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Long-Term Patterns of Acute Mental Health Service Use After a First Episode of Psychosis: Examining Ongoing Psychiatric Care Beyond the Critical Period

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Abstract

The long-term patterns of acute mental health service use after treatment in an early psychosis intervention (EPI) program are not well known. The objective of this thesis was to investigate the long-term patterns of acute mental health service use. We used health administrative data to examine the patterns and risk factors associated with acute mental health service use over the 5- to 10-year period post-EPI admission. Between years 5 to 10 post-EPI admission, approximately one quarter of people contacted acute mental health services. Factors associated with acute mental health service use during this period included younger age at admission, and prior use of acute mental health services in the first 5 years post-EPI admission. Our findings show that a subset of people with psychotic disorders continue to have contact with acute mental health services over the longer-term and suggests that the service needs of people recovering from psychosis may not be met.

Keywords: First-episode psychosis, mental health service use, survival analysis, early intervention, psychiatric hospitalization, involuntary admission, emergency department visit

Summary for Lay Audience

Psychosis is used to describe conditions that seriously affect the mind and cause some loss of touch with reality. Psychosis is a symptom of serious mental health illnesses such as schizophrenia. A person experiencing psychosis may see, hear, or believe things that are not real. Psychotic disorders typically begin in late adolescence, and early adulthood, during a crucial developmental period for young people in school and work. Research has shown that early diagnosis and treatment for psychosis is crucial for improving the long-term course of illness and minimizing the disruption to various important aspects of patients' lives, including their relationships, school, work, and independence. Hospitalizations, involuntary admissions, and emergency department services are commonly used mental health services, which may be necessary for young people experiencing a mental health crisis during the first few years following a first episode of psychosis. We know less about the long-term use of these acute mental health services 5- to 10-years after the first episode of psychosis. The overall goal of our thesis was to examine the long-term patterns of psychiatric hospitalization, involuntary admission, and mental health-related emergency department visits using healthcare data for people treated by an early psychosis intervention program in London, Ontario. We found that while the number of people using these services declined over time, a small proportion continued to have ongoing contact during the 5- to 10-year period after treatment from an early psychosis intervention program. We found that people with ongoing contact with acute services during the 5- to 10-year period were more likely to be younger and have previously used acute services during the first 5 years.

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List of Abbreviations

CI = Confidence interval

CIHI = Canadian Institute for Health Information

DAD = Discharge Abstract Database

DCP = Dataset creation plan

DUP = Duration of untreated psychosis

ED = Emergency department

EPI = Early psychosis intervention

FSA = Forward sortation area

FEP = First-episode psychosis

HR = Hazard ratio

ICES = Institute for Clinical Evaluative Sciences

IKN = ICES key number

IQR = Interquartile range

LOS = Length of stay

MOHLTC = Ministry of Health and Long-Term Care

NACRS = National Ambulatory Care Reporting System

NOS = Not-otherwise-specified

ODB = Ontario Drug Benefits

OHIP = Ontario Health Insurance Plan

OMHRS = Ontario Mental Health Reporting System

ONMARG = Ontario Marginalization Index

OR = Odds ratio

PEPP = Prevention and Early Intervention Program for Psychoses

RPDB = Registered Persons Database

SD = Standard deviation

Chapter 1

1. Introduction

The first chapter of this thesis will provide relevant background information and an overview of this thesis. Firstly, background information on first-episode psychosis and early psychosis intervention programs will be summarized. In the following section, the purpose and specific objectives of the study will be described. Lastly, the structure and organization of the remaining chapters, as well as the role of the student, will be outlined.

1.1.1 First-Episode Psychosis (FEP)

The term 'first episode of psychosis' is commonly used to refer to people in the early stages of a psychotic disorder, often operationalized based on duration of illness, first treatment contact, or duration of prior antipsychotic treatment.[1] Psychosis is a clinical syndrome composed of a wide range of symptoms causing disturbances to the mind, and a disconnect from reality. Approximately 3% of the general population will experience an episode of psychosis during their lifetime, with the majority of people experiencing the onset of psychotic symptoms during late adolescence and early adulthood, between the ages of 14 and 35.[2] The onset of psychosis usually emerges earlier in males compared to females, and this difference has been attributed to sex differences in maturational changes during adolescence.[3] Symptoms of psychosis are often characterized as positive and negative symptoms. Positive symptoms – which can include delusions, hallucinations, disorganized thinking (speech), and grossly disorganized or abnormal motor behavior – are signs and symptoms that are often exaggerated deviations of normal

psychological functions, such as believing, perceiving, and speaking. Delusions are fixed, false beliefs that are firmly held and are out of keeping with the person's cultural environment.[4] Hallucinations refer to sensory perceptions in the absence of an external stimulus that have qualities of real perceptions.[4] People with psychosis most often experience auditory hallucinations, whereas visual, tactile, gustatory and olfactory hallucinations are less common. To the person experiencing a hallucination, the sensory perceptions may appear to be real in the absence of external stimuli, however these alterations are created within their own minds.[4] Disorganized thinking refers to changes in a person's thinking patterns that make it difficult to concentrate or to follow a conversation (e.g., thoughts speed up, slow down or become jumbled).[4] Disorganized speech refers to a disturbance in a person's ability to communicate coherently with others, and may include abnormalities in speech such as rapid speech, rapidly shifting from topic to topic (loose associations), and using made-up words and phrases (neologisms).[4] Negative symptoms – which may include reduced motivation, social withdrawal, and restricted speech and verbal fluency – involve reductions to a person's normal behaviour.[4,5] Both positive and negative symptoms can significantly impair a person's functioning. A person with psychosis may experience other symptoms and behaviours alongside the psychotic symptoms, such as sleep disturbances, substance use, mood changes, suicidality, and impaired cognitive functioning.[4]

1.1.2 Course of Psychosis

The course of psychosis typically occurs in three phases: prodromal phase, acute phase, and recovery phase. It is important to note that the course of psychosis is variable and

people who experience a psychotic episode may not exhibit the same symptoms throughout the course of illness.

The first phase is the prodromal phase, which precedes a first episode of psychosis and is characterized by subtle changes in a person's feelings, thoughts, perceptions, and behaviors and includes symptoms such as reduced concentration and attention, reduced motivation, social withdrawal, sleep disturbance, irritability, anxiety, and reduced vocational functioning related to school or work.[6] The length of the prodromal phase is typically several months, although this can vary widely from person to person. Furthermore, not everyone with a psychotic episode will experience a prodromal phase. [6] The second phase is the acute phase, which is also commonly known as the "critical period". During the acute phase, people with psychosis experience the onset of psychotic symptoms, which can be very distressing and disruptive to their normal lives. During this time, people commonly experience positive symptoms such as hallucinations, delusions, and disorganized thoughts and behaviors. [6] The third phase of psychosis is the recovery phase, otherwise known as the residual phase. The recovery phase is characterized by a reduction or absence of symptoms, and ideally, a return to premorbid levels of psychosocial functioning. [6] Recovery is a gradual and nonlinear process, but with timely and effective treatment for psychosis and management of psychotic symptoms, people can recover from a first episode of psychosis and return to living meaningful lives.

