (0.44-0.66)**	**0.58 (0.48-0.71)**	**1.41 (1.22-1.63)**	**0.99 (0.85-1.15)**
Age Group:							
25-44 vs. 18-24	**0.81 (0.68-0.96)**	**0.69 (0.57-0.83)**	**1.62 (1.32-1.99)**	**1.89 (1.32-1.99)**	1.22 (0.98-1.54)	**1.48 (1.20-1.81)**	**2.41 (1.93-3.02)**
45-64 vs. 18-24	**0.68 (0.57-0.81)**	**0.21 (0.17-0.27)**	1.09 (0.88-1.35)	**1.97 (1.38-2.82)**	**0.20 (0.14-0.27)**	**1.68 (1.37-2.06)**	**1.78 (1.42-2.24)**
65+ vs. 18-24	**0.31 (0.25-0.39)**	**0.01 (0.01-0.03)**	**0.26 (0.18-0.37)**	**2.71 (1.86-3.95)**	**0.01(0.00-0.04)**	**0.47 (0.35-0.62)**	**0.18 (0.12-0.28)**
Education ≥ high school vs. < high school	**0.71 (0.60-0.85)**	**0.54 (0.44-0.66)**	1.07 (0.85-1.34)	**0.64 (0.49-0.83)**	**0.34 (0.37-0.43)**	**0.52 (0.43-0.62)**	**0.45 (0.37-0.55)**
(All parameters yes vs. no)							
Homeless	0.98 (0.72-1.33)	**2.28 (1.71-3.02)**	0.84 (0.66-1.34)	1.30 (0.86-1.98)	**2.90 (2.09-4.02)**	**1.77 (1.32-2.36)**	**1.62 (1.18-2.23)**
Employed	1.08 (0.94-1.24)	0.87 (0.73-1.03)	**1.78 (1.53-2.08)**	**0.56 (0.43-0.74)**	0.92 (0.74-1.14)	**0.79 (0.67-0.93)**	**1.28 (1.09-1.50)**
Non-Affective Psychotic	**0.72 (0.60-0.85)**	**0.80 (0.66-0.97)**	**0.25 (0.19-0.32)**	**1.40 (1.10-1.80)**	**0.23 (0.17-0.32)**	**0.52 (0.43-0.64)**	**0.14 (0.11-0.20)**
Personality	**1.65 (1.17-2.33)**	**1.86 (1.28-2.70)**	0.96 (0.61-1.52)	1.07 (0.48-2.40)	0.70 (0.39-1.26)	**1.83 (1.25-2.68)**	0.91 (0.58-1.43)
Post-Traumatic Stress Disorder	**1.55 (1.28-1.88)**	1.09 (0.85-1.39)	**0.50 (0.39-0.65)**	**3.03 (2.28-4.02)**	0.82 (0.60-1.13)	**2.61 (2.15-3.16)**	1.21 (0.97-1.50)

2.9 Discussion

This study identified the classifications of both trauma and substance use among individuals admitted to inpatient psychiatry. The results point to multi-dimensional experiences of both trauma and substance use. That is, not all psychiatric patients with trauma experience the same forms of trauma or patterns of substance use. When focusing solely on traumatic life events across the latent classes, individuals differed in terms of the type and diversity of trauma they experienced, from those with only several trauma experiences centered on health and loss (Class 1) to those with widespread experiences that include accidents, health challenges, grief and loss, and other social circumstances (Class 8). Other classes highlighted traumas that may be related to issues of immigration and living in war zones, perhaps when in combination indicative of persons who may be refugees to Canada or, in the case of the later, persons who have served in the military. As trauma complexity increases across the classes the temporality and the outcomes of cumulative exposures to trauma will be important to consider. These variations in inpatient psychiatric patients highlight the need for tailored trauma-focused care that recognizes the impact of varying and unique experiences that have contributed to trauma (Kline et al., 2023). Of course, to achieve such goals policies are needed to ensure specialized resources are in place to support practitioners, including having appropriately trained practitioners. The design of the hospital system in Ontario is such that few specialized programs are in place for supporting trauma, except for several tertiary hospitals (e.g., Centre for Addiction and Mental Health (CAMH), Ontario Shores Centre for Mental Health Sciences, Royal Ottawa Health Group, and Waypoint Centre for Mental Health Care) (Ministry of Health, 2023). Several advances in publicly funded services outlined in provincial strategic plans may hold promise, such as the introduction of structured psychotherapy programs and specific resources to support the military and first responders (Ministry of Health, 2022). There are also accreditation standards that promote trauma-informed care delivery as a standard practice for mental health and addictions care (Health Standards Organization, 2023). However, to date, the responsibility for specialized trauma-based service provision rests on provider discretion, or privately funded services, rather than being entrenched in public policy.

The variations in patterns of substance use across trauma classes present several important implications for ongoing prevention, early intervention, and addictions care. First, it is important to note that a proportion of the sample with trauma did not use substances as reflected by the three classes that did not use substances (i.e., Class 2, Class 5, and Class 7). There may be several reasons for this that could be considered within a strengths-based perspective, such as the person utilizing personal practices (e.g., religious, or cultural beliefs or others) to reorient from substance use (Stone, 2022). Some persons may also be in recovery from substance or alcohol use that occurred more than a year prior to admission. Interestingly, some classes with similar trauma composition differed in substance use. These nuances observed when comparing latent classes highlight the complex interplay between the cycle of substance use and experiencing trauma. For some, substance use seemed to be limited to alcohol and cannabis, while for others substance use was more widespread. The nature of substance use was further differentiated based on the behavioural indicators of problematic use. It may be some individuals with trauma were using substances but may not be experiencing addiction while others may have complex addictions. These patterns indicate the importance of having levels of support for substance use that consider ongoing prevention for those not using substances, early intervention and monitoring for those using substances, and addictions care for those experiencing problematic substance use. Novel approaches such as Concurrent Treatment of PTSD and Substance Use Disorders (COPE) should be further explored to address the treatment challenges of directionality among the two disorders (Persson et al., 2017).

The covariate regression analysis further highlights the challenges persons with trauma may experience and the diversity in clinical and social needs. For instance, homelessness was strongly associated with classes that include safety and relationships issues as well as classes that included widespread trauma where substance use was a concern in all but Class 7. Many studies have documented the intersection between homelessness, experiencing negative life experiences (e.g., violence), and substance use (Davis et al., 2019). For homeless patients the concern may be twofold, whereby untreated traumas, serious mental illness and in some cases, substance use, make residential instability a greater challenge while the experience of such instability may expose the person to risk of new or

ongoing trauma. From a demographic standpoint, as classes become more complex, patients were less likely to be female and more likely to be younger. Sex-related differences in the type of traumas experienced and treatment-seeking behaviours may account for differences observed in sex among classes (Olff, 2017). Studies have suggested that exposure to trauma in childhood contributes to severe, chronic, or complex trauma in adulthood (Dye, 2018). It is not surprising that patients with exposure to war and immigration experiences without substance use were older. These patients may reflect immigrants with religious or cultural restrictions on substance use, or older veterans. In terms of diagnoses, it was somewhat surprising that PTSD was associated with increased odds of membership in three classes and a decreased odds of membership in Class 4 compared to Class 1. Given that Class 1 had fewer indicators of trauma it may be that persons with PTSD were associated with classes comprised of more complex trauma experiences. Such conclusions cannot be ascertained from these findings given that all persons in these data expressed a sense of horror or fear in relation to any one life event. More broadly, the majority of people included in this study lacked a formal PTSD diagnosis even though trauma indicators were present. This finding is consistent with broader literature that suggests PTSD is often undetected in primary care settings and is diagnosed more often in females (Greene et al., 2016). In the present study, females were most likely to be in Class 2 (adj. OR: 2.15, 95% CI: 1.87-2.47) and Class 7 (adj. OR: 1.41, 95% CI: 1.22-1.63) where the odds of class membership was also higher for those with a formal diagnosis of PTSD. These findings reiterate the need to utilize data from existing assessments, such as the RAI-MH used in this study, to better identify individuals experiencing trauma-relate symptoms.

This study utilized a large dataset representative of a population of persons admitted to inpatient psychiatry across an entire health system. Additionally, this dataset comprised of a comprehensive set of life event exposures in conjunction with indicators of the effect and experience of these events. This strength adds credence to the representativeness of the findings for persons in need of inpatient care and the details available about their circumstances. However, the focus on inpatient data is a possible limitation in terms of generalizability to the broader population. There is a selection bias as to who may be admitted to inpatient settings. Particularly, those with trauma in an inpatient setting may

differ from individuals in the general population also experiencing mental health concerns. Further research may examine the classifications identified in this study to determine if indicators, such as the complexity of substance use, differentiate those with trauma using inpatient settings from those using community-based services. This study is unique in highlighting variations in types of trauma, substance use and behavioural indicators of addiction. Although variables such as "lived in a war zone" or "immigration" exist, refugees and immigrants still may be underrepresented in these data. Barriers such as differences in beliefs, language, explanatory approaches to mental illness, and social deprivation may impede immigrants from accessing mental health services (Giacco et al., 2014). Further research should explore patterns of trauma and substance use in samples that may better represent immigrants and the general population. Unfortunately, while comparable assessments are available for community mental health settings (Hirdes et al., 2020) these are not widely used across Ontario limiting the ability to conduct similar analyses among the broader community mental health population.

This study emphasizes the importance of considering a broad definition of trauma and highlights some of the key characteristics we observe within different subgroups of individuals with trauma. The results also emphasize the importance of having comprehensive assessment information available to support treatment decisions. To better support individuals with trauma, it may thus be beneficial for clinicians and health systems to consider differential treatment practices for different subgroups of individuals with trauma. Future research should explore barriers to mentioning trauma history and ways to support clinician confidence in discussing trauma with patients.

Chapter 3

Service Complexity among Latent Classes of Individuals with Traumatic Life Events and Substance Use in Inpatient Psychiatry

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Abstract

Background: Traumatic life events and the symptoms that follow have been associated with an increased risk for adverse mental health outcomes, including substance use. Trauma places a substantial economic burden on society, including excess health service utilization. However, within hospital settings, there are gaps in research on the complexity of services provided to those with varied trauma experiences. Therefore, this study examined the patterns of service complexity across pre-defined classifications of trauma and substance use among persons admitted to inpatient psychiatry in Ontario, Canada.

Methods: Using interRAI Mental Health (RAI-MH) assessment data, a population-based retrospective cohort study on individuals who had experienced traumatic life events was conducted. All patients who met the inclusion criteria with a psychiatric admission in Ontario, Canada between January 1, 2015 to December 31, 2019 were included (N=7,871). Service complexity was measured based on length of stay (from date of admission to date of discharge, measured in days), and the frequency of non-nursing formal care use, and nursing interventions in the prior 7 days. The odds of high service complexity was examined across patients in latent classifications of trauma (based on traumatic life events and substance use).

Results: Service complexity ranged from 1 to 13, with the most common services being psychiatrist (84.3%), nurse practitioners or medical doctors (non-psychiatrists) (64.1%), and social workers (59.7%). High service complexity, was observed in 18.1% of individuals with trauma. Compared to patients with few trauma experiences and no substance use, patients

with more widespread trauma experiences and had indicators of alcohol and cannabis addiction were 2.1 times (95% CI: 1.68-2.50) more likely to have high service complexity. Patients with safety and relationship traumas with alcohol and cannabis use, were less likely to have high service complexity compared to patients with interpersonal issues, without substance use (adj. OR: 0.70, 95% CI: 0.54-0.91). Characteristics such being female, having greater education, and being employed were associated with higher service complexity. **Conclusion:** Nuances were observed when considering the relationship between latent classes of trauma and level of service complexity. Patients with indicators of substance addiction were more likely to have high service complexity. Findings highlight the importance of ensuring funding is allocated to public services for the continuation of care post-discharge. The RAI-MH can identify specific experiences and needs of persons with trauma that may be useful for informing further analyses on resource utilization and service planning. Given that economic costs data were not available, future research may consider the use of resource measurement and cost data to validate observed differences in service complexity.

3.1 Introduction

Trauma may result from a combination of an individual's experience and response to negative life events. Trauma is a prevalent mental health challenge and has been associated with increased morbidity, and elevated risk for suicide ideation (Sareen, 2014). Following exposure to trauma, some individuals may rebound quickly and not experience changes in their psychological functioning (Bryant, 2019). However, for some individuals, symptoms such as flashbacks, re-experiencing trauma, avoidance behaviours, and hyperarousal may occur following the exposure to a traumatic life event (Sareen, 2014; Van Zelst, 2006). If left untreated, these pervasive symptoms can lead to chronic occurrences and the symptoms may be formally diagnosed (i.e., Post-Traumatic Stress Disorder (PTSD; American Psychiatric Association [APA], 2023)). Lifetime PTSD prevalence rates range from 13-20% among women, and 6-8% among men (Bryant, 2019). Management of trauma involves a combination of both psychological (i.e., psychotherapy) and pharmacological treatments to process and reduce the sense of threat associated with the traumatic event(s) (Bryant, 2019; Davis et al., 2022). Experiencing trauma has been associated with an increased risk of other mental health conditions, unemployment, and increased morbidity (Van Zelst, 2006). Substance use disorders commonly co-occur among individuals with trauma (Priester et al., 2016).

Trauma is associated with substantial economic burden. Davis et al. (2022) estimated that in the United States (US), the total economic burden of formally diagnosed trauma (i.e., PTSD) was $232.2 billion USD. Of this total cost, 32.8% ($76.1 billion USD) were direct health care costs. Per individual with trauma, the total economic burden equated to $19,630 USD annually (Davis et al., 2022). Persons with PTSD have been estimated to use 14% more time in emergency mental health settings (Hilberdink & Bui, 2023). Increased healthcare utilization in persons with PTSD was also associated with comorbid mental health conditions and increased mortality (Hilberdink & Bui, 2023). Not all persons with trauma may be diagnosed with PTSD; persons with unrecognized or misdiagnosed trauma still experience difficulty with treatment engagement and adherence, particularly where co-occurring substance use may exist (Meltzer et al., 2012; Priester et al., 2016). Interestingly, those without a formal PTSD diagnosis who are identified as having a probable PTSD based on

machine learning models have been found to utilize more inpatient psychiatric services and less outpatient services compared to those with a PTSD diagnosis (Gagnon-Sanschagrin et al., 2022). Even in the context of this increased resource use, trauma remains underrepresented in resource utilization systems used to inform service funding in psychiatry (Tran et al., 2019). Together, the prevalence of and resource utilization attributable to trauma are likely underestimated.