1.1.3 Early Psychosis Intervention (EPI) Programs

The early years after a first episode of psychosis are a critical period for improving long-term recovery outcomes.[7] Over the past two decades, a greater recognition of the

importance of intervening during the early phases of psychosis and reducing the delay in diagnosis and treatment has led to the development of specialized early psychosis intervention (EPI) services worldwide.[8] EPI programs provide specialized and comprehensive phase-specific services that are aimed at the early detection of emergent psychotic symptoms, reduction of the duration of untreated psychosis (DUP), and providing rapid access to effective treatment for people who experienced a first episode of psychosis.[9] EPI programs aim to minimize disruptions to the clinical, educational, vocational, and social functioning of young people experiencing psychosis so that they can manage their lives while learning how to manage their disorder.[9,10] Early detection and phase-specific treatment may be offered in addition to standard care, or provided through a specialized early intervention team.[11] Although universally accepted standards of early intervention care have been published and accepted by various organizations and governments worldwide for the types and duration of services delivered to patients, an ongoing challenge is ensuring that these standards are followed. An assertive case management approach is often used, which involves intensive medical and psychosocial management provided by a nurse or social worker case manager, with medical management by a psychiatrist.[12]

For the purpose of this thesis, we focused on young people with FEP admitted to the Prevention and Early Intervention Program for Psychoses (PEPP) in London, Ontario. Established in 1997, PEPP is a long-standing integrated clinical and research EPI program that typically provides patients with 2 years of a comprehensive range of specialized services, including psychosocial and pharmacological treatments, individual- and family-level psychoeducation, vocational rehabilitation, and social support.[13] Patients

who do not sufficiently recover may require an additional 1 to 3 years of extended case management.[13] Between years 2 and 5 following entry into PEPP, care is often stepped down from intensive treatment to medical management involving a program psychiatrist.[13]

Previous studies have consistently found that young people with FEP who receive care from EPI services have better clinical, social, and functional outcomes during the first two years of treatment, such as improved symptom severity, increased treatment adherence, and fewer psychiatric hospitalizations, compared to standard mental health services.[14] Psychosocial services incorporated into EPI programs, such as cognitive behavioral therapy and vocational training, promote broader recovery, and improve patients' long-term clinical and social outcomes related to quality of life, vocational functioning, and personal wellbeing.[15] In addition to timely early intervention, the transition to less intensive services following discharge from EPI programs is crucial for sustaining the early benefits of EPI programs over a long-term (5- to 10-year) period. Following discharge from EPI services, health care services should be delivered based on ongoing need to address long-term patient outcomes such as substance misuse, relapses, and rehospitalizations.[16]

1.1.4 Mental Health Service Use in Early Psychosis

In recent decades, the deinstitutionalization movement has placed a greater emphasis on the treatment and management of psychosis using outpatient- and community-based services.[17,18] Findings from a prior systematic review and meta-analysis have shown that during the early phases of psychosis, EPI programs are effective at preventing the need

for psychiatric hospitalization, reducing the total length of psychiatric hospitalization, and reducing the frequency of inpatient service use, relative to standard psychiatric care.[19,20]

In Canada, a large proportion of the economic burden of psychotic disorders is attributed to direct healthcare costs for acute- and non-acute hospital services, as well as large indirect costs due to lost productivity, as evident from high rates of unemployment, and low educational status among people with psychotic disorders. [21] In this thesis, we focus on the use of acute mental health services, defined as services contacted by people with psychosis experiencing a mental health crisis who require immediate treatment. Contact with acute mental health services – including mental health-related emergency department (ED) visits, psychiatric hospitalizations, and involuntary admissions – is frequent among young people during the early years following a first diagnosis of psychosis.[22] The type and frequency of mental health services used during the early critical period have important implications for the long-term trajectories of mental health service use. Prior studies have shown that psychiatric hospitalization during the first two years following diagnosis of a psychotic disorder was associated with a higher likelihood of future psychiatric hospitalization.[23] In a study conducted in Ontario, Rodrigues and colleagues observed that approximately one in three people with FEP experienced a psychiatric hospitalization during the first 2 years following admission into an EPI program.[24] Higher rates of psychiatric hospitalization were associated with younger age, an index diagnosis of psychosis NOS, prior substance use, and migrant status.[24] Rodrigues and colleagues also examined involuntary hospitalization in FEP, and observed that approximately one in four patients experienced an involuntary admission in

the first two years following EPI admission, with younger age at diagnosis, migrant status, recent police involvement, and admission to a general hospital associated with a higher risk of involuntary admission during the early course of illness.[25]

The use of acute mental health services among people with FEP have larger implications for the long-term provision of care throughout the course of illness, and affects other stakeholders including caregivers, clinicians, and the broader mental health care system. Many patients and caregivers have expressed conflicting perceptions and experiences of the use of acute mental health services.[68] The provision of psychiatric services in hospital settings may be distressing and disruptive for people experiencing the first onset of psychotic symptoms. The experience of psychiatric hospitalization has been characterized by some patients as necessary, accompanied by feelings of safety and care, whereas others have described their experiences as negative, traumatic, stigmatizing, and chaotic.[27,28] Such experiences may result in long-term avoidance of mental health services and delayed help-seeking when a relapse occurs, which may lead to a worsening of symptoms that can result in the use of more coercive measures in future contacts with the mental health care system.[29]

From a healthcare system perspective, the use of acute mental health services contributes a substantial portion of the economic burden associated with the cost of care for psychotic disorders, and accounts for approximately half of all treatment-related costs for psychosis.[30] The inpatient services required to treat patients with FEP are scarce and expensive resources in healthcare systems around the world.[31] Between 2006 and 2011, the rates of mental health service use among children and youth in Ontario have significantly increased, with a greater rate of increase observed for acute psychiatric

services.[32] The increasing rate of contact with acute mental health services over time suggests that people with psychiatric disorders may be receiving inadequate outpatient or community-based mental health care. In developed countries, such as the United States and Canada, the proportion of mental health-related ED visits is increasing over time, and presently, mental health-related disorders are the 10th leading cause of ED visits for males aged 15-65 years.[33]

Previous studies evaluating the impact of early intervention services on healthcare system cost savings in Ontario, Canada, and the United States have showed that these specialized programs have the potential to reduce costs associated with use of acute care services over the 2 year duration of the EPI program.[34,35] Early psychosis patients treated in EPI programs had significantly fewer emergency department visits, hospitalizations, and involuntary admissions, compared to those receiving standard psychiatric services. [34] For the PEPP program specifically, Anderson and colleagues reported lower rates of ED visits and higher rates of hospitalization compared to patients who did not receive EPI services in the 2-year period after admission; however, many of the differences in mental health service use observed in the first 2 years after admission did not persist in the subsequent 2-5 years following admission, suggesting a dilution of the benefits of EPI services.[36]

Given the substantial treatment costs associated with psychotic disorders, and the increasing rates of contact with acute mental health services, it is imperative to understand how the use of services early in the course of illness translates to long-term patterns of acute mental health service use beyond the critical period, when patients

typically transition out of EPI and into services focused on the long-term medical management of psychosis.

1.2 Study Rationale

Recovery is an important outcome in psychosis research, however, there is no consensus on its operational definition. Recovery is a complex, multifaceted concept, and recent definitions of recovery place an emphasis on components of psychosocial functioning, such as productivity in work or school, family life, social relations, and recreational activities.[37,38] One important dimension of this conceptualization of recovery is the absence of psychiatric hospitalizations, which is known as institutional recovery. Understanding the long-term patterns of acute mental health service use among people with psychosis has relevance for both clinical and personal perspectives of recovery. From the patients' and families' perspective, contact with acute mental health services can result in negative and distressing experiences that discourage patients' future use of health services.

Literature on the long-term trajectories of mental health service use after a first episode of psychosis is scarce. The existing literature on first-episode psychosis has focused primarily on the short- (first 2 years after first diagnosis) and medium-term (2 to 5 years after a first diagnosis) patterns of mental health service use. For the purpose of this thesis, we focused on long-term institutional recovery. Specifically, we investigated the relationship between clinical, sociodemographic, and service-related factors and long-term (5 to 10 years) patterns of mental health service use following a first diagnosis of a

psychotic disorder. We also examined the factors associated with acute mental health service use during the 5- to 10-year period post-diagnosis.

1.3 Thesis Objectives

The overarching goal of this study was to investigate the long-term patterns and factors associated with acute mental health service use among people with FEP treated at an EPI program. Our objectives were to:

1) Describe the long-term patterns of acute mental health service use among people with FEP with respect to the types of services used, intensity of service utilization, and timing of mental health service use. The types of acute mental health services examined in this study included ED visits for mental health reasons, psychiatric hospitalizations, and involuntary admissions;
2) Identify the timing of first contact with acute mental health services during the 5- to 10-year period following first diagnosis of psychosis, when patients are typically discharged back to primary or secondary care.
3) Identify sociodemographic, clinical, and service-use factors at baseline that are associated with the long-term use of acute mental health services.

1.4 Overview of Thesis

In Chapter 2, we summarize the literature on the long-term patterns of mental health service use among people with FEP, with a focus on the use of acute care services. In Chapter 3, the methods used in this thesis will be described, including the data sources, study setting, inclusion criteria, variables and outcomes of interest, and statistical analysis plan. In Chapter 4, we report on the descriptive statistics of the sample, and present the

main findings from our analyses addressing our specific thesis objectives. In Chapter 5, we discuss our study's key findings, limitations, and the implications of our findings for future research, treatment, and policy development.

Chapter 2

2 Literature Review

The purpose of this chapter is to summarize the current literature on the long-term patterns (5+ years after onset) of mental health services use among people with first-episode psychosis, with a focus on use of acute mental health services. We will also discuss the gaps in the existing literature, and how our study's thesis and objectives can help to address the gaps.

2.1 Indicators of Acute Mental Health Service Use

Our current understanding of long-term patterns of mental health service use among people with FEP is limited by the scarcity of longitudinal studies with follow-up periods of 5 years or longer. Mental health services play an important role in ensuring that the appropriate treatment is provided over the course of illness that meet the service needs of people with FEP. There is no universal definition or standard for measuring mental health service engagement and outcomes, despite indicators of mental health service use being commonly reported as outcome measures in longitudinal FEP cohort studies. The factors influencing patterns of mental health service use are complex and dynamic, and may change in relation to stage of treatment, patient need, and developmental factors.[39] Furthermore, the factors associated with acute mental health service use after FEP may also vary between geographic regions due to differences in the availability of hospitalization and acute services, quality of outpatient care, and individual preferences across mental health care systems. Access to comprehensive, continuous, and coordinated

psychiatric treatment for people with psychosis has been identified as an important factor associated with sustained symptomatic remission and improved levels of functioning.[40]

Indicators of health service use have been developed based on the clinician and health system perspective, which emphasizes the volume and type of services delivered to the patients (e.g. number of mental health-related ED visits and psychiatric hospitalizations). Psychiatric hospitalizations and other acute mental health service outcomes have high face validity and are easily recognized as significant events by patients, families, and clinicians. Health care systems commonly use readmissions over the longer-term period after FEP as an indicator for quality of health care and an adverse outcome in FEP.[41,42] Hospital admissions are consistently reported as an outcome measure for psychosis and have been shown to be significantly associated with quality of life and global psychopathology.[43] From the patient's perspective, ED visits, hospitalizations, and involuntary admissions are burdensome. However, these indicators have been criticized for focusing heavily on health-care system use and costs, which may be less meaningful for the people experiencing psychosis, as they do not focus on the personal process of recovery. Nevertheless, indicators of acute mental health service use are advantageous for evaluating institutional recovery, as they are routinely collected and readily available in health administrative data and medical records. In longitudinal FEP studies, hospitalizations are generally reported as outcome measures in two ways:

1) Number of psychiatric admissions

The number of psychiatric admissions can be measured as a count variable representing the cumulative frequency of hospitalizations over a defined follow-up period. The number of admissions may be expressed as an average, using mean or median values, and

binary indicators can be constructed to reflect the proportion of unique patients who had an inpatient admission during the study period. Hospital readmission, in particular, is a widely used indicator of health care quality, where readmissions may reflect substandard care and inefficient utilization of outpatient mental health services.[41] Psychiatric admissions may also be an indicator of relapse – indeed, McCreadie and colleagues defined relapse as the readmission to inpatient care due to worsening of symptoms or a psychotic episode.[44] Relapse has also been defined without a mental health services component as "a recurrence of positive psychotic symptoms which are of clinical significance, which persist for a sustained period of time and which follow a period of partial or full remission".[45] A study examining the relationship between relapse and hospitalization in FEP has shown that they are distinct but related measures, and both are useful as indicators of processes of care, however hospitalization is a highly specific but insensitive measure of relapse.[46]

2) *Duration of inpatient care*

The duration of inpatient care, or total hospital days, is often reported as a health service outcome in psychosis research. A longer duration of inpatient care over a long-term follow-up period may be an indicator of a more severe illness course and less favorable trajectories of mental health service use.[47] Total hospital days can be measured as a continuous variable representing the average duration of inpatient care or cumulative days of inpatient care over a time interval. Previous studies have demonstrated that a small minority of people with psychosis have multiple hospitalizations that account for a disproportionately large proportion of the inpatient stay.[29] Medians are preferred for reporting on the skewed distribution of total hospital days. Nevertheless, from a service

provider perspective, the mean hospital days is advantageous for estimating total bed needs and costs. To increase the comparability of duration of inpatient care across studies with differing follow-up periods, the total hospital days can be standardized to the number of days in inpatient care per month or per year.[48]

2.2 Long-Term Patterns of Acute Mental Health Service Use in First-Episode Psychosis

As described in Chapter 1, EPI programs have been shown to improve short- and medium-term outcomes related to symptomatic and functional domains, as well as to reduce the number of hospitalizations and total hospital days.[20] Despite the importance of understanding the trajectories of ongoing care received by patients with FEP, longer-term (5+ years) patterns of acute mental health service use following entry into an EPI program have not been researched extensively. It is unclear how many patients require hospitalizations over a longer-term period following FEP, and the total length of inpatient stay required during the later course of illness. [20] A systematic review of hospitalization after FEP found that across 81 longitudinal studies, the pooled proportion of patients with FEP that required at least one hospitalization during a 7-year period following FEP was approximately 55% (95% CI: 50.3-60.5%), with an average total hospital LOS of 4 months during the 7-year period.. Most hospitalized patients had infrequent and relatively short admissions (median = 2 admissions, IQR = 1-4 admissions), and a minority with a large number of admissions (10+) and longer total hospital lengths of stay.[49] The "revolving door" phenomenon is a term used to describe the small minority of people with psychosis considered heavy users of mental health services who have a large

number of repeated psychiatric hospital admissions.[50] The average hospital LOS has decreased over the past 20 years, most drastically in the last decade, and the proportion of people with FEP requiring a psychiatric hospitalization after first episode psychosis has declined over time. It is unclear how a shortened average LOS and earlier discharge in people with FEP affects care pathways and subsequent contacts with mental health services over time. A separate systematic review examining long-term outcomes between FEP patients admitted to EPI programs and those receiving standard care found inconsistent results regarding the number of hospitalizations and the total hospital LOS over the longer-term (5- to 10-year period post EPI admission). In many studies, by the end of the 5-year period following FEP, patients receiving treatment from EPI programs were not significantly different from patients receiving standard care in terms of the occurrence of hospitalization and mental health service use.[51] The findings related to long-term mental health service use were further complicated by the fact that differences in hospitalization were not significant at all time points after the end of EPI services, suggesting that the impact of EPI programs may become diluted over the long-term course of psychosis.[51]

There is a scarcity of long-term studies examining the patterns of acute mental health services use among young people admitted to an EPI program beyond the 5 years after a first diagnosis of psychosis. Chan and colleagues' systematic review of studies reporting on long-term outcomes in people receiving EPI services, relative to standard care, found that only six of the fourteen studies included in their review reported on mental health service-related outcomes, including psychiatric hospitalization, outpatient mental health services, psychotherapy, and medication adherence. [51]

We conducted a scoping literature review on long-term patterns of mental health service use among people with FEP. We conducted an electronic literature search in PubMed, Medline, and EMBASE of studies written in English reporting on indicators of long-term acute mental health service use following FEP. In the absence of a universal definition for what constitutes a long-term outcome in psychosis, we chose to include studies with follow-up periods of 5 years or longer post EPI entry, reporting on hospitalization and acute mental health service use outcomes among people with FEP. The study characteristics and key findings from the studies identified in our literature search are presented in Table 2.1**.**

We identified a total of 18 longitudinal studies with a follow-up period of five years or longer. Studies were conducted in a number of countries across Australia, Europe, North America, and Asia, between the years 1992 and 2017.[37,44, 47,52-64] Of the 18 studies included in the review, 8 had a median follow-up period of 10 years, and the length of follow-up periods ranged from 5 years to 18 years. The sample sizes ranged from 49 to 839 patients with psychosis, with a follow-up rate of 58% to 97%. Studies with small sample sizes (<100) generally had higher follow-up numbers. Most of the identified studies were retrospective cohort studies, and a few were randomized controlled trials examining the effectiveness of EPI services relative to standard psychiatric care as the control group.

The measures of mental health service use most commonly used included the number of contacts with mental health services, and the types of mental health service contacted. Most studies measured the number of contacts with mental health services using count variables that represented the number of contacts made with a specific type of health

service over a defined interval of time. Psychiatric hospitalizations and involuntary admissions were the most common types of mental health services studied. Several studies also reported on the use of ED services for mental health reasons, but rarely did studies report on indicators of mental health service use involving primary care visits, community-based psychiatric visits, social services, police, or crisis services.