There is a need for comprehensive services to support the recovery and well-being of those who have experienced traumas. The integrated treatment model is being recognized as a best practice intervention for persons experiencing concurrent trauma and substance use by combining, for instance, cognitive behavioural therapy to address symptoms related to trauma with interventions to provide addiction treatment (Priester et al., 2016; Torchalla et al., 2012). However, these approaches may be costly and resource intensive, particularly within inpatient settings where the focus of crisis assessment and stabilization may be the priority (Hilberdink & Bui, 2023). As such there may be barriers to access specialized services to identify unique characteristics of co-occurring trauma and substance use as well as concurrent treatment (Priester et al., 2016). Recognizing individuals with trauma who have complex care needs may allow for more targeted care interventions. Using a population-based dataset of persons in inpatient mental health settings, Fearon et al. (2023) identified classifications of trauma that vary in terms of the breadth of trauma exposures and patterns of substance use. This work underscores the variation in characteristics of persons in inpatient settings and the need to understand the services they receive in hospital.

The purpose of this study is to examine the service complexity received by persons with trauma during inpatient psychiatric care in Ontario, Canada. Specifically, this study examines whether persons with trauma experience variations in formal care and length of stay depending on their membership in various classifications of trauma and substance use.

3.2 Methods

3.2.1 Data and Sample

Data from the Ontario Mental Health Reporting System (OMHRS) obtained from the Canadian Institute for Health Information (CIHI) were accessed to identify a retrospective

cohort of individuals who had experienced traumatic life events (i.e., having experienced prior traumatic events or are experiencing immediate safety concerns due to current trauma) prior to admission to inpatient psychiatry in Ontario, Canada. The OMHRS is populated by the interRAI Mental Health (RAI-MH) assessment that is mandated for completion at admission and discharge for all inpatient psychiatric patients in Ontario, Canada. In Ontario, the majority of inpatient psychiatric care is provided in acute hospital settings. There are four psychiatric hospitals (Centre for Addiction and Mental Health (CAMH), Ontario Shores Centre for Mental Health Sciences, Royal Ottawa Health Group, and Waypoint Centre for Mental Health Care) that provide specialty psychiatric care and hold 1,389 mental health beds (Ministry of Health, 2017). Records were obtained for patients over the age of 18, with no recent psychiatric assessments (i.e., no admissions within the last two years), and who had a length of stay over 72 hours (3 days) between January 1, 2015 and December 31, 2019. Forensic patients were excluded because their stays in hospital were mandated and the nature of forensic psychiatry is different from acute psychiatry, potentially resulting in less variability in service complexity regardless of symptoms. After exclusions a cohort of 7,871 patients were included.

3.2.2 Assessment Instrument

The RAI-MH contains 396 items that assess mental and physical health status, demographic characteristics, cognition, social support systems and frequency of health service utilization (Hirdes et al., 2001; Hirdes et al., 2020). One of CIHI's key objectives is to maintain data quality and integrity through various quality checks (CIHI, 2023; Hirdes et al., 2019). Since adoption, data from the RAI-MH assessments are collected from 68 inpatient settings across Ontario. Clinical staff complete RAI-MH assessments through interview and observation with the patient, review of the patient's clinical record and consultations with additional staff members or family (CIHI, 2023, Hirdes et al., 2019). Coding guidelines and collection standards are maintained in the RAI-MH Resource Manual, and through educational sessions held at facilities to maintain data collection quality and submission standards (Hirdes et al.,2019; CIHI, 2023). Aspects of the assessment are used to calculate care planning, support clinical decision making, and to evaluate health system performance (Hirdes et al., 2020; Perlman et al., 2013). Psychiatric units submit completed

assessments to CIHI on a quarterly basis. Submission reports also describe possible errors or flag suspicious data that does not meet CIHI specification (CIHI, 2023). Facilities are then required to correct rejected records and resubmit assessment data to CIHI. Assessment data is then anonymized, and data are shared with interRAI Canada at the University of Waterloo.

3.2.3 Trauma Indicators in the RAI-MH

To identify individuals who had experienced trauma, the Traumatic Life events Clinical Assessment Protocol (Trauma CAP) embedded within the RAI-MH was utilized (Mathias et al., 2010). The Trauma CAP includes a series of items assessing potentially traumatic life events (e.g., serious accident or physical impairment, distress about the health of another person, death of a close family member or friend, loss of income or economic hardship). Each of these items are then scored based on recent exposure ranging on a scale from never (0) to in the last 3 days (5). An additional item assesses whether the person experiences a sense of fear or horror in relation to any of the life events. The Trauma CAP is triggered if the person has experienced any of these life events in their lifetime and experiences fear or horror related to an event (Mathias et al., 2010; Hirdes et al., 2011).

3.2.4 Service Complexity

The RAI-MH contains a section on Service Utilization and Treatments to collect information on the treatment type, frequency, and modality of interventions during inpatient care. Two items measured the frequency of use of formal care providers. First, non-nursing formal care was assessed based on the number of days in the prior 7 days, or since admission where a person received at least 15 minutes of care for the following providers: psychiatrist, nurse practitioner or MD, social worker, psychologist or psychometrist, occupational therapist, recreation therapist, addiction counsellor or dietician. Second, nursing interventions were based on the number of days the person received medical or crisis management nursing interventions. Service utilization at admission was used to assess the frequency of formal care or nursing interventions among the sample population. In addition to these items, the length of stay from date of admission to date of discharge, measured in days, was used as a third indicator of service complexity. Care items and nursing interventions included in the service complexity scale are outlined in **Table 6.**

The counts of formal care service use and nursing interventions were dichotomized into two levels (i.e., yes, or no). This follows prior research using similar variables from the interRAI Child/Youth Mental Health Assessment to measure service complexity (Stewart et al., 2019). Total length of stay was divided into quartiles (i.e., 1: 7-12 days, 2: 12-23 days, 3: 24-35 days, 4: >=36 days) based on an evaluation of the distribution of the variable. Dividing length of stay into quartiles allowed for the distributional characteristics and continuous nature of the variable to be maintained. Formal care, nursing interventions, and the quartile version of length of stay were summed to result in a total service complexity score. The individual items were summed without any weighting to allow for a general representation of higher care use. The distribution of the service complexity score had a total possible range of 0 to 14.

Table 6. RAI-MH Items included in the service complexity scale for inpatient psychiatry

Formal Care	Definition
Psychiatrist	A visit that is routine or a scheduled appointment to complete an assessment or crisis intervention with a psychiatrist
Nurse practitioner or MD (non-psychiatrist)	A visit with a family doctor, medical/surgical specialist, general practitioner, dentist, or nurse practitioner
Social worker	A visit with a social worker or social work student to facilitate assessment or intervene
Psychologist or Psychometrist	A visit with a licensed psychologist (or psychology student) or psychometrist for assessment or intervention purposes
Occupational therapist	An assessment or therapeutic services provided or supervised by a qualified occupational therapist
Recreation therapist	Therapeutic services or an assessment provided by or supervised by a qualified recreation therapist
Addiction counsellor	Services provided by any formal health care professional with specific training in addictions
Dietician	Services provided by a specialist in food and nutrition
Nursing Interventions	**Definition**
Nursing Medical Interventions	Nursing interventions related to a medical procedure such as changing dressings, assisting with blood work, x-rays, and monitoring IVs
Nursing Crisis Interventions	Responding to scenarios that are unexpected in nature and require immediate nursing intervention
Other Indicators	**Definition**
Length of Stay	Net length of stay in the inpatient mental health unit categorized based on quartiles (7-11 days, 12-23 days, 24-35 days, 36+ days)

3.2.5 Trauma Classifications

Prior research has identified 8 latent classifications of trauma and substance use, presented in **Table 7** arranged by those with less complex trauma without substance use to classes that included a greater number of trauma indicators in combination with substance use and indicators of addiction. (Fearon et al., 2023). The trauma variables within each class were initially assessed on the RAI-MH based on the time since the event occurred and were dichotomized based on exposure at any time prior to admission. The substance use indicators include time since last use of each substance, having consumed 5 or more alcoholic beverages in a single sitting in the 2 weeks prior to assessment, and indicators of problematic use such as withdrawal, guilt/shame about use, and being told by others to cut down.

Table 7. Latent classification of traumatic life events and substance use among persons admitted to inpatient psychiatry in Ontario, Canada (Fearon et al., 2023)

Latent Class	Title	Key Indicators of Traumatic Life Events and Substance Use
1	Interpersonal Issues, Without Substance use	• Interpersonal challenges, severed relationship • No indicators of substance use
2	Safety & Relationship Issues, Without Substance use	• Severed relationship, victimization • No indicators of substance use
3	Safety & Relationship Issues, with Alcohol & Cannabis use	• Severed relationship, failed education, victimization • Alcohol and cannabis use • Told to cut down on substance use
4	Immigration with Interpersonal Stressors, Alcohol & Cannabis Addiction	• Experienced an accident, interpersonal challenges, immigration, emotional abuse • Indicators of problematic alcohol and cannabis use
5	War & Immigration Trauma, without Substance use	• Experienced an accident, interpersonal challenges, lived in a war zone, immigration, victimization • No indicators of substance use
6	Widespread Trauma & Substance Addiction	• Experienced an accident, interpersonal challenges, major loss of income, failed education, victimization • Alcohol, cocaine, stimulants, opiate, cannabis use • Behavioural indicators of problematic substance use
7	Widespread Trauma, Without Substance Use	• Experienced an accident, interpersonal challenges, child custody issues, major loss of income, failed education, victimization • No indicators of substance use
8	Widespread Trauma, Alcohol & Cannabis Addiction	• Experienced an accident, interpersonal challenges, child custody issues, major loss of income, failed education, victimization, lived in a war zone, witnessed a severe accident • Alcohol and cannabis use • Behavioural indicators of problematic substance use

3.2.6 Covariates

Additional covariates were considered when assessing the relationship between latent class membership and service complexity. Age was grouped into a four-level variable based on approximate age including 18-24, 25-44, 45-64, and 65 years of age or older. Sex was based on biological sex of male or female. Education was derived by the highest level of education attained and was grouped by less than high school education, completed high school, or post-secondary education beyond high school. Homeless status was coded in either the location an individual was admitted from or their usual place of residence. Employment status was a two-level variable and included employed or unemployed/unknown. Individuals were coded as having an early leave if they were discharged against medical advice or if they were absent without official leave. Formal diagnoses based on DSM-V diagnoses assessed by the psychiatrist overseeing the care of the person included mood, bipolar disorders, anxiety disorder, non-affective psychotic disorder, and personality disorder.

A number of clinical variables embedded in the RAI-MH that may be related to increased service utilization while in hospital were also included. The Risk of Harm to Others (RHO) scale embedded in the RAI-MH is based on a combination of variables assessing violent and aggressive behaviour in combination with the presence of psychotic symptoms or impaired cognitive performance (Neufeld et al., 2012). Severity of Self-harm (SOS) scale assesses risk of harming oneself due to historical self-harm or suicide behaviours and the presence of mental health symptoms (Hirdes et al., 2020). Both RHO and SOS have scores ranging from 0 to 6 where higher scores represent an increased risk. For modelling, both RHO and SOS were separately grouped into three categories of not present (0), low (1-3) and moderate/high (4-6). The Cognitive Performance Scale (CPS) describing cognitive status and ability to perform daily tasks was also included. CPS with scores ranging from intact (0) to very severe impairment (6) (Jones et al., 2010). The variable for CPS was grouped into three categories: intact to mild impairment (0-2), moderate impairment (3,4), and severe cognitive impairment (5, 6). The Depression Rating Scale (DRS) was also considered in logistic regression models to reflect the mood status of individuals and the presence of depressive symptoms such as persistent anger, negative statements, and unrealistic fears. Scores for the DRS ranged from 0 to 21, and the variable was grouped into

3 categories of: no symptoms to low depressive symptoms present (0-2), possible depressive symptoms (3-6) and severe depression (scores above 7).

3.3 Analysis

Descriptive statistics at baseline were conducted using SAS 9.4 to assess the bivariate association between all demographic characteristics and level of service complexity. Bivariate analyses were also conducted to determine the frequency of service complexity scores among the 8 latent classes. Chi-squared tests were also performed to highlight bivariate associations. Logistic regression modelling was used to assess the association between latent classes and the outcome (i.e., service complexity: low/moderate versus high service complexity). In additional models, baseline demographic and clinical characteristics were added to investigate the relative impact of each characteristic on the association between class membership and service complexity. Odds ratios and 95% confidence intervals were reported for models.

3.4 Results

The average service complexity score was 6.42 (SD = 2.14) with a median of 6.00 and interquartile range from 5.00 to 8.00. Across the various service complexity indicators. Receipt of psychiatrist care was the most common treatment as 84.3% (N=6,635) had contact with a psychiatrist in the last 7 days.

The overall average length of stay was 28.05 days (SD=33.65) while the average length of stay was 12.08 days (SD= 6.22) among those with low service complexity, 26.79 days (SD=29.38) among those with moderate service complexity, and 50.42 (SD=49.94) among those with high service complexity. Based on the distribution of service complexity three levels were defined: low- (scores of 1 to 4) = 20.4%, moderate- (scores of 5 to 8) = 61.5%, or high-service complexity (scores of 9 to 14) = 18.1%. The cut-points of low-, moderate-, and high-service complexity were determined based on the distribution of the data, and prior categorizations of service complexity (Stewart et al., 2019). Demographic characteristics are reflected in **Table 8**. Age, education, and employment were significantly different among the levels of service complexity based on bivariate analyses. The average age was higher among those with high service complexity (43.05, SD: 17.04) and with the proportion of those with

high service complexity was highest among those with greater than high school education (21.24%, N=995). Mood disorders were the only clinical diagnosis that was significantly different across the three levels of service complexity.

Table 8. Demographic characteristics among individuals with traumatic life events in inpatient psychiatry, stratified by level of service complexity (N=7,871)

	Level of Service Complexity, % (N)			
Characteristic:	**Low** (Scores: 1-4) **20.4% (1,608)**	**Moderate** (Scores: 5-8) **61.5% (4,841)**	**High** (Scores: >=9) **18.1% (1,422)**	**P value**
Age, mean (SD)	39.85 (16.27)	41.95 (17.13)	43.05 (17.04)	<.0001
Sex				0.0208
male	19.5 (632)	63.3 (2,048)	17.1 (554)	
female	21.1 (976)	60.2 (2,793)	18.7 (868)	
Education				<.0001
< high school	21.3 (279)	63.7 (833)	15.0 (196)	
High school	24.2 (455)	63.5 (1,192)	12.3 (231)	
>high school	18.7 (874)	60.1 (2,816)	21.2 (995)	
Homeless				0.0171
no	20.4 (1,516)	61.3 (4,567)	18.4 (1,368)	
yes	21.9 (92)	65.2 (274)	12.9 (54)	
Employment				<.0001
no	21.7 (1,109)	61.8 (3,158)	16.5 (842)	
yes	18.1 (499)	60.9 (1,683)	21.0 (580)	
Length of stay, mean (SD)	12.1 (6.22)	26.8 (29.38)	50.4 (49.94)	<.0001
Early leave				0.4040
no	20.4 (1,566)	61.4 (4,704)	18.2 (1,391)	
yes	20.0 (42)	65.2 (137)	14.8 (31)	
Non-affective Psychotic Disorder				0.0027
no	20.4 (1,381)	61.0 (4,134)	18.7 (1,265)	
yes	20.8 (227)	64.8 (707)	14.4 (157)	
Anxiety Disorder				0.2332
no	20.3 (1,544)	61.6 (4,685)	18.1 (1,380)	
yes	24.4 (64)	59.5 (156)	16.0 (42)	
Personality Disorder				0.7059
no	20.4 (1,554)	61.6 (4,697)	18.0 (1,376)	
yes	22.1 (54)	59.0 (144)	18.9 (46)	
Mood Disorders				<.0001
no	15.8 (737)	64.7 (3,012)	19.5 (905)	
yes	27.1 (871)	56.9 (1,829)	16.1 (517)	

The complexity of service among latent classifications of trauma and substance use is reflected in **Table 9**. The highest proportion of low service complexity was observed among individuals in Class 2, where 25.8% individuals had service complexity scores between 1 and 4. Other classes with common occurrences of low service complexity were Class 3 (25.4%), Class 1 (22.2%, N=413), and Class 7 (23.5%). The percentage of patients with high service complexity (i.e., scores greater than or equal to 9) was highest among patients in Class 8 (28.7%) followed by patients in Class 4 (23.6%), Class 5 (20.5%), and Class 6 (19.8%). Bivariate analyses suggested that the latent classes were significantly associated with level of service complexity ($p<0.0001$).

Table 9. Level of service complexity among latent classes in Ontario Inpatient Psychiatry (N=7,871)

Latent Class	**Level of Service Complexity** % (N)			
	Low (Scores: 1-4)	**Moderate (Scores: 5-8)**	**High (Scores: >=9)**	**P value**
Class 1: Interpersonal Issues, Without Substance use	22.2 (413)	61.5 (1149)	16.4 (306)	<0.0001
Class 2: Safety & Relationship Issues, Without Substance use	25.8 (398)	60.6 (935)	13.6 (210)	
Class 3: Safety & Relationship Issues, with Alcohol & Cannabis use	25.4 (200)	64.1 (505)	10.5 (83)	
Class 4: Immigration with Interpersonal Stressors, Alcohol & Cannabis Addiction	13.7 (135)	62.8 (621)	23.6 (233)	
Class 5: War & Immigration Trauma, without Substance use	13.2 (49)	66.6 (247)	20.2 (75)	
Class 6: Widespread Trauma, Substance use	16.4 (59)	63.8 (229)	19.8 (71)	
Class 7: Widespread Trauma Without Substance Use	23.5 (253)	58.6 (631)	17.9 (193)	
Class 8: Widespread Trauma, Alcohol & Cannabis Addiction	11.5 (101)	59.8 (524)	28.7 (251)	

Table 10 shows the odds ratio estimates and 95% confidence interval results of logistic regression models of high service intensity compared to low to moderate intensity. Model 1 examines the odds of high service complexity based on class membership with reference to the first latent class (Class 1: Interpersonal Issues, Without Substance use). Intermediate models were completed to determine significant variables to consider in the final model. The Final Model considered the association between latent classes and level of service complexity while adjusting for risk of harm to others, depression rating scale, cognitive performance scale, and severity of self-harm. The Final Model considered variables that were significantly associated with high service utilization in secondary modelling.

In the Final Adjusted Model, individuals in Class 8 were 2.05 times (95% CI: 1.68-2.50) more likely to have high service complexity. Members of Class 4 were also 1.55 times (95% CI: 1.27-1.90) more likely to have high service complexity. Having greater than high school education (adjusted (adj.) OR: 1.38, 95% CI: 1.15-1.64), being female (adj. OR: 1.19, 95% CI: 1.05-1.35) and being employed (adj. OR: 1.17, 95% CI: 1.03-1.33) were significant predictors of high service complexity. Individuals in Class 3 (adj. OR: 0.70, 95% CI: 0.54-0.91) exhibited a negative association, that is, they were less likely to require high service complexity during their inpatient stay. Individuals with moderate cognitive impairment were 1.45 times (95% CI: 1.04-2.01) more likely to have high service complexity. Both mild/moderate and severe depressive symptoms were associated with increased odds of high service complexity. Those with moderate severity of self-harm (adj. OR: 0.66, 95% CI: 0.56-0.78) were less likely to have complex service levels during their inpatient stay.

Table 10. Results of logistic regression models examining the association between latent classes, demographic characteristics, and level of service complexity among persons with trauma admitted to inpatient psychiatric beds in Ontario, Canada (N=7,871)

Effect	**Model 1:** Unadjusted association between class membership and high versus low/moderate service complexity ***c statistic:0.60*** **Estimate (95% CI)**	**Final Model:** Adjusted association between class membership and high vs. low/moderate service complexity ***c statistic: 0.65*** ***Estimate (95% CI)***
Class 1: Interpersonal Issues, Without Substance use	*Reference*	*Reference*
Class 2: Safety & Relationship Issues, Without Substance use	**0.80 (0.67-0.97)**	0.83 (0.68-1.01)
Class 3: Safety & Relationship Issues, Alcohol & Cannabis use	**0.60 (0.46-0.78)**	**0.70 (0.54-0.91)**
Class 4: Immigration with Interpersonal Issues, Alcohol & Cannabis Addiction	**1.57 (1.30-1.91)**	**1.55 (1.27-1.90)**
Class 5: War & Immigration trauma, without substance use	1.29 (0.98-1.72)	1.33 (0.99-1.77)
Class 6: Widespread Trauma & Substance Addiction	1.26 (0.94-1.68)	**1.40 (1.04-1.88)**
Class 7: Widespread Trauma, Without Substance use	1.11 (0.91-1.36)	1.15 (0.94-1.41)
Class 8: Widespread Trauma, Alcohol & Cannabis addiction	**2.05 (1.69-2.48)**	**2.05 (1.68-2.50)**
Female	**-**	**1.19 (1.05-1.35)**
Education:		
high school vs. < high school	-	**0.79 (0.64-0.97)**
> high school vs. < high school	**-**	**1.38 (1.15-1.64)**
Employed	**-**	**1.17 (1.03-1.33)**
Cognitive Performance Scale:		
moderate vs. intact	**-**	**1.45 (1.04-2.01)**
severe vs. intact	**-**	0.79 (0.53-1.16)
Depression Rating Scale:		
possible vs. low symptoms	**-**	**1.22 (1.06-1.44)**
severe vs. low symptoms	**-**	**1.68 (1.43-1.98)**
Risk of Harm to Others:		

low risk vs. no risk	-	**1.28 (1.11-1.49)**
moderate/high risk vs. no risk	-	1.11 (0.90-1.37)
Severity of Self Harm:		
low risk vs. no risk	-	1.11 (0.94-1.31)
moderate/high risk vs. no risk	-	**0.66 (0.56-0.78)**

Notes:

- All latent classes with reference to the first class
- All clinical diagnoses are at discharge (presence versus absence)

3.5 Discussion

Our findings revealed that service complexity varied among individuals with trauma in inpatient psychiatry in Ontario. Considering the variability in traumatic or negative life experiences (e.g., severed relationships, experiencing severe accidents, etc.), it is not surprising that service complexity also varied. The results show that understanding the traumatic experiences of patients, and how best to support their care needs may be nuanced. Within inpatient psychiatry there is a juxtaposition whereby treatment units are likely to include fixed staffing models and, at the same time, strive to provide person-centered or tailed care. There is also an assumption within inpatient settings that individuals with complex needs require greater complexity of services (Ferreira et al., 2020). This assumption was supported in our study, where individuals with more complex trauma and addiction patterns were at greater odds of experiencing high service complexity. For instance, high service complexity was more common among individuals with widespread exposure to negative events, such as child custody issues, major loss of income, failed education, exposure to victimization, with indicators of substance use and addictions (Class 8) relative to those with fewer traumas. However, the relationship between substance use, trauma and service complexity is more nuanced than the simple interpretation that those who utilize substances have higher service utilization. We observed that individuals in Class 3: Safety & Relationship Issues, Alcohol & Cannabis use, for instance, had lower odds of high service use compared to persons with less complex trauma and no substance use. Interestingly, those in Class 3 have only 1 indicator of potentially problematic substance use. Therefore, perhaps the presence of addiction (especially related to alcohol and cannabis) rather than the presence of substance use alone is what is driving higher service complexity in inpatient settings. This

finding highlights the subtle but important difference between substance use and addiction. The period of time when an individual is using substances casually or in a non-problematic manner reflects an important period for therapeutic interventions to prevent greater harm from substance use.

The results indicated that latent classes with traumas related to interpersonal or relationship issues (i.e., Class 1, Class 2, Class 3) had higher frequencies of low service utilization relative to those with more complex trauma. It may be that individuals with interpersonal or relationship issues have broader support networks that are able to provide care outside of an acute setting. Social networks can be described by functional (i.e., the quality and availability of relationships), and structural (network size, number of individuals in one's immediate social circle) components (Wang et al., 2021). That is, individuals with negative social relationships (i.e., low quality) may also have greater availability of broader social structures. Previous studies have identified a reciprocal association between social support and trauma; whereby social relationships can either cause additional stress, or additional support (Wang et al., 2021). Across the distribution of service complexity, it was observed that only 2.1% of those with low service complexity saw an addiction counsellor (relative to 67.5% among moderate service complexity, and 30.4% among high service complexity) (See Appendix C). Considering 25.4% of individuals with safety and relationship issues, alcohol, and cannabis use (Class 3) had low service complexity, greater use of addiction counselling would be expected. Future studies should aim to understand the quality of the services provided, and whether the level of service complexity, and the type of services provided are appropriately addressing the needs of patients with safety and relationship-related trauma, alcohol and cannabis use in acute settings.

Latent classes were particularly useful in this study to identify some of the key characteristics of individuals in inpatient care (e.g., immigration, interpersonal issues, widespread trauma, and alcohol and cannabis addiction) with higher service complexity. Future studies should examine community-based service options post-discharge that address these broader demographic and clinical characteristics to ensure continuity in care.

While the focus of this study was to assess latent classifications and service complexity, we should note that there are other important covariates that were associated

with service complexity. In our study, individuals with high service complexity were more likely to be female, have more education, and be employed. Research assessing latent classifications of traumatic life events suggested that females were more likely to have complex patterns of victimization that may contribute to higher service complexity (Fearon et al., 2023b). The increased likelihood of females having higher service complexity may also reflect gendered differences in health perceptions and attitudes towards engaging with service providers. Literature suggests that there are gender differences in health service use where women are more likely to use primary care services, have exhibited greater trust in physicians, and more awareness of their mental health concerns relative to male counterparts (Manuel, 2018; Thompson et al., 2016). Based on the distribution of demographic characteristics, 70% of individuals with high service complexity had greater than high school education (relative to 58% among those with moderate, and 54% among those with low service complexity). Higher educational attainment may reflect higher functioning and ability to vocalize care needs.

Depressive symptoms, and moderate cognitive impairment were associated with increased odds of high service complexity. Symptoms commonly associated with anxiety and depression (that may overlap with trauma) have previously been associated with increased health service use (Yim et al., 2021). Alternatively, a surprising finding was that individuals with low risk of harm to others had increased likelihood of higher service complexity. For individuals with higher risk of harm, the focus of care is on stabilizing their risk behaviours. These individuals may be subject to fewer services since studies suggest that patients with higher risk of harm to others may be subject to containment measures such as seclusion or medication use (Pettit et al., 2017). Due to less use of safety and confinement measures, individuals with lower risk of harm to others may receive, or be more willing to engage in, greater service complexity. In this study, moderate to high severity of self-harm reduced an individual's likelihood of high service complexity. Previous studies have found that individuals with self-injurious behaviours may be less likely to initially engage in care due to a complex relationship with external- and personal-stigmas experienced in clinical settings (Williams et al., 2020). People with harm to self behaviours may have personal stigmas where they do not want to engage in care because of complex feelings of being less deserving

of treatment. Patients have also reported negative experiences with the processes of care, such as health professionals being dismissive or withholding treatment (Williams et al., 2020). Study findings highlight the important difference between service complexity and resource intensity; whereby low service complexity does not necessarily infer low resource intensity. Future studies should consider indicators of risk when considering service complexity and resource intensity in inpatient settings.

It was also observed that a notable proportion of individuals in Class 5: War & Immigration Trauma, Without Substance had high service complexity**.** Individuals in this group may include refugees and immigrants that have unique challenges that increase the complexity of their care. Previous studies have indicated that immigrants are less likely to access mental health services (Whitley et al., 2017). As such, the service needs of those with immigrant-related trauma may be even greater in the general population given that this study included only those who accessed mental healthcare. Immigrants and refugees also face many barriers, such as lack of culturally appropriate care or language, when accessing mental health care services (Giacco et al., 2014). This may increase other staff time required to support the person. Furthermore, patients in this class may need other supports related to physical, functional, and social needs that require greater staff time. Studies have also found associations between measures of equity (e.g., material deprivation, residential instability) and use of mental health services (de Oliveira et al., 2021). Thus, further research should explore the experiences among persons with immigration experience, such as refugees, in inpatient mental health contexts including their preferred mental health treatment options, and the intensity of service utilization when care is accessed. Furthermore, additional research could aim to reflect possible relationships between culture and mental health care use.

The RAI-MH data provides the unique ability to broadly assess mental health, functional concerns, substance use and treatment in inpatient settings across Ontario. However, the findings of this study must also be considered within the context of possible limitations. One of the possible limitations of this study is the potential for the inpatient psychiatric data to not be representative of the general population. That is, individuals in inpatient care may differ in terms of their presentation of the same mental illness. A person

with trauma in the community may not have the same acuity and functional concerns as a person in hospital, thus their service needs may be different. Second, service complexity was used as a proxy measurement to understand differences in the intensity of service use among patients. This study was limited in not assessing the economic cost associated with service use. Thus, it cannot be assumed that high service complexity results in excess costs nor can assumptions be made about better or worse health outcomes as a result of complexity. Future studies should also consider time measurement and cost data to validate differences observed in service complexity. Another possible limitation is facility differences in care practices for individuals with trauma. Some facilities, particularly those that provide specialized services, may provide more intensive services with fixed lengths of stay for individuals with co-occurring substance use. Thus, future studies should assess differences between acute and non-acute facilities, as well as remove length of stay when deriving service complexity.

Our study is novel in providing a snapshot of service complexity among individuals who have experienced negative life events in Ontario. In summary, this study highlights the variability in both trauma and service complexity at a health systems level. The results of this study show that there are many factors to consider in supporting care needs of individuals with trauma in inpatient care. Demographic characteristics, such as level of educational attainment, gender and employment status influenced the intensity of service use. However, the complexity of trauma experienced in addition to patterns of substance use was also associated with service complexity. Integral to interpreting these results, even among latent classes with complex trauma and addiction, the majority of patients had moderate service complexity. In essence, this study highlighted the multifaceted nature of health service use among individuals with trauma. However, it did not assess how individuals access mental health services, or the quality of services provided. Future studies should aim to better understand the costs, quality, and types of services provided to continue to address the needs of patients with co-occurring trauma and substance use in acute settings.