There was substantial variability in the way that studies reported on time intervals of interest and mental health service utilization during the time intervals. Several studies reported on the number of compulsory or involuntary hospital admissions and the number of contacts with outpatient services. Studies also reported on the percentage of time in hospital or inpatient care over the follow-up period.

The current literature on long-term use of acute mental health services in FEP suggests that a large proportion of patients with first-episode psychosis require at least one hospitalization over a 5- or 10-year period following a first episode of psychosis. Across multiple studies, the 5- and 10-year rates of hospitalization were 70% or higher, indicating that a large proportion of patients with first-episode psychosis will require at least one readmission to psychiatric care over a follow-up period of 5 years and longer. Several studies found that a small minority of patients accounted for a large proportion of inpatient service utilization because of their frequent and repeated rehospitalizations over the follow-up period.

Table 2.1 Summary of studies (n=18) reporting on long-term (5 years and longer) mental health service utilization outcomes among people with psychosis

Study Authors (Year)	Country	Sample Source	Sample Size	Length of Follow-Up	Outcome Measures	Relevant Findings
Munk-Jorgensen et al. (1991)	Denmark	Danish Central Psychiatric Research Registery	53 patients with a first diagnosis of schizophrenia	13 years	Type of inpatient admission (voluntary/involuntary), duration of hospitalization (days)	12.3% of readmissions during the follow-up period were involuntary. 60.4% of patients spent more than 10% of the follow-up in hospital, 33.9% spent more than 20% and 9.4% more than 75%
McCreadie et al. (1992)	Scotland	Scottish First Episode Schizophrenia Study	49 with a diagnosis of schizophrenia with 5-year follow-up information available for 44 (89.8%) patients	5 years	Number of readmissions to inpatient care over the follow-up period, length of time in inpatient care during follow-up period	At 5-year follow-up, 13 patients (30%) had no readmission to inpatient care. The mean total length of time spent in inpatient care was 8.2 months (SD 11.1 range 1-48). 23 patients (53%) had one or two relapses, 7 (17%) had three or more relapses
Takei et al. (1999)	England	Camberwell Cumulative Psychiatric Case register	88 patients with a first hospital admission for functional psychosis, 85 (97%) traced at 18-year follow-up	18 years	The total length (days) and frequency of psychiatric admissions	Afro-Caribbean ethnicity patients with schizophrenia was significantly associated with a greater median length of admission compared to White patients (255 days vs. 89 days, respectively). 66% of Afro-Caribbean patients had an involuntary admission at follow-up compared to 26% of White patients.

Study Authors (Year)	Country	Sample Source	Sample Size	Length of Follow-Up	Outcome Measures	Relevant Findings
Harrow et al. (2005)	United States	Chicago Follow-up Study	274 early young patients with psychotic disorders, 210 (77%) completed 15-year follow-up	15 years	Proportion of patients with rehospitalizations at follow-up points	Patients diagnosed with schizophrenia were more frequently hospitalized over the follow-up period. Across all diagnosis types, there was a decreasing rate of rehospitalization from 2-year to 15-year follow up (rehospitalization rate ranging from 11-32% based on diagnosis type)
Bertelsen et al. (2008)	Denmark	OPUS trial	547 patients with first-episode psychosis, information available for 312 (57%) patients at 5-year follow-up	5 years	Duration of hospitalizations, emergency department utilization, outpatient contacts	Patients in intensive early intervention programs had significantly fewer days in hospital compared to patients receiving standard care in the first two years, but not at 5-year follow-up (96 vs 123 days). Mean emergency department use, and outpatient contacts did not differ between groups at 5-year follow-up
White et al. (2009)	United Kingdom	National Health Service Psychiatric Units	109 patients with first-episode psychosis, 69 (63.3%) patients interviewed at ten-year follow-up	10 years	Number of contacts with mental health services	76% of patients had been in contact with mental health services for 8 or more of the past 10 years. 18% of patients had no further inpatient hospitalizations and 18% of patients had 10 or more hospitalizations over follow-up. 19% of patients had full- or part-time employment at follow-up and 48% had never worked.

Study Authors (Year)	Country	Sample Source	Sample Size	Length of Follow-Up	Outcome Measures	Relevant Findings
Gafoor et al. (2010)	United Kingdom	Lambeth Early Onset (LEO) trial	Original cohort of 144 patients with first-episode psychosis, 99 patients at 5-year follow-up (70%)	5 years	Number of inpatient admissions	No significant differences in the number of readmissions or bed days used for patients receiving early intervention services and standard care at 5-year follow-up. 33% of patients receiving specialized care had one or more readmissions by the end of the 5-year follow-up period.
Henry et al. (2010)	Australia	Early Psychosis Prevention and Intervention centre (EPPIC)	651 patients with first-episode psychosis at 7-year follow-up (90%) with 484 interviewed	7 years	Proportion of patients receiving psychiatric treatment, type of treatment used (private psychiatrist/ medical practitioner, community mental health care center, inpatient psychiatric care)	At follow-up, 487 patients (77.5%) were receiving psychiatric treatment. The most commonly used treatment types were community mental health centers (49.7%) and private practitioners (46.6%). Inpatient psychiatric care was rarely used (3.7%) among patients who used psychiatric treatment.
Angelo et al. (2011)	Italy	Programma2000 early psychosis intervention	23 patients with first-episode psychosis receiving early intervention services and 23 patients with FEP receiving standard care, with all patients remaining at 5-year follow-up	5 years	Number of days using hospital inpatient care and in residential care, cost of care associated with inpatient, outpatient, and residential care	9 (39%) patients in the EPI group used inpatient services over 5 years compared to 13 (56%) patients in the standard care group. Patients in the EPI group were marginally less likely to use inpatient care and semi-residential facilities, and had shorter hospitalizations compared to patients receiving standard care.

Study Authors (Year)	Country	Sample Source	Sample Size	Length of Follow-Up	Outcome Measures	Relevant Findings
Morgan et al. (2014)	United Kingdom	Aetiology and Ethnicity in Schizophrenia and Other Psychoses (AESOP-10)	532 patients with first-episode psychosis, information collected for 387 (85%) patients at 10-year follow-up	10 years	Number of hospital and compulsory admissions, length of admissions	Patients with non-affective FEP had a greater rate and length of hospital admissions than patients with an affective disorder. 88% of patients with FEP were admitted to hospital at least once over the follow-up period (IQR 1-4) and 6% had 10 or more admissions (maximum number of admissions 20). 69% of patients were compulsorily admitted either at first presentation or at some point during the follow-up. A diagnosis of non-affective psychosis and male gender were associated with poorer outcomes. More than 70% of patients were employed for less than a quarter of the 10-year follow-up period
Chan et al. (2015)	Hong Kong	Early Assessment Service for Young People with Psychosis (EASY) program	145 patients with first-episode psychosis receiving early intervention services and 145 patients with first-episode psychosis receiving standard care, 102(70.3%) and 107(73.8%) at 10-year follow-up	10 years	Number of hospitalizations, duration of hospitalization	71% of patients receiving early intervention services had been hospitalized over a 10-year period. Patients with FEP receiving early intervention services had significantly fewer number of hospitalizations and shorter duration of hospitalizations over a 10-year follow-up period compared to patients receiving standard care
Friis et al. (2016)	Norway, Denmark	Scandinavian and Early Treatment and Intervention in Psychosis Study (TIPS)	301 patients with first diagnosis of nonaffective psychosis, 186 (61.8%) patients remaining at 10-year follow-up	10 years	Percentage of time over the 10-year period using inpatient care and in psychotherapy	The mean percentage of the follow-up period spent as in inpatient was 15.0% (median 6.7%) and 66.1% in psychotherapy (median 72.2%)