Chapter 4

Early Leaves from Inpatient Care Among Individuals with Traumatic Life Events in Ontario, Canada

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Abstract

Background: Substance use commonly co-occurs among individuals who have experienced traumatic life events. Integrated treatment models exist to address the complexities of both trauma and substance use. However, in Ontario there are often barriers in the timely access to community-based mental health services. A lack of integrated and available mental health services often results in the use of acute inpatient mental health care for individuals experiencing trauma and substance use. Mental health legislation in the province allows for the right to refuse treatment, and some individuals may choose to take an early leave from their inpatient care. The receipt of formal support in addition to the presence of supportive social relationships may influence discharge status. This study aims to examine how trauma classifications, social relationships, and formal support are associated with early leaves from inpatient care.

Methods: All records for individuals who have a history of or have experienced recent trauma with an index admission of over 72 hours between January 1, 2015 and December 31, 2019 were included (N=11,043). Chi-squared tests were used to understand associations between demographic and clinical characteristics, and early leaves from inpatient stays. Multinomial logistic regression modelling was then used to assess the adjusted association between latent classes of trauma with and without substance use, and the multi-level outcome of early leaves (i.e., unplanned, or short length of stay), and those who did not discharge prematurely.

Results: Using multinomial logistic regression, membership in several latent classes increased the odds of an early leave after adjusting for demographic characteristics, clinical

diagnoses, and other care planning needs. Individuals in latent classes with patterns of substance use (e.g., Class 6: Widespread Trauma & Substance Addiction (adj. OR: 4.17, 95% CI: 2.72-6.39)) were more likely to have unplanned early leaves. Individuals with interpersonal conflict (i.e., conflict in relationships and widespread interpersonal conflict) were more likely to have early leaves that were unplanned. Class 4: Immigration with Interpersonal Issues, Alcohol & Cannabis Addiction (adj. OR: 0.68, 95% CI:0.56-0.83), and Class 8: Widespread Trauma, Alcohol & Cannabis Addiction (adj. OR:0.73, 95% CI 0.60-0.89) were less likely to have early leaves that were short length of stays.

Discussion: Unplanned and early leaves are important outcomes to consider within treatment planning, particularly in relation to addressing complex traumas and substance use. While an eagerness to return to the community to utilize substances may be driving unplanned discharges in this study there may also be challenges to providing complex care within acute mental health settings. Further exploration of policies and practices to prevent early leaves are necessary, including the potential need for longer-term specialized treatment programs. There is also a need to further examine the associations between social relationships, formal supports, and early leaves.

4.1 Introduction

Negative life experiences can have lasting psychological effects on an individual. Following a traumatic experience, some individuals may be resilient, while others may experience lasting effects on their mental health and well-being resulting in psychological trauma (Bryant, 2019; Sareen, 2014). Common symptoms such as flashbacks or nightmares, avoidance behaviours, hyperarousal and functional impairments can be indicative of the need for clinical diagnoses such as acute stress disorder **(**ASD; American Psychiatric Association [APA], 2023) or Post-Traumatic Stress Disorder (PTSD; APA, 2023). These formal diagnoses rely on broader criteria such as the frequency and nature of traumatic life events experienced, the perceived threat, and severity of symptoms (APA, 2023).

Of those who have experienced trauma, substance use is particularly common (Priester et al., 2016). In Ontario, both mental illness and substance use disorders account for approximately 11% to 15% of the province's disease burden (HQO & ICES, 2015). Among those with diagnosed trauma, approximately 46% have co-occurring substance use disorders (SUD) (Loryte et al., 2021) The co-occurrence of trauma and substance use has been associated with adverse clinical outcomes often due to challenges in prioritizing and integrating treatment (María-Ríos & Morrow, 2020). Trauma can be amplified by ongoing substance use resulting in worse physical health problems, interpersonal challenges, and increased use of medical services (Lewis et al., 2018; María-Ríos & Morrow, 2020).

There are several models that have been used to explain the close relationship between trauma and substance use. First, susceptibility models suggest that while utilizing substances, individuals are more likely to place themselves in dangerous situations increasing one's likelihood of experiencing traumatic events (Buckley, 2006; Morisano et al., 2014; Loryte et al., 2021). Self-medication hypotheses propose that substances are utilized to self-medicate, cope, and disengage from trauma (María-Ríos & Morrow, 2020; Leonard et al., 2015; Loryte et al., 2021). Characteristics such as impulsivity and hyperarousal, that are characteristic of trauma, may increase risk-seeking behaviours and influence the use of illicit substances (Wojciechowski, 2021). Other models suggest neurobiological or genetic vulnerability that predisposes individuals to the co-occurrence of trauma and substance use (María-Ríos & Morrow, 2020; Wolf et al., 2010). Additional factors such as exposure to

early-life stress, behavioural or personality traits, structural barriers, geographic location, and family income have also been associated with co-occurring trauma and substance use (María-Ríos & Morrow, 2020). Coping and stress-related theories (e.g., Coping Theory of Substance Use, Stress Process Model) suggest that among individuals with trauma, there are factors that can mediate the risk of substance use. Among those who have experienced trauma, moderators such as social relationships, psychological resources (e.g., coping skills), and higher socioeconomic status may reduce the likelihood of substance use behaviours (Fivecoat et al., 2023; Elliot & Lowman., 2015).

Best practices in the care of persons with trauma, including those with co-occurring substance use, include a variety of psychosocial and pharmacological interventions. While a range of services exist for substance use disorders, treatment plans typically involve detoxification or withdrawal management, psychosocial, behavioural, and pharmacological interventions with ongoing care (Lin et al., 2015; Ministry of Health and Long-Term Care, 2018). Treatment is primarily delivered by counsellors in outpatient and residential settings (Lin et al., 2015). Tailored trauma-informed approaches such as cognitive behavioural therapy (using strategies such as cognitive restructuring), arousal management, and corrective exposure interventions are clinical best practices for treatment for trauma (Katzman et al., 2014). Pharmacological interventions such as antidepressants have also been approved as secondary treatment for traumatic stress (Katzman et al., 2014). Importantly, integrated treatment is vital for those with concurrent PTSD and substance use. The COPE intervention, for instance involves trauma-focused cognitive behavioural therapy, prolonged exposure treatment, and relapse prevention for substance use (Persson et al., 2017). Beyond clinical care, integration of services at the policy level is also vital.

The continuum of care for individuals with co-occurring trauma relies heavily upon integrated health services that ensure observation and support throughout the recovery journey (HQO & ICES, 2015). For instance, the Ontario Government have implemented strategies to reduce the impact of both trauma and substance use by encouraging policies and programs that increase awareness and support lower risk use, and direct services (e.g., Ontario Structured Psychotherapy (OPS) program, opioid response teams, Addiction Medicine clinics, Consultation services, additional treatment beds) (Ontario Government,

2021; CAMH, 2023b). However, in Ontario there are often delays between the onset of mental illnesses and accessing care. Barriers such as a shortage of accessible mental health professionals, lack of mental health service integration, inequities in demographic distribution, and costs of accessing services all impede Canadians from accessing mental health care with wait times of 6 months to 1 year, on average (Moroz et al., 2020). Inability to access community-based services often means that those who access acute care in inpatient settings often reflect greater clinical complexity relative to those in the community with mental health concerns (HQO & ICES, 2015). It is estimated that one-third of emergency department visits in Ontario for mental illness or addictions are by individuals who have never accessed or been treated by a physician for their mental health concerns (Kurdyak et al., 2021).

The gaps in formal health services in Ontario highlight the importance of informal social relationships. The role of social relationships in aiding mental health care has been well documented. The presence of supportive family, friends, and other community leaders have been associated with increased awareness and improved confidence in seeking formal mental health services (Brown et al., 2014; Sharma et al., 2016). On the contrary, weak, and problematic social relationships have been associated with compromised physical and mental health outcomes (e.g., physical inactivity, substance use, obesity, and trauma) (Southwick et al., 2016). With shifts in policies placing greater emphasis on community-based interventions, studies have also noted that social relationships often account for more support among individuals with mental health concerns relative to formal caregivers (Sharma et al., 2016; Brown et al., 2014). In the Ontario Substance Use and Prevention and Harm Reduction Guidelines, factors such as having positive parent relationships, parenting competence, and a network of non-drug using peers are all listed as important protective mechanisms for mitigating the effects of substance use (Ontario Government, 2021). Having both formal care and social relationships in place are beneficial for the journey to manage symptoms and the cessation of substances (Hagman et al., 2022).

Mental health legislation allows for individual autonomy in decision-making including the right to mental health care, but also the right to refuse treatment (Ontario Government, 1990). Some individuals may choose to leave their inpatient care prematurely.

Early leaves can be defined as discharges against medical advice or leaving early from an inpatient stay (Baiden et al., 2013; Olufajo et al., 2016). Given the complexity and nature of co-occurring trauma and substance use, care needs may not be effectively addressed among individuals who leave care early. Prior research among inpatient mental health units, suggests that age, gender, substance use, and race have been associated with early leaves (Baiden et al., 2013; Ibrahim et al., 2007; Olufajo et al., 2016). Early discharges from hospitalizations have been associated with increased health care costs, incorrect clinical diagnoses, poor quality of care, and worse patient health outcomes such as unaddressed health concerns and higher readmission rates (Olufajo et al., 2016; Tsopra et al., 2018). An improved understanding of the role of social relationships among individuals with co-occurring trauma and substance use is needed for supporting early and ongoing interventions to address symptoms, reduce relapses and readmissions. Therefore, the purpose of this study is to examine how trauma classifications, and social relationships are associated with early leaves from inpatient care.

4.2 Methods

4.2.1 Participants

Data were included for individuals aged 18 years or older with an initial assessment between January 1, 2015 to December 31, 2019 in Ontario. Data from the Ontario Mental Health Reporting System (OMHRS) were used to retrospectively identify a cohort of individuals who had experienced traumatic life events (i.e., prior, or current trauma) recognized through their interRAI Mental Health (RAI-MH) assessment tool. The RAI-MH assessment is mandated across Ontario, Canada and completed at admission, discharge, and every 90-days for longer stays for every patient in inpatient psychiatry. Other patient types such as geriatric or forensic were excluded. Forensic patients have mandated hospitalizations and their length of stay and ability to leave against medical advice varies from acute psychiatric patients. Geriatric patients were also excluded given cognitive related diseases such as Alzheimer's disease may not be reflective of trauma in the adult inpatient population.

4.2.2 Assessment Instrument

The RAI-MH (also referred to as the interRAI MH internationally) includes 396 items assessing social supports, mental health status, cognitive functioning, substance use, and other demographic and clinical factors (Hirdes et al., 2001). The instrument supports care planning through algorithms, outcome measurement and performance indicators (Hirdes et al., 2020). The validity and reliability of the RAI-MH has been previously assessed to be strong (Hirdes et al., 2002; Hirdes et al., 2020). The RAI-MH assessments are completed by clinical staff based on observations of the patient, review of their clinical record, and interviews with the patient, their family members, and other staff overseeing care of the individual (CIHI, 2023; Hirdes et al., 2019). Completed RAI-MH assessments are submitted by each of the 70 facilities in Ontario to CIHI on a quarterly basis (CIHI, 2023). RAI-MH assessments are then reviewed for their quality, integrity, and completeness (CIHI, 2023). Anonymized assessment data are then shared with interRAI Canada at the University of Waterloo through a data sharing agreement between the University of Waterloo and CIHI.

4.2.3 Trauma & Substance use Indicators in the RAI-MH

To identify those who had experienced trauma, patients were included if they had stays of at least 72 hours, were 18 years of age or older, were not on a forensic treatment unit, and triggered the Traumatic Life Events Clinical Assessment Protocol (Trauma CAP) embedded in the RAI-MH (Mathias et al., 2010; Hirdes et al., 2011) (N=11,043). The Trauma CAP identifies two levels of trauma, individuals who experienced a prior traumatic event greater than 7 days ago and those who are experiencing immediate safety concerns due to their ongoing or current experience of trauma within the last 7 days of the assessment (Mathias et al., 2010; Hirdes et al., 2011). To trigger the Trauma CAP, these events must also evoke a sense of horror or fear (Hirdes et al., 2019). Some of the life events included in the Trauma CAP are serious accident or physical impairment, distress about another person's health, death of a close family member or friend, child custody issues, loss of income, severed relationships, immigration, war zone, witnessing a serious accident, parental abuse of substances and victimization (i.e., physical, sexual, or emotional). Life events included in the Trauma CAP have been previously described (Hirdes et al., 2019; Fearon et al., 2023; Mathias et al., 2010).

Substance use is assessed on the RAI-MH based on time since use variables for inhalants, cocaine, cannabis, stimulants, opioids, hallucinogens, from the last 3 days prior to assessment to within the last year. Alcohol consumption is assessed based on the number of drinks in a single sitting in the prior 14 days. Behavioural indicators of problematic substance usage are also assessed based on items for the severity of withdrawal, guilt, or shame about use, feeling the need to cut down, being told to cut down on substance use and feeling the urge to use right away upon waking in the last 90 days.

Using a combination of life events items and substance use variables, Latent Class Analysis was previously used to reflect the variation in patterns of trauma and substance use in inpatient psychiatry based on the RAI-MH (Fearon et al., 2023). An 8-class solution provided variation in how traumatic life events and substance use (including behavioural indicators) cluster in inpatient psychiatry. The procedures and approach used to operationalize Latent Class Analysis in a sample of inpatient psychiatry is reflected elsewhere (Fearon et al., 2023). A summary of the classes is presented in **Table 11**.

Table 11. Summary of latent classes

Latent Classification	Title
1	Interpersonal Issues, Without Substance use
2	Safety & Relationship Issues, Without Substance use
3	Safety & Relationship Issues, with Alcohol & Cannabis use
4	Immigration with Interpersonal Stressors, Alcohol & Cannabis Addiction
5	War & Immigration Trauma, without Substance use
6	Widespread Trauma & Substance Addiction
7	Widespread Trauma, Without Substance Use
8	Widespread Trauma, Alcohol & Cannabis Addiction

4.2.4 Early leave variable

The RAI-MH contains a section that reflects the person's reason for discharge from the facility. The criteria are determined by the most appropriate reason for discharge based on examination of the person's status at discharge, and in consultation with the staff overseeing the person's care (Hirdes et al., 2019). The variable is coded to reflect planned

discharges, discharges against medical advice, if the individual died (as a result or not as a result of suicide), if they were transferred, discharged due to being absent without leave, discharged due to a leave of absence (LOA) to the community (over 92 days), and other reasons (Hirdes et al., 2019).

The counts of reasons for discharge were categorized into three different levels: unplanned leave (excluding death), early leave (patients with short length of stays), and no early leave. Unplanned leave included patients who were discharged due to an absence without an approved leave where the person did not return to hospital and persons discharged against medical advice. Early leave based on length of stay included patients who did not have an unplanned early leave and had a length of stay less than or equal to 6 days.

4.2.5 Social Relationships

Social relationship variables included the nature and functioning of social relationships with friends, family, and others as well as the availability of broader social support networks at discharge. Informal support items include Section O of the RAI-MH assessment tool (Hirdes et al., 2019). This section focuses on aspects of social relations, such as the nature of family roles (e.g., dysfunctional), the potential problems with social relationships, family or friends feeling overwhelmed by their illness, no confidant, and hostility or challenges with staff (hostility towards family or friends, hostility towards staff, staff reporting frustration with the patient, having family or friends being unreceptive towards the patient, and family or friends requiring a large amount of staff time) (Hirdes et al., 2019). Participation in social activities, employment status, and risk of unemployment are also considered. Resources available at discharge are assessed in Section P of the RAI-MH assessment tool (Hirdes et al., 2019). Resources for discharge include items assessing having a family member or friend available to provide support with childcare, supervise their personal safety, provide crisis support, and support with activities of daily living (or instrumental activities of daily living) (Hirdes et al., 2019). These variables were then included in several CAPs embedded in the RAI-MH and considered for further analysis.

The Social Relationships CAP of the RAI-MH aims to examine how a person interacts, engages, and relates to others (Hirdes et al., 2011). The key aim of the Social Relationships CAP is to identify causes of difficulty in social relationships, reduce the

possible impact on the individual, and support beneficial social interactions (Hirdes et al., 2011a). The CAP includes three levels: not triggered, triggered to highlight the need to improve close friendships and family functioning, and triggered to reduce social isolation and family dysfunction (Hirdes et al., 2011). The Interpersonal Conflict CAP of the RAI-MH was also used to highlight issues of conflict that patients may have in their personal relationships and social interactions (Hirdes et al., 2011). Characteristics of interpersonal conflict such as hostility, irritable mood, anger, and aggression can be exacerbated by mental health symptoms and impede treatment. When triggered, the Interpersonal CAP flags individuals with the need to reduce conflict in specific relationships, and those with widespread conflict (Hirdes et al., 2011).

The Support Systems for Discharge CAP of the RAI-MH aims to assess resources and support needed for an individual to re-enter into the community. Gaps in support systems allow for the mobilization of social services, and community engagement (Hirdes et al., 2011). The Support Systems for Discharge CAP includes two levels: not triggered and triggered. When triggered, the CAP flags individuals with precarious living arrangements (e.g., homelessness), those who do not have a family or friend available to support with daily functioning (e.g., personal safety, activities of daily living, supervision, crisis support, or child-care after discharge), or those without a positive support person in the community (Hirdes et al., 2011).

4.3 Covariates

Demographic characteristics that may be related to early leaves from hospitalizations were also considered. A four-level variable for age including 18-24, 25-44, 45-64, and greater than or equal to 65 years of age was included. Sex based on biological sex (male or female) was also considered. Employment status (i.e., employed, or unemployed), homeless status (based on the location at admission or place of residence), and highest level of education obtained (grouped as: less than high school education, completed high school education, or post-secondary education following high school) were all used as covariates in modelling. Based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), primary diagnoses at discharge that were assigned by a psychiatrist overseeing the person were also used as covariates. Disorders considered for bivariate and modelling analysis were

non-affective psychotic disorders, eating disorders, substance use disorders, anxiety disorders, personality disorders, depression, and mood disorders.

4.3.1 Formal Support

In the RAI-MH, there is a section that describes service utilization and treatments accessed during inpatient admissions. Formal supports include having received a minimum of 15 minutes per day of care by a psychiatrist, nurse practitioner or MD (non-psychiatrist), social worker, psychologist or psychometrist, occupational therapist, recreation therapist, addiction counsellor, or dietician (Hirdes et al., 2019). Receipt of formal support in addition to nursing interventions (based on the number of days an individual received medical or crisis management interventions) were used to derive a service complexity variable. Counts of both formal supports, nursing interventions, and were summed used to create a service complexity score. The score ranged from a total of 0 to 11, with higher scores reflecting high service complexity. A variant of this service complexity variable that included length of stay has been used in prior studies examining variations in formal care among persons with trauma (Fearon et al., 2023). However, in the present study, length of stay was excluded from the service complexity calculation, given the use of length of stay in characterizing discharge status.

4.4 Analysis

At baseline, bivariate analyses were used to assess the possible association between demographic characteristics and early leaves from inpatient stays. Chi-squared tests were used to highlight bivariate associations. Multinomial logistic regression modelling was used to assess the association between latent classes, demographic characteristics, and the multi-level outcome of early leaves (i.e., early leaves (unplanned), early leave (short length of stay), and those who did not leave early. Length of stay was not included in regression models since it was directly used to determine the outcome variable, early leaves. Substance use disorder was also excluded from multinomial logistic regression modelling since substance use variables were used to determine latent class membership. Multinomial logistic regression modelling was used in a sequential process. The first model only assessed the association between latent classes and discharge status. Secondary modelling considered

latent classes, demographic characteristics, relevant Clinical Assessment Protocols, and primary diagnoses. A final model was shared that included variables significantly associated with early leaves.

4.5 Results

On average, individuals without early leaves had a length of stay of 26.54 (SD: 28.99) whereas individuals with early leaves, short length of stays (<=6 days) had an average of 4.93 days (SD: 0.85). Demographic and clinical characteristics, and their association with discharge status can be found in **Table 12**. Across discharge groups, the average age ranged from 34.9 to 38.8 with the oldest being those who did not discharge prematurely. Participants tended to have higher than high school education. The average length of stay was longer among those who did not have an early leave 26.54 days (SD: 28.99) relative to individuals with unplanned early leaves (mean: 14.93 days, SD: 25.76) and those with short length of stays (mean: 4.93, SD: 0.85). Bivariate analyses suggested significant associations by Social Relationships CAP, Interpersonal Conflict CAP, and Substance Use CAP across discharge statuses. Individuals with unplanned leaves were likely to have family dysfunction (4.4%), and widespread conflict (6.1%). Whereas individuals with short length of stays were likely to have conflict in their relationships (19.7%) and current problematic substance use (21.3%). Non-affective psychotic disorder, eating disorder, substance use disorder, mood disorder, and personality disorder were all significant based on bivariate analyses. Unplanned leaves were more common among those with substance use conditions (7.7%) compared to most other conditions, while both anxiety (22.6%) and personality disorders (29.70%) were evident among those with short length of stays.

Table 12. Demographic characteristics among individuals that left or did not leave their inpatient admission with traumatic life events in inpatient psychiatry (N=11,043)

	Discharge status, % (N)			
	No early leave	**Unplanned leave**	**Early leave, Short length of stay (<=6 days)**	
	76.72% (8,472)	**3.78% (417)**	**19.51% (2,154)**	**P value**
Age, mean (SD)	38.8 (15.78)	35.5 (12.76)	34.9 (14.40)	<.0001
Sex				0.1502
male	76.8 (3,376)	4.2 (183)	19.0 (836)	
female	76.7 (5,096)	3.5 (234)	19.8 (1,318)	
Education				<.0001
< high school	71.6 (1,386)	5.1 (98)	23.4 (452)	
high school	75.3 (2,072)	3.8 (105)	20.9 (575)	
>high school	78.9 (5,014)	3.4 (214)	17.7 (1,127)	
Homeless				<.0001
no	77.1 (7,983)	3.5 (366)	19.4 (2,010)	
yes	71.5 (489)	7.5 (51)	21.1 (144)	
Employment				<.0001
no	75.8 (5,476)	4.3 (312)	19.9 (1,438)	
yes	78.5 (2,996)	2.8 (105)	18.8 (716)	
Clinical Assessment Protocols				
Social Relationships				<.0001
Not triggered	72.8 (2,425)	3.4 (113)	23.8 (794)	
Family dysfunction	79.0 (3,245)	4.4 (180)	16.7 (685)	
Social isolation	77.8 (2,802)	3.4 (124)	18.7 (675)	
Interpersonal Conflict				<.0001
Not triggered	77.5 (5,496)	3.1 (223)	19.4 (1,377)	
Conflict in relationships	75.9 (2,064)	4.4 (119)	19.7 (535)	
Widespread conflict	74.2 (912)	6.1 (75)	19.7 (242)	
Support Systems for Discharge CAP				<.0001
Not triggered	77.6 (6,127)	3.4 (265)	19.0 (1,500)	
Lack of Support Systems	74.4 (2,345)	4.8 (152)	20.8 (654)	
Clinical Diagnoses				
Non-affective psychotic disorder				<.0001
no	76.1 (7,278)	3.7 (353)	20.2 (1,928)	
yes	80.5 (1,194)	4.3 (64)	15.2 (226)	
Eating disorder				<.0001
no	76.5 (8,334)	3.7 (404)	19.8 (2,150)	

yes	89.0 (138)	8.4 (13)	#	
Anxiety disorder				0.096
no	76.8 (8,173)	3.8 (408)	19.4 (2,064)	
yes	75.1 (299)	2.3 (9)	22.6 (90)	
Personality disorder				<.0001
no	77.2 (8,167)	3.7 (393)	19.1 (2,015)	
yes	65.2 (305)	5.1 (24)	29.7 (139)	
Substance use disorder				<.0001
no	76.2 (6,592)	2.7 (233)	21.1 (1,828)	
yes	78.7 (1,880)	7.7 (184)	13.6 (326)	
Mood disorders				<.0001
no	76.5 (4,982)	5.0 (321)	18.5 (1,193)	
yes	77.0 (3,544)	2.1 (96)	20.9 (961)	

Note: *Mood disorders includes bipolar and related disorders, and depression; # indicates the number was too low to report.*

Overall, 3.8% of persons with trauma had unplanned leaves while 19.5% had an early leave based on length of stay. The distribution of early leaves is described across latent classes of trauma and substance use in **Table 13**. The highest percentage of unplanned leaves was observed in Class 6: Widespread Trauma & Substance Addiction (9.8%) while Class 1: Interpersonal Issues, Without Substance use (1.8%) had the lowest percentage of unplanned early leaves. Whereas Class 3: Safety & Relationship Issues, Alcohol & Cannabis use had the highest proportion of short length of stays (<=6 days).

Table 13. Distribution of early leave variable across latent classes of trauma and substance use among persons with trauma in inpatient mental health services in Ontario, Canada (N=11,043)

	Latent Class, % (N)							
	Class 1: Interpersonal Issues, Without Substance use	**Class 2:** Safety & Relationship Issues, Without Substance use	**Class 3:** Safety & Relationship Issues, with Alcohol & Cannabis use	**Class 4:** Immigration with Interpersonal Stressors, Alcohol & Cannabis Addiction	**Class 5:** War & Immigration Trauma, without Substance use	**Class 6:** Widespread Trauma & Substance Addiction	**Class 7:** Widespread Trauma, Without Substance use	**Class 8:** Widespread Trauma, Alcohol & Cannabis Addiction
Early leave:								
No	79.2 (1,978)	76.2 (1,600)	66.9 (853)	81.5 (1,102)	78.7 (348)	70.81 (427)	77.4 (1,218)	79.0 (946)
Unplanned	1.8 (45)	2.28 (48)	5.33 (68)	4.51 (61)	2.71 (12)	9.78 (59)	3.2 (50)	6.2 (74)
Short length of stays (<=6 days)	19.0 (474)	21.6 (453)	27.8 (355)	14.0 (190)	18.6 (82)	19.4 (117)	19.4 (305)	14.9 (178)

(p value: <.0001)

Bivariate analyses were also used to assess the association between informal and formal supports and discharge status presented in **Table 14**. Having family or close friends report feeling overwhelmed by the person's illness, the patient being persistently hostile towards staff, and staff reporting frustration in dealing with the person were all significant informal support measures. Notably, individuals with unplanned leaves had high proportions of hostility towards others or staff (9.6%). Of informal supports at discharge, having support with activities of daily living were significant. Individuals with no early discharge had the highest availability of social support to assist with activities of daily living (81.7%). Of those with early leaves, short length of stays, 20.1% did not have support with activities of daily living at discharge. Service complexity was significant across discharge statuses; with higher proportions of moderate and high service complexity observed among individuals that did not have an early discharge.

Table 14. Supports stratified by discharge status among individuals with traumatic life events (N=11,043)

	Discharge status, % (N)			
	No early leave	**Early leave, unplanned**	**Early leave, Short length of stay (<=6 days)**	
	76.7% (8,472)	**3.8% (417)**	**19.5% (2,154)**	**P value**
Informal supports				
Reports having no confidant				0.1237
no	76.9 (7,390)	3.6 (350)	19.4 (1,865)	
yes	75.2 (1,082)	4.7 (67)	20.1 (289)	
Family/close friends report feeling overwhelmed by person's illness				<.0001
no	75.4 (5,433)	3.3 (240)	21.2 (1,530)	
yes	79.1 (3,039)	4.6 (177)	16.3 (624)	
Persistently hostile towards or critical of others or staff				<.0001
no	77.0 (8,042)	3.4 (359)	19.5 (2,039)	
yes	71.3 (430)	9.6 (58)	19.1 (115)	
Staff reports persistent frustration in dealing with person				<.0001
no	76.6 (7,985)	3.5 (362)	20.0 (2,084)	
yes	79.6 (487)	9.0 (55)	11.4 (70)	
Family/friends require unusual amounts of facility staff time				0.0005
no	76.5 (8,190)	3.8 (401)	19.8 (2,116)	
yes	83.9 (282)	4.8 (16)	11.3 (38)	
Available supports at discharge				
Supervision for personal safety				0.0036
no	77.2 (4,341)	4.2 (238)	18.6 (1,047)	
yes	76.3 (4,131)	3.3 (179)	20.4 (1,107)	
Crisis support				0.0005
no	77.8 (2,753)	4.4 (157)	17.8 (628)	
yes	76.2 (5,719)	3.5 (260)	20.3 (1,526)	
Support with ADL or IADL				<.0001
no	76.0. (7,300)	3.9 (373)	20.1 (1,935)	
yes	81.7 (1,172)	3.1 (44)	10.2 (219)	
Formal supports				
Service Complexity				<.0001
Low	70.0 (1,467)	3.2 (67)	26.8 (561)	
Moderate	77.9 (6,191)	4.0 (318)	18.1 (1,437)	
High	81.5 (814)	3.2 (32)	15.3 (153)	

Table 15 presents the results of multinomial regression models assessing the association between latent class membership, demographic variables, clinical diagnoses, Clinical Assessment Protocols, and discharge status. The results of the multinomial regression models are presented with odds ratio estimates and 95% confidence intervals. Model 1 assessed the association between latent classes, early leaves that were unplanned and early leaves that were short length of stays (with reference to individuals who did not have an early discharge). In the first model, individuals in Class 6 were 6.07 times more likely (95% CI: 4.06-9.08) to have an unplanned leave. Increased odds of individuals in Class 3, Class 4, Class 7, and Class 8 having unplanned leaves were also evident. In the final adjusted model, these associations between latent classes and discharge status held. Notably, individuals in Class 6 were 4.2 times more likely (95% CI: 2.72-6.39), and individuals in Class 8 were 2.9 times more likely (95% CI: 1.93-4.27) to have an unplanned early leave. Being aged 65 or older (adj. OR: 0.31, 95% CI: 0.14-0.69), and being employed (adj. OR: 0.63, 95% CI: 0.50-0.80) were both protective factors reducing the likelihood of unplanned early leaves. Interpersonal conflict (i.e., conflict in relationships and widespread interpersonal conflict) and a lack of support systems available at discharge were both associated with increased odds of unplanned early discharges. Patients who had eating disorders were 2 times (95% CI: 1.15-3.86) as likely to have unplanned early leave discharges. However, mood disorders reduced the odds of unplanned early leaves.