Study Authors (Year)	Country	Sample Source	Sample Size	Length of Follow-Up	Outcome Measures	Relevant Findings
Ajnakina et al. (2017)	United Kingdom	Genetics and Psychosis (GAP) study	245 patients with FEP, 84.5% at 5-year follow-up	5 years	Time to first-readmission, number of hospital and compulsory admissions, length of inpatient stay	70% of patients were re-admitted at least once, and 30% had three or more hospital-readmissions over the 5-year period. Black ethnicity associated with higher rates of compulsory admissions and longer inpatient stays compared to White British ethnicity.
Topor et al. (2018)	Sweden	Hospital registers	447 patients with first-episode psychosis, 361 (80.8%) patients followed-up at ten-years	10 years	Psychiatric hospitalization status, use of 24/7 social care, use of community-based psychiatric and social services	171 (45%) of patients were institutionalized at least once during the last 5 years of the 10-year follow-up. Among those that were not institutionalized, 157 patients (41%) received community-based psychiatric and/or social services. 58 patients (15%) achieved institutional recovery by not having contact with any institution- or community-based services.
Chi et al. (2016)	Taiwan	Nationwide population-based data for Taiwan	808 first hospitalization schizophrenic patients with information on 783 patients (96.9%) at 10-year follow-up	10 years	Number of outpatient visits and hospitalizations	25% of patients were re-hospitalized within the first four months following discharge. 29.5% of patients had no hospital readmissions and 50.5% had multiple readmissions during the 10-year follow-up period. The median time between admissions was 1.9 years. Age, gender, and length of first hospitalization were not significantly associated with psychiatric readmissions and emergency room visits

Study Authors (Year)	Country	Sample Source	Sample Size	Length of Follow-Up	Outcome Measures	Relevant Findings
Pedersen & Aarkrog (2001)	Denmark	Psychiatric unit at Bispebjerg Hospital in Copenhagen	839 patients with first-episode psychosis at baseline, 488 patients (58%) at 10-year follow-up	10 years	Number of psychiatric admissions and the duration of inpatient stay	For patients with a follow-up of 10-years or more, 223 (48%) were readmitted at least once during follow-up and 129 (26%) were classified as heavy users (patients admitted for more than 1 year, patients with at least four admissions during the 10-year period) A primary diagnosis of psychosis was associated with future heavy use of psychiatric services; however, age of onset was not predictive of future psychiatric service use
Nielsen et al. (2010)	Denmark	Danish Central Psychiatric Research Registry	13 600 patients with a first diagnosis of schizophrenia	10 years	Number of psychiatric admissions, number of bed days, number of contacts with outpatient care	Over a 10-year period, patients had fewer and shorter inpatient stays following first diagnosis and greater frequency of outpatient visits.
Strålin et al. (2020)	Sweden	Swedish Parachute project	161 patients with first-episode psychosis	14 years	Number of hospitalizations for psychosis	67% of patients were hospitalized in first year for psychosis. The proportion hospitalized declined over time, even in the first year Low educational level, younger age at onset of FEP and antipsychotic medication by year 1 were predictors of later hospitalizations for psychosis

2.3 Factors associated with long-term patterns of acute mental health service use in people with psychosis

Sex

The current literature on trajectories of mental health service use has reported mixed findings regarding the impact of sex and gender on long-term trajectories of mental health service use among people with FEP. Morgan and colleagues found that males and females had similar rates of hospitalization over a 10-year period following a first episode of psychosis, and including the first hospitalization, rates were equivalent to approximately one hospital admission every 3 years.[29] Furthermore, no sex differences were observed for rates of compulsory hospital admissions, although males generally had lengthier hospital admissions compared to females. A separate 10-year follow-up study found no significant association between gender and rates of hospital admissions or emergency department visits for mental health reasons.[62]

Rurality of residence

Previous studies have looked at the urban-rural disparities in long-term psychiatric service use among patients with FEP. A retrospective population-based cohort study in Taiwan using universal health claims data found that the risk of psychiatric readmission 4 years after the first admission for psychosis was higher among rural patients compared to urban patients. The urban-rural inequity for use of outpatient and ED services remained stable over time, however, the risk of psychiatric readmission 4 years after the first admission has decreased faster for urban patients relative to rural patients. This suggest that patients' rurality of residence may influence mental health needs, accessibility, and

utilization of psychiatric services.[65] A separate study reporting on psychiatric aftercare among adolescents with psychiatric disorders, not limited to psychosis, in Ontario, Canada, found that youth residing in rural areas were less likely to receive psychiatric aftercare within 395 days of discharge.[66] It remains less clear whether rurality of residence has a longer-term (5-year and longer) impact on patients' utilization of mental health services.

Material deprivation

A systematic review and meta-analysis of clinical and social factors associated with involuntary admission found that individual- and population-level indicators of economic deprivation among patients diagnosed with a psychotic disorder were associated with an increased risk for involuntary psychiatric hospitalization.[28]

Index diagnosis

A few studies found that a primary diagnosis of schizophrenia was associated with a greater risk of heavy use of psychiatric services later in the follow-up period, as compared to other psychotic disorders, where heavy use was defined as multiple hospitalizations.[37,63] Additionally, when comparing patients with a primary diagnosis of affective psychosis and nonaffective psychosis, those diagnosed with affective psychosis had a lower rate of hospital admissions and shorter hospital length of stay over a long-term follow-up period.[29]

Ethnicity

In general, studies found a significant association between Afro-American ethnicity and longer length of hospitalizations and more frequent involuntary admissions, compared to

people of White ethnicity. [47,53] Furthermore, Black ethnic groups were more likely to have longer inpatient stays and more frequent occurrences of police involvement during or shortly before a readmission to a psychiatric hospital. [47]

Age at first diagnosis of psychosis

The findings for the relationship between age of onset and risk of readmission have been inconsistent with some studies reporting on an increased risk of readmission for younger patients, whereas others have found no significant association. [63,67] An Australian study using data from a national survey of psychosis found that younger patients were more likely to be high intensity users of emergency mental health services and have a greater likelihood of requiring hospitalization.[69] In a FEP study conducted in Sweden, Stralin and colleagues found a strong association between younger age at onset of FEP and a greater risk of later for psychosis during the later 2- to 14-year period following FEP.

Substance misuse

Patients with comorbid substance use disorders had poorer treatment outcomes and more frequent compulsory admissions and psychiatric hospitalizations than patients with no prior history of substance misuse.[67]

Employment status

Steady employment status during the first 5 years after a first diagnosis of psychosis was associated with decreased mental health service use over the 5-year period, which suggests that independent vocational functioning was associated with lower dependence on mental health service use.[70,71]

2.4 Knowledge Gaps in the Current Literature

There is a lack of evidence from longitudinal studies with study periods of 5 years or longer reporting on long-term patterns of acute mental health services use in clinically defined populations of FEP. Moreover, even when health services utilization is examined in studies, it receives less attention compared to other clinical and functional outcomes and is usually assessed as a secondary outcome. Even when mental health service use outcomes are included in studies, the reasons for mental health service use remain unclear due to a lack of detailed information on whether the services were used for an emergency/acute reason versus routine service use. A further limitation of the prior research is that many studies report on the frequency and timing of health services utilized, but rarely do they assess the socioeconomic, clinical, and service-related risk factors associated with different service utilization trajectories.[72] Our existing knowledge of patterns of mental health services utilization in first-episode psychosis is based primarily on studies conducted outside of Canada, in countries with different mental health care legislation and practices. To our knowledge, no longitudinal study has attempted to identify the long-term patterns of mental health services use among people with FEP in a Canadian setting. The aim of our study is to add to the growing knowledge on long-term patterns of ongoing mental health service use in FEP by reporting on a broader range of acute mental health services used by patients with FEP as they navigate the mental health care system 10years afters a first diagnosis of psychosis.

Chapter 3

3 Methods

In this chapter we describe the methods used in this study. Firstly, we describe the key elements of the study design, data sources, and study setting in Section 3.1. In Section 3.2, the inclusion criteria for our FEP cohort are discussed. In Section 3.3, we propose definitions for our independent and outcome variables of interest and explain how the key variables are computed in our health administrative databases. Lastly, in Section 3.4, we outline the types of statistical techniques used to address our study's main objectives.

3.1 Study Design

We constructed a retrospective cohort of people with first-episode psychosis treated at the Prevention and Early Intervention Program for Psychosis (PEPP) between April 1st, 1997 and March 30th, 2006. We used a deterministic linkage of clients' information from PEPP with health administrative data to provide us with longitudinal information related to patients' ongoing interactions with the mental health system over a 10-year follow-up period after admission to PEPP. The index date for the follow-up period was the date of admission to the PEPP program. This project received approval from the Health Sciences Research Ethics Board at Western University.

3.2 Data Sources

We used a linkage of patient-level data from the PEPP program to population-based health administrative data at ICES. ICES is a non-profit, independent research organization that holds all of Ontario's health related records from the publicly funded

healthcare system. For privacy purposes, personal identifiers such as name and health card numbers were removed from the data and replaced with unique and confidential ICES Key Numbers (IKN), which allowed for the linkage of patient' data across various Ontario health administrative databases. This identification number was created using a secure ICES algorithm based on the Ontario health card numbers, which are then anonymized and encrypted.[73]

The following databases were used in this study:

Registered Persons Database (RPDB): The RPDB is a population registry that includes information on all Ontario residents who are enrolled in the Ontario Health Insurance Plan (OHIP). OHIP is a provincially funded health care program for citizens of Ontario and covers health care costs such as physician services, ED visits, and hospital admissions.[73,74] We used the RPDB to obtain sociodemographic information on key variables, including age, sex, neighborhood-level income quintile, and rural place of residence.

Ontario Health Insurance Plan (OHIP): OHIP claims database contains information on physician billings, for a wide range of health care services (diagnosis and procedures) covered by the provincial government's universal health insurance plan. Physicians who are compensated based on a fee-for-service remuneration model submit billings for the services they provide in order to be compensated, and physicians who are compensated through alternative payment plans submit shadow billing information. The OHIP database covers all reimbursement claims to the Ministry of Health and Long-Term Care

(MOHLTC) and contains information on the date of service, visit fee codes, and diagnostic codes for the service provided.

National Ambulatory Care Reporting System (NACRS): The NACRS database contains information on hospital-based and community-based ambulatory care visits in Canada, including; day surgery, outpatient and community-based clinics, and EDs. This database will also be used to identify contact with the ED for mental health reasons.[75]

Ontario Mental Health Reporting System (OMHRS): The OMHRS database contains patient-level demographic, diagnostic, procedural, and treatment information on all individuals admitted to a designated adult inpatient psychiatry bed in Ontario. OMHRS may also include information on psychiatric admissions for patients younger than 18 who were admitted to an adult mental health-designated bed.[76] OMHRS uses the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) diagnostic system for recording mental health-related discharge diagnoses. In the current study, this database will be used to identify the occurrence of psychiatric hospitalization and involuntary admission.

Discharge Abstract Database (DAD): The DAD database contains information abstracted from hospital records and captures data on acute inpatient services such as hospitalizations, chronic rehabilitation, and day surgery hospital discharges. The DAD includes information on patient identifiers (e.g. name, health care number), patient demographics (e.g. age, sex, geographic location), clinical (e.g. diagnoses, procedures), and information on hospital inpatient separations, such as discharges, deaths, sign-outs, and transfers to other facilities.[77] Provinces and territories submit data to the DAD using the International Statistical Classification of Diseases and Related Health Problems, 10th

Revision, Canada (ICD-10-CA) diagnostic system, which is an enhanced version of the ICD-10 for morbidity classification in Canada. [77] DAD data are collected, maintained, and validated by CIHI. Any psychiatric hospitalization not reported to OMHRS is reported to DAD.

3.2.1 Description of the Study Sample

This thesis used data from the Prevention and Early Intervention Program Psychoses (PEPP), which is an integrated clinical and research program based in London and Middlesex County, Ontario, Canada. PEPP provides early intervention services for people diagnosed with a nonaffective psychotic disorder in a defined catchment area of 425,000 people. We constructed a retrospective FEP cohort of 455 patients admitted to the PEPP between the fiscal years of 1997 and 2006. PEPP uses an assertive case-management approach that involves medical and psychosocial management geared towards the needs of young people with psychosis. [13] The program typically provides 2 years of intensive case management and other psychosocial and medical services, followed by less intensive medical management by a program psychiatrist between years 2 and 5 postadmission. [13,79] Note that these timelines may vary depending on clinical need. The core clinical features of PEPP include: 1) Initiatives for case detection and rapid assessment of previously untreated people with psychotic symptoms; 2) Development of a treatment plan in collaboration with patients and family members; 3) Flexible assessment and treatment approaches to facilitate engagement; 4) Comprehensive and coordinated individual-, group- and family-level pharmacological and psychosocial interventions.[13]

3.2.2 FEP Cohort Inclusion Criteria

People were eligible for admission to PEPP based on the following inclusion criteria:

1. Aged 16 to 50 years;
2. Diagnosis of nonaffective psychotic disorder (e.g. schizophrenia, delusional disorder, psychosis NOS);
3. Less than 30 days of prior treatment with antipsychotic medication;
4. Absence of a developmental disability or organic psychosis;
5. No outstanding criminal charges that would warrant ongoing contact with the criminal justice system and consequently prevent engagement with the program

3.3 Data Cleaning

There were several steps involved in preparing our data for analysis. Firstly, our datasets were prepared by an ICES analyst who identified, created, and compiled the variables of interest listed in our dataset creation plan (DCP). We checked to ensure that there were no duplicate observations, that the variable labels were correct, and assed the distributions of key variables for the presence of outliers of variables in our datasets.

3.4 Variables

3.4.1 Independent Variables

Sociodemographic factors

Sex

Sex was obtained from the RPDB databases, and female sex was used as the reference category in our statistical analyses.

Rural Place of Residence

We obtained information on rurality of residence from the RPDB, which was used as a dichotomous indicator variable. Rurality of residence accounts for the population size, distance, and commuter flow between rural and small towns and larger centres and is based on forward sortation areas (FSA; first three characters in a Canadian postal code) found in census data. An area designated as a rural place of residence has a core population of 10,000 or less. In our analysis, urban place of residence was used as the reference level for the rurality of residence variable.

Neighbourhood-Level Material Deprivation

A dichotomous indicator variable was created for material deprivation based on the Ontario Marginalization Index (ON-Marg). ON-Marg is an area-based multidimensional index used in population health research to show differences in levels of marginalization between urban and rural areas of residence in Ontario.[80] ON-Marg was empirically

derived using principal component factor analysis of 42 measures from Canadian census data and discriminates between geographical areas on the basis of postal codes. [80] The four dimensions that make up the ON-Marg include: residential instability, material deprivation, dependency, and ethnic concentration. For the purposes of thesis, we focused solely on material deprivation, which refers to an inability to access and attain basic material needs, and is comprised of census indicators that measure *income* (proportion of the population considered low-income, aged 15+ who are unemployed, proportion of income from government transfer payments), *education* (proportion of the population aged 20+ without a high-school diploma), *quality of housing* (proportion of households living in dwellings that are in need of major repair) and *family structure* (proportion of lone parent families). [80] Marginalization quintiles were created by sorting the marginalization score into five groups based on provincial distributions, ranked from 1 (least marginalized) to 5 (most marginalized). We created a dichotomous indicator variable for material deprivation level based on the ONMARG material deprivation quintiles, where high material deprivation level reflects those in the in the fourth or fifth most materially deprived quintiles based on the provincial distribution. For our analysis, low material deprivation was used as the reference category.

Clinical factors

Age at Index Diagnosis

Age at the index diagnosis was calculated using the date of birth and the date of admission to PEPP. In this thesis, age at admission used as a categorical variable with three categories: 16 to 20 years of age, 21 to 25 years of age, and 26 to 30 years of age.

We categorized age at index diagnosis to adhere to ICES data deidentification requirements. The 26-30-year age category was used as the reference in our statistical analyses.

Index Diagnosis

We created a categorical variable for the index diagnosis at the time of admission to PEPP, categorized as Schizophrenia Spectrum Disorder, Delusional disorder, and Psychosis Not Otherwise Specified (NOS). The specific ICD-9 and ICD-10 diagnostic codes used to categorize these diagnoses can be found in the Appendix.

3.4.2 Outcome Variables

We recorded information on health service use based on the time elapsed from the date of the first admission to PEPP to the date of contact with an acute mental health service. The frequency of contact with various mental health services was also collected in the health administrative databases. We used information on the date of contact with a mental health service to code indicator variables for health service use (dichotomous variable) and a continuous variable representing the total number of contacts with a service during the follow-up period by year. To prepare our data for survival analysis, we ensured that the intervals between the index and censor date were correctly coded within the follow-up period.