In Model 1, individuals in latent Classes 2 and 3 were both associated with increased odds of an early leave, short length of stay. However, through intermediary adjusted models, the association between Class 2 and early discharges based on short length of stays did not hold. In the final model, individuals in Class 3 were 1.3 times (95% CI: 1.14-1.59) more likely to have an early leave, short length of stay. Individuals in Class 4 (adj. OR: 0.68, 95% CI: 0.56-0.83) and Class 8 (adj. OR: 0.73, 95% CI: 0.60-0.89) were less likely to have a short length of stay. Older age, and greater than high school education both had negative associations and reduced the likelihood of short length of stays. Both non-affective psychotic (adj. OR: 0.62, 95% CI: 0.52-0.73), and eating disorder (adj. OR: 0.10, 95% CI: 0.04-0.26) decreased odds of short length of stays. Having personality disorder, however, increased the odds of early leaves with short length of stays. Patients with high service complexity had

lower odds of a short length of stay. Issues of social relationships, including family dysfunction and social isolation, reduced the odds of early leaves, short length of stays.

Table 15. Results of multinomial logistic regression models examining the association between latent classes, demographic, clinical characteristics, and discharge status among persons with trauma admitted to inpatient psychiatric beds in Ontario, Canada (N=11,043)

Discharge Status	**Variables**	**Model 1** OR (95% CI) **c statistic:** 0.56	**Final Model** adj. OR (95% CI) **c statistic:** 0.63
Early leave, unplanned			
	Latent Classes:		
	Class 1: Interpersonal Issues, without substance use	*Reference*	*Reference*
	Class 2: Safety & Relationship issues, without substance use	1.32 (0.87-1.99)	1.24 (0.82-1.88)
	Class 3: Safety & Relationship Issues, Alcohol & Cannabis use	**3.50 (2.38-5.15)**	**2.68 (1.80-3.98)**
	Class 4: Immigration with Interpersonal Issues, Alcohol & Cannabis Addiction	**2.43 (1.64-3.60)**	**2.22 (1.48-3.34)**
	Class 5: War & Immigration Trauma, Without Substance use	1.52 (0.79-2.89)	1.38 (0.72-2.65)
	Class 6: Widespread Trauma & Substance Addiction	**6.07 (4.06-9.08)**	**4.17 (2.72-6.39)**
	Class 7: Widespread Trauma, Without substance use	**1.80 (1.20-2.72)**	**1.59 (1.05-2.40)**
	Class 8: Widespread Trauma, Alcohol & Cannabis Addiction	**3.44 (2.36-5.02)**	**2.87 (1.93-4.27)**
	Age group:		
	25-44 vs. 18-24	-	1.11 (0.86-1.43)
	45-64 vs. 18-24	-	0.93 (0.69-1.25)
	65+ vs. 18-24	-	**0.31 (0.14-0.69)**
	Education:		
	high school education	-	0.86 (0.64-1.15)
	≥ high school education	-	0.81 (0.63-1.06)
	Employed *(yes vs. no)*	-	**0.63 (0.50-0.80)**
	Interpersonal Conflict CAP:		
	Conflict in relationships	-	**1.37 (1.09-1.73)**
	Widespread Interpersonal Conflict	-	**1.89 (1.41-2.53)**
	Social Relationships CAP:		
	Family dysfunction	-	0.84 (0.65-1.08)
	Social isolation	-	**0.73 (0.56-0.96)**
	Support Systems for Discharge CAP:		

	Lack of Support systems	-	**1.36 (1.10-1.68)**
	Diagnoses at Discharge:		
	Non-affective Psychotic	-	0.86 (0.63-1.17)
	Eating Disorder	-	**2.11 (1.15-3.86)**
	Personality Disorder	-	1.22 (0.77-1.91)
	Mood Disorder	-	**0.55 (0.42-0.71)**
	High Service Complexity	-	0.76 (0.52-1.10)
Early leave, short length of stays (<=6 days)			
	Latent Classes:		
	Class 1: Interpersonal Issues, without substance use	*Reference*	*Reference*
	Class 2: Safety & Relationship issues, without substance use	**1.81 (1.02-1.37)**	1.04 (0.90-1.20)
	Class 3: Safety & Relationship Issues, Alcohol & Cannabis use	**1.74 (1.48-2.04)**	**1.34 (1.14-1.59)**
	Class 4: Immigration with Interpersonal Issues, Alcohol & Cannabis Addiction	**0.72 (0.60-0.87)**	**0.68 (0.56-0.83)**
	Class 5: War & Immigration Trauma, Without Substance use	0.98 (0.76-1.28)	1.01 (0.78-1.32)
	Class 6: Widespread Trauma & Substance Addiction	1.14 (0.91-1.45)	0.88 (0.69-1.12)
	Class 7: Widespread Trauma, Without substance use	1.05 (0.89-1.23)	0.97 (0.82-1.14)
	Class 8: Widespread Trauma, Alcohol & Cannabis Addiction	**0.79 (0.65-0.95)**	**0.73 (0.60-0.89)**
	Age group:		
	25-44 vs. 18-24	-	**0.75 (0.66-0.84)**
	45-64 vs. 18-24	-	**0.53 (0.46-0.61)**
	65+ vs. 18-24	-	**0.28 (0.22-0.38)**
	Education:		
	high school education	-	0.86 (0.64-1.15)
	≥ high school education	-	**0.76 (0.66-0.87)**
	Employed *(yes vs. no)*	-	0.92 (0.82-1.02)
	Interpersonal Conflict CAP:		
	Conflict in relationships	-	1.05 (0.93-1.18)
	Widespread Interpersonal Conflict	-	1.15 (0.98-1.36)
	Social Relationships CAP:		
	Family dysfunction	-	**0.63 (0.56-0.72)**
	Social isolation	-	**0.73 (0.65-0.83)**
	Support Systems for Discharge CAP:		

	Lack of Support systems	-	1.11 (0.99-1.23)
	Diagnoses at Discharge:	-	
	Non-affective Psychotic	-	**0.62 (0.52-0.73)**
	Eating Disorder	-	**0.10 (0.04-0.26)**
	Personality Disorder	-	**1.32 (1.06-1.66)**
	Mood Disorder	-	0.97 (0.87-1.09)
	High Service complexity	-	**0.74 (0.62-0.89)**

Notes:

- Discharge status was with reference to individuals who did not have an early discharge
- High service complexity assessed with reference to low/moderate complexity
- Family dysfunction and social isolation were with reference to those who did not trigger the Social Relationships CAP
- Education was assessed with reference to those with less than high school education

4.6 Discussion

This study identified classifications of trauma and substance use as well as social and demographic characteristics associated with early leaves from inpatient admissions among individuals with traumatic life events in inpatient psychiatry in Ontario. The results highlight differences in factors associated with early leaves that were unplanned versus short length of stays. Notably, latent classes with the highest odds of unplanned early leaves commonly included indicators of substance use (e.g., Class 6: Widespread Trauma & Substance Addiction, Class 8: Widespread Trauma, Alcohol & Cannabis Addiction). Previous qualitative studies have reported that some individuals with substance use disorders feel that hospitalizations are interrupting their substance use (Velez et al., 2017). Challenges with withdrawal or a lack of willingness to change substance use behaviours may be contributing to early unplanned discharges observed in this study. The timeframe prior to discharge reflects an important period to intervene in ongoing substance use. However, patients have also voiced that in acute settings, the focus of their care has been reducing substance use; while underlying trauma and complex mental health needs are not being addressed (Simon et al., 2020; Velez et al., 2017).

Substance use was not always involved when examining classes associated with early leaves. For instance, patients with widespread trauma, without substance use (Class 7) also had increased odds of unplanned early leaves. These findings highlight the need for interventions that begin to address the complexities of the trauma a person may have experienced. Providing practitioners with appropriate resources that include trauma-informed training as well as staffing levels that support personalized care may be particularly relevant in acute settings. Furthermore, there is a need for increased availability of specialized trauma-based services in inpatient and community settings may be important for addressing these barriers just as it will be important to increase the availability of addiction treatment services that can be offered collaboratively within mental healthcare.

It is important to note that most patients did not have early leaves from hospital, including the majority of those with complex trauma and substance use. Although conclusions about outcomes experienced by these patients cannot be made, this pattern is an important initial indicator of treatment engagement. However, there is also evidence that

challenging relationships marred by interpersonal conflict increased the odds of unplanned early leaves. Given that interpersonal conflict is a common factor among those with personality disorders it is also not surprising, although also not encouraging, that those with personality disorders were at greater odds of early leaves. In our study, interpersonal conflict reflected criticism of family or friends, persistent anger with oneself or others, and challenges with staff. Previous studies have reported that individuals with substance use disorders felt judged or treated differently by staff members in inpatient settings (Simon et al., 2020). Adding to the findings related to complex trauma with substance use, the effect of conflict with staff points to the challenges both staff and patients are experiencing in an inpatient setting. Quality standards, for instance, have identified the need to improve the assessment and support for substance use among persons with psychiatric diagnoses. Within such standards there is an emphasis on improvements to the addiction education and supports available to clinical staff, including efforts to reduce stigmatization associated with substance use in psychiatric settings in order to reduce unplanned early leaves (HQO, 2023). Negative attitudes and dynamics between staff and patients may also create barriers in communication and treatment outcomes

Support systems play an important role in preventing unplanned leaves. For instance, a lack of support systems at discharge increased the odds of unplanned early discharges but were not associated with early leaves. This means that having supports in place may increase treatment engagement and continuity for the person. However, it was interesting to note that social isolation reduced an individual's odds of early leaves, including both unplanned and short length of stays. It may be that isolation from social networks may actually serve to motivate a person for treatment or more responsive to care when they feel isolated from their social networks or such isolation may be a result of a person's social networks being a source of distress for the person, particularly in cases involving substance use (Fivecoat et al., 2023). Our study findings may reflect that individuals with social isolation or family dysfunction may feel motivated by the challenges in their social networks to complete their treatment.

Unplanned early leaves can reflect unmet care needs. In our study it is crucial to note that many individuals with complex trauma and substance use patterns were leaving their acute treatment early. These complex care needs may be better supported by longer-term or

specialized treatment programs that utilize best practice approaches for the treatment of both trauma and substance use. However, inpatient acute settings are typically not designed to provide specialized concurrent disorder care and, thus, many individuals may end up being discharged early in the hopes of follow-up care in the community. Beyond clinical care, there may also be a need for culturally relevant care. This study found that patients with immigration and interpersonal issues who had signs of alcohol and cannabis addictions (Class 4) were also more likely to have unplanned early leaves. This finding may reflect cultural differences in the continuation of care, beliefs about illness and treatment, and other sociocultural barriers (e.g., material deprivation) that increase the likelihood of leaving an inpatient admission prematurely (Durbin et al., 2015). Improving access to mental health professionals in that community and reducing barriers to accessing mental health care services (e.g., financial constraints) would help reduce the need for acute inpatient treatment that is not addressing the complexity of trauma and substance use patterns.

The findings related to patients with eating disorders warrant further discussion even though the overall number of persons was relatively low. Individuals with eating disorders have been documented as being reluctant to change and frequently drop out of treatment programs (Zaitzoff et al., 2015; Masson et al., 2007). In many cases, individuals with eating disorders deny the severity of their disorder or are referred for treatment by others. Thus, retaining, and effectively addressing eating disorders are particularly challenging (Zaitzoff et al., 2015). With this said, eating disorders require specialized care that is often delivered in community-based contexts. So, it may not be surprising that some have had shorter stays if safety concerns that may have been driving the reason for admission have subsided. However, given the strength of the association for eating disorders, it is likely that this co-morbidity is not being treated effectively in inpatient settings, and driving some of the unplanned early leaves that we observe. While in the inpatient setting, patients with disordered eating behaviours need to be recognized to ensure treatment for their co-occurring conditions (i.e., substance use and trauma) are also being completed.

Although this study provided a novel analysis of early leaves in inpatient settings among individuals with trauma in Ontario, findings must also be considered with possible limitations. One of the limitations to the analysis used in this study (but perhaps a strength of

the quality of inpatient care) is the small sample size of individuals who had unplanned early leaves. The smaller sample size reduces the statistical power of the analysis meaning that effects for risk factors for unplanned leaves may lack accuracy. Of course, it would be unethical to consider this outcome in anything other than an observational study, with this study representing a population-based estimate of unplanned leaves from psychiatric hospitalizations. Another limitation is that the temporality of trauma and substance use cannot be determined. The cohort data provides a sample of mental health in inpatient settings. The main purpose of this study was to examine the patterns of early discharges among individuals with different classifications of traumatic life events and substance use. We also examined other covariates such as age, education, employment, interpersonal conflict, social relationships, support systems for discharge, diagnoses at discharge, and service complexity. However, it was limited that in that we did not look at whether social relationships moderate formal supports. Future research should examine whether or not there is an interaction between social relationships and formal relationships. However, future studies should assess the interplay between social relationships and formal support with respect to early leaves.

Another important consideration is the differences between early leaves that were unplanned versus short length of stays. Unplanned discharges against medical advice have been well documented in research as being associated with increased morbidity, and likelihood of readmission (Southern et al., 2012). Short length of stays (<=6 days) was used as a subjective variable to reflect possible variation in treatment. Early discharges with short length of stays do not directly imply poorer health outcomes. In addition, the notable differences in total length of stay do not directly mean that patients should have had longer stays. However, short length of stays reflect an important opportunity to recognize comorbid conditions, treat, and provide supportive environment that fosters the continuity of care. In this study, separately identifying unplanned discharges and short length of stays did suggest that there is a distinction in factors associated with the two discharge statuses.

This study emphasizes the importance of recognizing factors that contribute to early discharges, and some of the key factors associated with discharge status. The results suggest

the importance of early interventions for individuals utilizing substances, the influence of interpersonal conflict, and support systems on treatment engagement.

Chapter 5
General Discussion

Experiencing traumatic life events can have long-term psychological effects, such as distress, that add clinical complexity and can impede care. Among individuals with trauma, substance use disorders commonly co-occur. In Ontario, barriers to accessing mental health services such as a lack of service integration, and long wait times for community-based services as well as persons experiencing psychiatric emergencies often result in the need for inpatient mental health services. Given that inpatient settings are often the first point of access, this dissertation aimed to address several knowledge gaps related to trauma and substance use within inpatient settings.

5.1 Summary of Findings

The co-occurrence of both trauma and substance use in inpatient psychiatry highlight an important public health concern. Given the need to better understand characteristics and patterns among these patients, this dissertation:

1. identified classifications of both trauma and substance use among inpatients in Ontario, Canada, and factors associated with latent class membership

2. examined service complexity received by latent classes of persons with trauma in inpatient psychiatric care

3. examined whether latent classes of trauma and social relationships were associated with early leaves from inpatient care

This dissertation has made several contributions when considering trauma and substance use in inpatient settings. In Chapter 2, life events included in the Traumatic Life events CAP and substance use variables, were used in LCA to identify unobserved subgroups. The 8 classifications highlighted multi-dimensional experiences and complex interplay of both trauma and substance use. Variations in traumas experienced and

substances used reflect the need for tailored trauma-focused, and person-centred care that recognizes unique experiences of patients. However, few specialized programs exist in the province that provide specialized trauma-based service provision. Services need to consider the complex circumstances of patients who have experienced traumatic life events, including the common co-occurrence of substance use. Co-occurring substance use can amplify mental health concerns and interfere with care. Thus, it is essential that practitioners are trained to effectively identify a vast array of traumas, and treat co-occurring substance use.

Previous studies often used formal diagnoses (e.g., PTSD) to identify trauma. This study was unique in highlighting the broad spectrum of types of traumas experienced and how they cluster with substance use. Considering transdiagnostic theories, it is also possible that individuals with trauma present symptoms of other mental health disorders such as depression or anxiety. Therefore, it is imperative that care providers recognize the possible breadth of life events that may contribute to an individual's perceived trauma in addition to their care needs.

Notably in Chapter 3, one of the classifications with safety & relationship issues, alcohol and cannabis use (Class 3) was associated with decreased odds of high service complexity. However, this study also found that certain classes with patterns of both trauma and substance addiction (e.g., Class 4, Class 6, and Class 8) reflected increased likelihood of high service complexity during inpatient care. Broadly, results of this study suggested differences in service intensity among latent classes and variations of the experiences of persons with trauma. Practice must therefore recognize the critical nuance between substance use and addiction, and the importance of early intervention. To address co-occurring trauma and substance use, an integrated care approach is best practice. This approach involves treating both trauma and substance use simultaneously. Early identification of individuals with this co-occurrence, in addition to providing optimal treatment approaches are needed to address recreational use before addiction.

This dissertation also found that complex trauma, in addition to substance use, predicted discharge status. For example, certain classes with patterns of substance use (e.g., Class 3, 4), and complex trauma (e.g., Class 6, 7, 8) had increased odds of early leaves that were unplanned. Lack of willingness to change substance use behaviours or withdrawal

symptoms may have contributed to early unplanned discharges. During inpatient admissions, that is, prior to discharge reflects a crucial period to intervene in ongoing substance use, while simultaneously addressing complex mental health needs. Other covariates such as widespread interpersonal conflict also increased a patient's likelihood of early discharge. In inpatient settings, ensuring quality standards to increase addiction education, reduce stigma, and support clinical staff are consistently necessary. Lack of support systems at discharge was associated with an increased likelihood of unplanned early discharges. Patients who are who are socially isolated may appreciate the safety of inpatient settings. This finding further amplifies the important role of staff during inpatient care.

5.2 General Strengths and Limitations

This dissertation had many strengths that allowed for the examination of trauma and substance use at a population level. The data source, the OMHRS, is representative of all persons admitted to inpatient psychiatry in Ontario reflecting an entire health system. By using representative data, the descriptive aspects of the dissertation become a depiction of the real-world context in Ontario. Furthermore, the comprehensive design of the RAI-MH allowed for the assessment a variety of traumatic life events that fall within broad definition of trauma. As such, this dissertation was able to build on a common limitation of research within acute care, of the reliance on the use of formal diagnoses and the possibility that such diagnostic frameworks may overlook trauma (Lewis et al., 2018). Thus, having a comprehensive definition of traumatic life events provided a large sample of trauma in inpatient psychiatry.

Another strength of the RAI-MH is the inclusion a broad set of substance use indicators as well as many validated scales and CAPs that supported analysis (See Appendix A). By using CAPs and scales, this dissertation could consider many covariates to the understanding of trauma/substance use classes, service complexity, and discharge patterns. This dissertation also provided a novel understanding of the patterns of substance use, and broader factors associated with trauma. The comprehensive approach of completing the RAI-MH assessment (e.g., interviews with family, clinical staff, individual, and review of their

chart) ensures the accurate reporting of demographic, and clinical variables used in this study.

One of the limitations of this study was the potential for inpatient psychiatric data to not be representative of the general population. Often, as a result of lack of access to mental health services, those who access acute care often have more complex care needs than the general population. Therefore, individuals in the present research may reflect more clinical complexity than observed in other settings (e.g., community-based mental health care). Similarly, individuals with mental health disorders in Ontario reflect a larger population and observed in inpatient settings. Some jurisdictions have begun using the interRAI Community Mental Health (CMH) assessment but system wide continuity has yet to occur (Hirdes et al., 2020). Inclusion of other access to mental health services (e.g., community mental health clients) would have provided a more holistic representation of mental health service use.

Another limitation was the use of only OMHRS data for this dissertation. Further, this research only considered the index admissions during the observational window. Other data sources such as National Ambulatory Care Reporting System (NACRS) would have been helpful to provide insight into possible emergency department use prior or following inpatient stays but ultimately would have lacked contextual information about trauma and substance use. Similarly, while Discharge Abstract Database provides information on the patterns of psychiatric admissions by diagnosis in most other provinces and territories there is a lack of detailed information about trauma exposures or substance use. To consider a more in-depth analysis, continued service use such as access to community based mental health services would have also provided additional insight. Another limitation of this research was the secondary use of existing health data, as it was difficult to do planned follow-up and longitudinal analyses of trauma exposures and substance use patterns. While RAI-MH is widely available, and many indicators of both trauma and substance use could be determined, the temporality of the two mental health conditions could not be concluded. Future work should aim to utilize transition modelling among individuals with multiple RAI-MH assessments. Additional research could also validate latent classes among youth data.

5.3 Implications

This dissertation contributed to a body of knowledge on persons experiencing trauma and substance use in inpatient settings. Study findings can be used to inform research, policy, and practice on how trauma and substance use cluster together, patterns of service use, and predictors of discharge status among individuals with co-occurring trauma and substance use. Future policy and research should build on the findings of this dissertation through the following recommendations:

1. *Using best practice approaches to treat co-occurring trauma and substance use.*
   One of the common themes of this dissertation was the complex nature of co-occurring of trauma and substance use. The co-occurrence of trauma and substance use was discussed as amplifying symptoms and prolonging treatment. The variations in patterns of substance use across trauma classes was evident in Chapter 2, trauma types and substance use varied across inpatients. For some latent classes, substance use was limited to one or two substances, while for others, the type of substances used was more widespread. Variations in types of trauma was also evident, ranging from interpersonal challenges, or victimization, to widespread negative life events. As noted in Chapter 3, classes with complex trauma and substance use often required high service complexity in inpatient settings. This finding may reflect that substance addiction was driving many of the associations observed with high service complexity. Additionally, this dissertation observed that individuals with substance use were likely to have early leaves from their inpatient stays. Early leaves among individuals utilizing substances may reflect the desire to continue substance use or relapse in the community. Based on this dissertation, accurate assessments, and early detection of trauma in inpatient settings are important. By detecting trauma, best practice approaches to simultaneously treat both trauma and substance use may reduce some of the relapse behaviours, and high service complexity observed through this research. Educating staff on common characteristics of trauma, utilizing a person-centered care approach in routine interactions are continually needed to integrate trauma detection into care procedures. Perhaps, all mental health settings should consider screening all

patients with substance use disorders for traumatic stress to provide more holistic, and optimal care for these individuals.

2. *Understand the broader life circumstances of individuals with co-occurring trauma and substance use.*

   Through this dissertation, many demographic and clinical characteristics were associated with latent classes, or the outcomes of interest. For example, in Chapter 2, homelessness, biological sex, age, education, employment status, non-affective psychotic disorder, and personality disorder were associated with many latent classes that presented complex patterns of both trauma and substance use. In Chapter 4, interpersonal conflict was significantly associated with an unplanned early leave from inpatient care. Through each of the studies, it was evident that there were a variety of broader life circumstances that influenced care. Future studies should aim to understand these broader life circumstances (e.g., experiences of homelessness, interpersonal relationships, clinical diagnoses such as eating disorders) and how they influence patterns of co-occurring trauma and substance use. Further, engaging with patients who have co-occurring trauma and substance use would support our understanding of care preferences, and patient-level factors that contribute to trauma histories. Determining approaches to keep patients engaged in their own care, and funding existing services that address broader barriers to care may also reduce dropout from treatment.

3. *Explore additional resilience factors.*

   In Chapter 4, it was evident that certain factors were protective or reduced an individual's likelihood of leaving their inpatient care. Factors such as family dysfunction, employment status, older age, and certain diagnoses (e.g., non-affective psychotic disorders and eating disorders) were all associated with a lower likelihood of early leaves that were unplanned or short length of stays. Additional exploration of resilience factors (e.g., social services, the role of casual connections), and demographic characteristics should be further researched to understand their influence

on service utilization and the continuation of care.

4. *Measuring how service complexity may relate to resource intensity.*
   Chapter 3 was limited in not assessing the economic cost associated with service use among the latent classes. This limitation meant that service complexity could only be used to understand differences in the number of service providers who worked with the patient. Future studies should consider resource intensity by use of cost analysis to differentiate variation among persons with co-occurring trauma and substance use. Latent classifications of trauma could also be used to provide meaningful categorizations for clinical care planning. Classification-based case-mix measures could then be used to classify patients for predicting healthcare costs. Future studies should aim to assess cost effectiveness by comparing differences in treatment approaches, and outcomes based on inpatient services.

5. *Validate latent classes in other contexts and identify relevant treatment options.*
   Latent class analysis was a useful approach for RAI-MH data to identify the underlying subgroups of trauma and substance use. Future studies should repeat LCA among individuals with trauma in a variety of settings (e.g., community-based settings through the use of the interRAI Child and Youth Mental Health assessment data) to validate the observed latent classes. Once validated, targeted treatment plans that concurrently address negative life experiences and substance use should be determined. Further research should consider precision treatment options (e.g., matching treatment based on classifications of trauma and/or substance use combination) for more effective approaches. Providing individual and relevant care would better complement the complex needs of persons with co-occurring trauma and substance use.

6. *Assess broader health service utilization following inpatient stays*
   Another potential focus of future research would involve linking RAI-MH assessments used for this dissertation to interRAI Community Mental Health data as well as other population health datasets (e.g., National Ambulatory Care Reporting System) to assess

additional patterns of readmissions and service use following discharge. Using observed subgroups of individuals with trauma, understanding how patients vary in terms of their time to readmission, and types of services used would be beneficial to understand variations in care needs following discharge from inpatient care.

In summary, this dissertation demonstrated the complex nature and interplay between trauma and substance use. It also demonstrated that in inpatient mental health settings in Ontario, the needs of individuals vary. Ontario is beneficially positioned with a comprehensive tool (i.e., interRAI suite of instruments) able to broadly identify traumatic life events and substance use behaviours. Use of the RAI-MH places Ontario in a favourable position to fund more integrated and innovative programs. To improve health outcomes of inpatients with co-occurring trauma and substance use, early identification, and accessible concurrent treatment options are needed.

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Appendix A: Description of RAI-MH CAPs and Scales

Table A-1. Description of RAI-MH Clinical Assessment Protocols, and Scales

The Clinical Assessment Protocols (CAPs) are triggered through predictive algorithms based on responses to assessment items. CAPs highlight care concerns and alert clinical caregivers of potential areas of concern (i.e., when triggered) or strengths (i.e., when not triggered). The CAPs manual summarizes each of the CAPs and provides best practice guidelines (Hirdes et al., 2011)

Description of RAI-MH Clinical Assessment Protocols (Hirdes et al., 2011)	
Category	**Relevant CAPs**
Autonomy	• Control Interventions • Medication Management and Adherence • Rehospitalization
Economic Challenges	• Personal finances • Education and Employment
Health Promotion	• Smoking • Substance Use • Weight Management • Exercise • Sleep Disturbance • Pain • Falls
Safety	• Harm to Others • Suicidality and Purposeful Self-Harm • Self-Care
Social Life	• Social relationships • Informal support • Support Systems for discharge • Interpersonal Conflict • Traumatic Life events • Criminal Activity
Scales within the RAI-MH	
Scale	**Description**
Aggressive Behaviour Scale (ABS)	• Measure of aggressive behaviours (i.e., physical or verbal abuse)
Activities of Daily Living (ADL) Scale	• Measure of functional performance (i.e., ability to complete activities of daily living)
CAGE (Substance Use)	Screener assessing: • Need to **C**ut down on substance use • **A**ngered by criticism from others on substance use • **G**uilt about substance use • "**E**ye-opener" (requiring substances first thing in the morning)
Cognitive Performance Scale (CPS)	• Measure of a person's cognitive status (e.g., short-term memory, daily decision making)

Depression Severity Index (DSI)	• Determining severity of depression-related symptoms (i.e., sadness, negative statements, self-deprecation, guilt, shame, and hopelessness)
Instrumental Activities of Daily Living (IADL Capacity Scale)	• Person's ability to complete instrumental or higher-level daily activities (e.g., meal preparation)
PAIN	• Summarizes whether the person is experiencing pain, and the intensity of the pain
Positive Symptoms Scale (PSS)	• Assesses whether abnormal thought processes are present (e.g., hallucinations or delusions)
Risk of Harm to Others (RHO)	• Summarizes whether an individual is at risk of harming others based on cognitive state and history of violence
Self-Care Index (SCI)	• Risk of inability to care for oneself due to the presence of psychiatric symptoms
Severity of Self-Harm (SOS)	• Risk of harm based on history of self-harm or suicide

Appendix B: Supplementary Materials for Study 1

Table B-1. Demographic characteristics across latent classes (N=10,125)