3.4.2.1 Indicators of Acute Mental Health Service Use

Our primary outcomes of interest were indicators of acute mental health service use – specifically mental health-related emergency department visits, psychiatric

hospitalizations, and involuntary admissions –throughout the 10-year period following the PEPP admission date. We computed count variables for the number of contacts patients had, and we computed binary indicator variables for any contact with each type of acute mental health service over the entirety of the 10-year. We aggregated indicators of mental health service use for the first five years following EPI admission of psychosis (EPI phase), the 5 to 10 years after EPI admission (post-EPI phase), and the entirety of the 10-year post-EPI admission period.

Emergency department visits for a mental health reason

ED visits for a mental health reason were identified from NACRS and OHIP data and were defined as visits for psychotic and non-psychotic mental disorders, substance use disorders, or social problems. A list of ICD and OHIP codes used in this definition can be found in the Appendix A.

Psychiatric hospitalizations

We used hospital admission and discharge dates to identify instances of hospitalization and the associated lengths of hospital stay (days). We also categorized the number of psychiatric hospitalizations by study year. Non-elective admissions for all psychiatric hospitalizations at acute care institutions were identified in the OMHRS and DAD databases using DSM and ICD diagnostic codes (Appendix A).

Involuntary admissions

We identified the number and timing of involuntary admissions based on information in the OMHRS, DAD, and OHIP databases (Appendix A). Involuntary admissions were defined in the OMHRS database using information collected on the inpatient status for

each admission that used Form 1 or Form 3.[81] An Application for Psychiatric Treatment "Form 1" is completed by a physician and allows a patient to be detained and examined for up to 72 hours in a psychiatric hospital. If patients continue to meet the criteria for involuntary admission, a Certificate of Involuntary Admission "Form 3" may be subsequently completed by a different physician than the physician who completed the Form 1 that allows a patient to be detained for up to 2 weeks.[83]

3.5 Statistical Analysis

All analyses were performed using SAS version 9.4 (SAS Institute, Cary, North Carolina) and Kaplan-Meier survival plots were created using Stata Statistical Software version 14 (StataCorp LLC, 2015). We calculated descriptive statistics for baseline sociodemographic, clinical, and service use characteristics. Continuous variables were described using means and standard deviations (SD), as well as medians and interquartile ranges (IQR), and categorical variables were described using proportions and percentages.

3.5.1 Objective 1 Analysis

Our first objective was to describe the long-term patterns of mental health service use among people with FEP with respect to the type, intensity, and timing of contacts with acute mental health services. We computed the proportions of patients who had any ED visits for mental health reasons, psychiatric hospitalizations, and involuntary admissions over the 10-year period postadmission, respectively. The timing of acute mental health service use was described using frequency distributions of contact with each type of mental health service by follow-up year, and the intensity of service use was categorized

based on the number of contacts with each service type by year (e.g., 1 contact, 2 contacts, 3 or more contacts).

3.5.2 Objective 2 Analyses

Our second objective was to identify the timing of first contact with acute mental health services during the 5- to 10-year period following first diagnosis of psychosis, We plotted separate Kaplan-Meier (K-M) survival estimates for the time to first contact for each type of mental health service outcome: ED visits for mental health problems, involuntary admissions, and psychiatric hospitalizations. The Kaplan-Meier survival curve is defined as the probability of surviving a given length of time while assessing time in many small intervals.[82] The nonparametric approaches of K-M curves in survival analysis are advantageous for handling incomplete observations during the survival time. We define the event of interest as the time to the first acute mental health contact during the 5- to 10-year period after admission to an EPI program.

We created Kaplan-Meier survival plots displaying the cumulative survival of time to first contact with mental health services (mental health-related ED visits, psychiatric hospitalization, involuntary admission) during the 5- to 10-year period post-EPI admission. We defined our time origin (t_0) as year 5 after a first diagnosis of psychosis. We used Kaplan-Meier survival curves stratified by age group and gender to estimate the time to ED visit, psychiatric hospitalization, and involuntary admission. The axes of the Kaplan Meier survival curves were created so that the Y-axis represents the survival proportion of patients who have not contacted the acute mental health services during the

5-year period post-EPI admission, and the x-axis was designated as the time, in days, following the 5-year follow-up time point.

3.5.3 Objective 3 Analyses

Our third objective was to identify sociodemographic, clinical, and service-use factors that are associated with the long-term use of acute mental health services. We used multivariable Cox proportional hazards regression to model the relationship between these factors and time to first contact with each of the acute mental health services in the 5- to 10- year period post-EPI admission. Cox proportional hazards models are semi-parametric approaches used in survival analysis to estimate the effect of explanatory variables on the risk of the occurrence of an outcome event, adjusting for other risk factors. This approach is widely used in health service research because of its ability to accommodate incomplete and censored time-to-event health administrative data.

There are two components of observation time that must be clearly defined: 1) The beginning point known as the time origin (t_0), and 2) A reason or cause for the observation of time to end.[84] We defined the time origin (t_0) in this analysis as the date 5 years after a patient's first diagnosis of psychosis and entry into the EPI program. The 5-year follow-up time point was chosen as the time origin because it aligned with our thesis' purpose of identifying long-term patterns of mental health service use among people with psychosis, between 5 to 10 years following a first admission. Cohort members were defined as being at risk until the date of the event of interest or they were censored at the date of last contact, loss of OHIP eligibility, death, or the end of follow-up period. The Kaplan-Meier survival curves were used to verify that the proportional

hazards assumption was satisfied for covariates included in our Cox regression models as predictors. To satisfy the proportional hazards assumption, there can be no crossovers present between the survival curves for a covariate of interest. Log-log graphs were also used to verify the proportional hazards assumption for fixed covariates of interest.

We computed separate univariate and multivariable Cox proportional hazard regression models to assess the association between sociodemographic, clinical, and service-related factors and time to event data for our outcomes of interest: 1) Time to first psychiatric emergency department visit for mental health-related problems during the 5 to 10 year period post-EPI admission; 2) Time to first psychiatric hospitalization during the 5- to 10-year period post-EPI admission; 3) Time to first involuntary admission during the 5-10 year period post-EPI admission. We included the following variables in the multivariable model: age at diagnosis, sex, rural place of residence, area-level material deprivation, diagnosis, and indicators of prior contact with mental health services (i.e. 0 to 5-year period post-admission). These health service indicators included total hospital days in the first 5 years post-EPI admission, as well as whether the person had any ED visit for a mental health reason, psychiatric hospitalization, or involuntary admission over this time period.

Results from the Cox proportional hazards models are presented as hazard ratios (HR) with associated 95% confidence intervals (CI). Hazard ratios are defined as the instantaneous rate of failure at time *t*, conditional on having survived to time *t*.[84,85]**Error! Reference source not found.** Like relative risk ratios, hazard ratios can be interpreted as the percent change in the hazards of the two population groups given an increase of one unit in an explanatory variable, adjusting for values of all other explanatory variables.[86] A

hazard ratio of more than 1 indicates an increased risk and a hazard ratio less than 1 indicates a decreased risk. [86] We computed modified Poisson regression models to examine risk factors associated with the total duration of psychiatric hospitalization between the period between the end of year 5 to the end of year 10 post-EPI admission. For the univariate Poisson regression analyses, we modelled the same variables used for the Cox proportional hazards regression analyses.

Chapter 4

4 Results

In Section 4.1 we present the descriptive statistics for sociodemographic, clinical, and service-related variables of the FEP sample. In Section 4.2, the long-term patterns of mental health service use among people with FEP are described with respect to the frequency, timing, and type of mental health services contacted by people with FEP over the 10-years after a first diagnosis. We then present the results of our survival analysis and regression models in Section 4.3.

4.1 Sample Characteristics for the FEP Cohort

Our cohort included 455 patients with FEP who were admitted to PEPP between the fiscal years of 1997 to 2006. Descriptive statistics for the sample sociodemographic and clinical characteristics are presented in Table 4.1. People with FEP were predominantly male (75.4%; *n*= 343) and living in an urban place of residence (92.5%; *n*=421). Most of the people with FEP (70%; n=268) were 25 years or younger at the time of admission to PEPP. Approximately half of the sample (47.0%; *n*= 214) were categorized as having high neighbourhood-level material deprivation, based on membership in the fourth or fifth quintiles of the ON-MARG index. Most patients had an index diagnosis of schizophrenia or schizoaffective disorder (43.9%; *n*= 191) or psychosis NOS (48.5%; *n*= 211), and delusional disorder was relatively uncommon in our sample (7.6%; *n*=33).