	Class 1: Interpersonal Issues, Without Substance use 22.9% (2,315)	**Class 2:** Safety & Relationship Issues, Alcohol & Cannabis use 18.5% (1,875)	**Class 3:** Safety & Relationship Issues, Alcohol & Cannabis use 10.5% (1,066)	**Class 4:** Immigration with Interpersonal Issues, Alcohol & Cannabis use 12.7% (1,287)	**Class 5:** War & Immigration Trauma, Without Substance use 4.6% (463)	**Class 6:** Widespread Trauma & Substance Addiction 5.6% (570)	**Class 7:** Widespread Trauma, Without Substance use 13.5% (1,363)	**Class 8:** Widespread Trauma, Alcohol & Cannabis Addiction 11.7% (1,186)
Age, mean (SD)	45.59 (19.31)	39.05 (16.55)	30.54 (11.47)	39.73 (13.76)	51.52 (21.07)	30.87 (9.78)	43.22 (15.19)	40.64 (12.67)
Sex, % (N)								
Female	23.1 (1,377)	24.0 (1,436)	10.2 (610)	7.8 (467)	3.4 (200)	4.4 (261)	15.4 (919)	11.8 (705)
Male	22.6 (938)	10.6 (439)	11.0 (456)	19.8 (820)	6.3 (263)	7.5 (309)	10.7 (444)	11.6 (481)
Education, % (N)								
< high school	18.4 (324)	16.6 (292)	13.6 (239)	7.6 (133)	5.8 (102)	9.6 (168)	15.4 (271)	13.0 (228)
high school	22.4 (541)	20.5 (496)	12.6 (305)	13.2 (319)	3.9 (95)	5.3 (127)	12.7 (307)	9.5 (231)
> high school	24.4 (1,450)	18.3 (1,087)	8.8 (522)	14.0 (835)	4.5 (266)	4.6 (275)	13.2 (785)	12.2 (727)
Homeless	16.1 (105)	11.5 (75)	19.2 (125)	7.7 (50)	4.9 (32)	12.9 (84)	15.8 (103)	12.0 (78)
Employed	19.8 (670)	18.6 (630)	8.8 (299)	19.6 (665)	2.3 (79)	5.1 (174)	11.2 (379)	14.6 (493)
Length of Stay, mean (SD)	32.2 (71.8)	29.9 (35.5)	22.4 (31.5)	30.3 (24.9)	40.1 (57.8)	26.8 (22.6)	28.8 (29.7)	33.6 (27.9)

Appendix C: Supplementary Materials for Study 2

Table C-1. Distribution of scales used in logistic regression models analyzing the association between demographic, clinical characteristics, and service complexity (N=7,871)

	Service complexity, % (N)			
	Low 20.4% (1,608)	Moderate 61.5 (4,841)	High 18.07 (1,422)	**P value**
Scale				
Cognitive Performance Scale				<.0001
intact	21.1 (1,558)	60.8 (4,484)	18.1 (1,336)	
moderate	10.7 (26)	67.4 (163)	21.9 (53)	
severe	9.6 (24)	77.3 (194)	13.2 (33)	
Depression Rating Scale				<.0001
low	22.8 (523)	62.3 (1,427)	14.9 (341)	
possible	19.3 (615)	62.3 (1,983)	18.4 (585)	
severe	19.6 (470)	59.7 (1,431)	20.7 (496)	
Risk of Harm to others				<.0001
no risk	26.6 (545)	66.1 (840)	15.4 (196)	
low risk	18.2 (829)	61.7 (2,807)	20.1 (917)	
moderate/high risk	18.4 (234)	58.3 (1,194)	15.1 (309)	
Severity of Self-harm				<.0001
no risk	18.6 (275)	59.7 (886)	21.6 (319)	
low risk	16.5 (392)	62.5 (1,486)	21.0 (500)	
moderate/high risk	23.5 (941)	61.5 (2,469)	15.0 (603)	

Table C-2. Distribution of service variables and length of stay by service complexity, among individuals with traumatic life events (N=7,871)

	Service complexity, % (N)			
	Low 20.4% (1,608)	Moderate 61.5 (4,841)	High 18.07 (1,422)	**P value**
Formal supports				
Psychiatrist				<.0001
no	11.2 (138)	62.62 (774)	26.2 (324)	
yes	22.2 (1,470)	61.3 (4,067)	16.6 (1,098)	
Nurse practitioner or MD (non-psychiatrist)				<.0001
no	38.2 (1,080)	50.0 (1,413)	11.8 (333)	
yes	10.5 (528)	68.0 (3,428)	21.6 (1,089)	
Social worker				<.0001
no	40.9 (1,296)	57.1 (1,811)	2.0 (64)	
yes	6.6 (312)	64.5 (3,030)	28.9 (1,358)	
Psychologist or psychometrist				<.0001
no	23.1 (1,586)	64.2 (4,409)	12.7 (869)	
yes	2.2 (22)	42.9 (432)	54.9 (553)	
Occupational therapist				<.0001
no	26.9 (1,562)	63.6 (3,693)	9.5 (550)	
yes	2.23 (46)	55.6 (1,148)	42.2 (872)	
Recreation therapist				<.0001
no	32.1 (1,473)	63.4 (2,908)	4.5 (204)	
yes	4.1 (135)	58.8 (1,933)	37.1 (1,218)	
Addiction counsellor				<.0001
no	23.5 (1,584)	60.5 (4,073)	16.0 (1,079)	
yes	2.1 (24)	67.5 (768)	30.4 (346)	
Dietician				<.0001
no	23.1 (1,593)	64.4 (4,445)	12.5 (866)	
yes	1.6 (15)	41.0 (396)	57.5 (556)	
Nursing Interventions				
Medical interventions				<.0001
no	34.7 (1,196)	59.8 (2,064)	5.5 (191)	
yes	9.3 (412)	62.8 (2,777)	27.9 (1,231)	
Crisis interventions				<.0001
no	25.4 (1,291)	58.9 (2,991)	15.6 (794)	
yes	11.3 (317)	66.2 (1,850)	22.5 (628)	
Other				
Length of Stay				<.0001
mean (SD)	12.1 (6.22)	16.8 (29.4)	50.42 (49.9)	

Table C-3. Results of logistic regression models examining the association between latent classes, additional diagnoses, and level of service complexity among persons with trauma admitted to inpatient psychiatric beds in Ontario, Canada (N=7,871)

Effect	**Comparison Model:** Adjusted association between class membership and high vs. low/moderate service complexity, considering Diagnoses of PTSD and Substance Use Disorder **c statistic: 0.65** ***Estimate (95% CI)***	**Final Model:** Adjusted association between class membership and high vs. low/moderate service complexity ***c statistic: 0.65*** ***Estimate (95% CI)***
Class 1: Interpersonal Issues, Without Substance use	*Reference*	*Reference*
Class 2: Safety & Relationship Issues, Without Substance use	0.83 (0.98-1.01)	0.83 (0.68-1.01)
Class 3: Safety & Relationship Issues, Alcohol & Cannabis use	**0.69 (0.53-0.90)**	**0.70 (0.54-0.91)**
Class 4: Immigration with Interpersonal Issues, Alcohol & Cannabis Addiction	**1.49 (1.18-1.87)**	**1.55 (1.27-1.90)**
Class 5: War & Immigration trauma, without substance use	1.32 (0.99-1.76)	1.33 (0.99-1.77)
Class 6: Widespread Trauma & Substance Addiction	1.33 (0.93-1.40)	**1.40 (1.04-1.88)**
Class 7: Widespread Trauma, Without Substance use	1.14 (0.93-1.40)	1.15 (0.94-1.41)
Class 8: Widespread trauma, Alcohol & Cannabis addiction	**1.95 (1.56-2.45)**	**2.05 (1.68-2.50)**
Female	**1.19 (1.05-1.36)**	**1.19 (1.05-1.35)**
Education:		
high school vs. < high school	**0.79 (0.64-0.98)**	**0.79 (0.64-0.97)**
> high school vs. < high school	**1.37 (1.15-1.64)**	**1.38 (1.15-1.64)**
Employed	**1.16 (1.02-1.32)**	**1.17 (1.03-1.33)**
Cognitive Performance Scale:		
moderate vs. intact	**1.46 (1.05-2.02)**	**1.45 (1.04-2.01)**
severe vs. intact	0.79 (0.54-1.17)	0.79 (0.53-1.16)
Depression Rating Scale:		
Possible vs. low symptoms	**1.23 (1.06-1.43)**	**1.22 (1.06-1.44)**
Severe vs. low symptoms	**1.69 (1.43-1.99)**	**1.68 (1.43-1.98)**
Risk of Harm to Others:		

low risk vs. no risk	**1.28 (1.11-1.48)**	**1.28 (1.11-1.49)**
moderate/high risk vs. no risk	1.12 (0.91-1.38)	1.11 (0.90-1.37)
Severity of Self Harm:		
low risk vs. no risk	1.12 (0.94-1.33)	1.11 (0.94-1.31)
moderate/high risk vs. no risk	**0.67 (0.57-0.79)**	**0.66 (0.56-0.78)**
PTSD Diagnosis	1.09 (0.90-1.31)	-
Substance Use Disorder Diagnosis	1.04 (0.88-1.24)	-

Notes:

- All latent classes with reference to the first class
- All clinical diagnoses are at discharge (presence versus absence)

Table C-4. Final model (adjusted association between class membership and high vs. low/moderate service complexity), controlling for sex

Effect	**Comparison Model:** Adjusted association between class membership and high vs. low/moderate service complexity, among **females** (N=4,637) **c statistic: 0.665** ***Estimate (95% CI)***	**Comparison Model:** Adjusted association between class membership and high vs. low/moderate service complexity, among **males** (N=3,234) **c statistic: 0.647** ***Estimate (95% CI)***
Class 1: Interpersonal Issues, Without Substance use	*Reference*	*Reference*
Class 2: Safety & Relationship Issues, Without Substance use	0.82 (0.65-1.04)	0.88 (0.60-1.28)
Class 3: Safety & Relationship Issues, Alcohol & Cannabis use	0.72 (0.51-1.00)	0.67 (0.44-1.02)
Class 4: Immigration with Interpersonal Issues, Alcohol & Cannabis Addiction	**1.46 (1.08-1.98)**	**1.54 (1.16-2.05)**
Class 5: War & Immigration trauma, without substance use	1.42 (0.94-2.13)	1.24 (0.82-1.87)
Class 6: Widespread Trauma & Substance Addiction	**1.80 (1.20-2.69)**	1.07 (0.69-1.68)
Class 7: Widespread Trauma, Without Substance use	1.16 (0.90-1.48)	1.15 (0.81-1.64)
Class 8: Widespread trauma, Alcohol & Cannabis addiction	**2.26 (1.76-2.91)**	**1.74 (1.26-2.41)**
Education:		
high school vs. < high school	0.83 (0.62-1.12)	0.75 (0.55-1.02)
> high school vs. < high school	**1.56 (1.22-1.98)**	1.17 (0.81-1.52)
Employed	**1.22 (1.04-1.44)**	1.06 (0.86-1.31)
Cognitive Performance Scale:		
moderate vs. intact	1.35 (0.87-2.08)	**1.58 (0.96-2.61)**
severe vs. intact	0.96 (0.59-1.55)	0.58 (0.29-1.14)
Depression Rating Scale:		
possible vs. low symptoms	1.10 (0.90-1.35)	**1.45 (1.15-1.81)**
severe vs. low symptoms	**1.70 (1.38-2.11)**	**1.57 (1.20-2.05)**
Risk of Harm to Others:		
low risk vs. no risk	**1.40 (1.16-1.68)**	1.09 (0.86-1.39)

moderate/high risk vs. no risk	1.17 (0.89-1.56)	0.99 (0.72-1.35)
Severity of Self Harm:		
low risk vs. no risk	**1.33 (1.05-1.68)**	0.90 (0.70-1.16)
moderate/high risk vs. no risk	0.80 (0.64-1.00)	**0.52 (0.40-0.67)**

Appendix D: Supplementary Materials for Study 3

Table D-1. Formal supports stratified by discharge status among individuals with traumatic life events (N=11,043)

	Discharge status, % (N)			
	No early leave 76.7% (8,472)	**Early leave, unplanned** 3.8% (417)	**Early leave, Short length of stay (<=6 days)** 19.5% (2,154)	**P value**
Formal supports				
Psychiatrist				<.0001
no	53.3 (1,380)	7.0 (182)	39.7 (1,027)	
yes	83.9 (7,092)	2.8 (235)	13.3 (1,127)	
Nurse practitioner or MD (non-psychiatrist)				<.0001
no	68.0 (3,490)	3.8 (196)	28.2 (1,447)	
yes	84.3 (7,982)	3.7 (221)	12.0 (707)	
Social worker				<.0001
no	56.61 (2,005)	4.52 (160)	38.88 (1,377)	
yes	86.22 (6,467)	3.43 (257)	10.36 (777)	
Psychologist or psychometrist				<.0001
no	74.97 (7,304)	3.93 (383)	21.09 (2,055)	
yes	89.78 (1,168)	2.61 (34)	7.61 (99)	
Occupational therapist				<.0001
no	71.84 (5,601)	4.19 (327)	23.97 (1,869)	
yes	88.45 (2,871)	2.77 (90)	8.78 (285)	
Recreation therapist				<.0001
no	66.12 (3,876)	3.99 (2.34)	29.89 (1,752)	
yes	88.71 (4,596)	3.53 (183)	7.76 (402)	
Addiction counsellor				<.0001
no	74.29 (6,984)	3.66 (344)	22.05 (2,073)	
yes	90.62 (1,488)	4.45 (73)	4.93 (81)	
Dietician				<.0001
no	75.01 (7,187)	3.86 (370)	21.13 (2,024)	
yes	87.89 (1,285)	3.21 (47)	8.89 (130)	

Table D-2. Characteristics of discharge, stratified by early leave status (N=11,043)

	Discharge status, % (N)			
	No early leave 76.72% (8,472)	**Early leave, unplanned** 3.78% (417)	**Early leave, Short length of stay (<=6 days)** 19.51% (2,154)	**P value**
Discharged To				
Private home/apartment/rented room	68.7 (7,583)	3.7 (366)	19.7 (1,946)	<.0001
Board and care	80.30 (53)	0.0 (0)	19.7 (13)	
Group home for persons with physical disabilities	58.8 (10)	#	35.3 (6)	
Psychiatric hospital	77.68 (87)	#	21.4 (24)	
Homeless (with or without shelter)	67.33 (204)	10.6 (32)	22.11 (67)	
Rehabilitation hospital/unit	92.3 (48)	0.0 (0)	#	
Acute care hospital	74.5 (73)	0.0 (0)	25.5 (25)	
Other	81.9 (370)	3.8 (17)	14.4 (65)	

Note:

- *# indicates number was too small to report*.
- "Other" category includes: Assisted living or semi-independent, mental health residence, settings for persons with intellectual disabilities, correctional facilities, hospice facility/palliative care unit, deceased, and other.