Of the 455 people in our FEP cohort, 413 (90.8%) were followed up at 5 years post-EPI admission, and 383 (84.2%) were followed up at 10 years post-EPI admission in the

health administrative data. The 10-year mortality rate in our FEP cohort was 6.2%, with 28 people in our cohort dying over the 10-year follow-up period. The total duration of follow-up over the 10-year follow-up period was 3,828 person-years. The total number of events observed during the 5- to 10-year period post-EPI admission were 585 mental health-related ED visits, 208 psychiatric hospitalizations, and 514 involuntary admissions.

Table 4.1 Sociodemographic and clinical characteristics of the FEP sample at EPI admission (n=455)

Characteristic	**N**	**%**
Sex		
Male	343	75.4
Female	112	24.6
Age at index date (years)		
16—20	178	39.1
21—25	133	29.2
26—30	144	31.7
Place of Residence		
Rural	34	7.5
Urban	421	92.5
Material deprivation quintile		
5 (Highest level)	100	22.8
4	114	26.0
3	66	15.0
2	77	17.5
1 (Lowest level)	82	18.7
Index diagnosis		
Schizophrenia spectrum disorder	191	43.9
Delusional disorder	33	7.6
Psychosis NOS	211	48.5

4.2 Objective #1

Our first objective was to describe the long-term patterns of acute mental health service utilization among people with FEP over a 10-year period following a first diagnosis of a psychotic disorder. We focused on the intensity of service utilization, and the timing of contact with acute mental health services, including mental health-related ED visits, psychiatric hospitalizations, and involuntary admissions.

4.2.1 Acute Mental Health Service Use 10-Years after First Diagnosis of Psychosis

Summary statistics for the acute mental health service outcomes of interest are presented in Table 4.2. More than half of the people in our cohort had one or more contacts with ED visits for mental health problems (56.5%). psychiatric hospitalizations (58.7%), and involuntary admissions (54.9%) during the 10-year follow-up period. Across all three mental health service outcomes examined in this study, we observed a higher proportion of people with mental health service contacts during the first 5 years postadmission, compared to the subsequent 5 to 10 years postadmission.

Table 4.2 Acute mental health service use among people with FEP over the 10-year period following a first diagnosis of psychosis (n=455)

Mental Health Service Type	**Number of Service Contacts Over the 10-Year Period**			
	N (%)	**Mean (SD)**	**Median (IQR)**	**Range**
Emergency department visit for a mental health reason	257 (56.5)	4.42 (7.75)	3 (1-4)	1-76
First 5 years postadmission	193 (42.4)	2.70 (3.46)	2 (1-3)	1-31
5 to 10 years postadmission	164 (36.0)	3.75 (6.53)	2 (1-3)	1-45
Psychiatric hospitalization	267 (58.7)	2.52 (1.98)	2 (1-3)	1-15
First 5 years postadmission	221 (48.6)	2.06 (1.46)	2 (1-3)	1-11
5 to 10 years postadmission	108 (23.7)	2.03 (1.49)	1 (1-3)	1-9
Involuntary admission	250 (54.9)	4.74 (4.73)	3 (2-6)	1-46
First 5 years postadmission	196 (43.1)	3.28 (3.15)	2 (1-4)	1-33
5 to 10 years postadmission	136 (29.9)	3.98 (3.61)	3 (2-5)	1-18

4.2.2 Emergency Department Visits for Mental Health Reasons 10-Years after First Diagnosis of Psychosis

The frequency and timing of mental health-related ED visits, as well as the proportion of people who contacted ED services for mental health reasons by follow-up year, are presented in Figures 4.3 and Table 4.4. More than half (56.5%) of the people in our cohort had any contact with the ED for mental health reasons at least once during the 10-

year period following a first diagnosis of psychotic disorder. Of the people who used ED services for mental health reasons during this 10-year postadmission period, most of them had only one contact with the ED for mental health reasons per year, whereas approximately one third had two or more contacts with the ED per year. The proportion with any contact with the ED for mental health reasons was highest in the first two years following a first diagnosis of psychosis, with approximately 15.2% of people having a mental health-related ED visit in the first year, and 13.6% with a visit in the second year. The proportion with one or more mental health-related ED visits was relatively stable and did not change drastically over the remaining follow-up period. Nearly two-thirds (64.0%) of people with FEP who contacted the ED for mental health reasons between years 5 and 10 postadmission did not have any prior ED visits for a mental health reason during the first 5 years post-EPI admission.

It is noteworthy that although the proportion of people with an ED visit did not change substantially over the follow-up period, the total number of visits increased in the 5- to 10-year period post-admission, possibly suggestive of unmet mental health needs after a patient is discharged from the EPI program or ongoing dependence on ED services for intervention during a mental health crisis

Figure 4.3 Emergency department visits for mental health reasons over a 10-year period following a first diagnosis of psychosis (*n*=455)

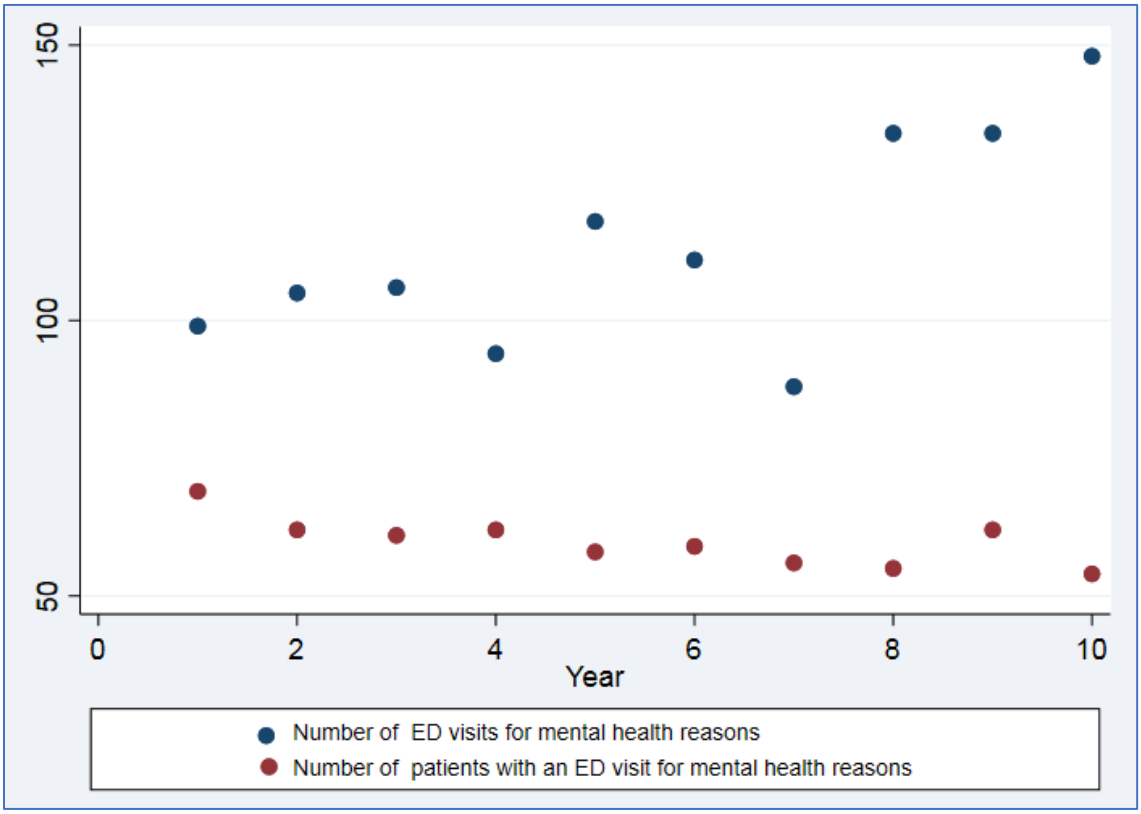


Table 4.4 Number of unique patients with emergency department visits for mental health reasons over the 10-year period following a first diagnosis of psychosis

Year	1	2	3	4	5	6	7	8	9	10
Frequency										
0	386	393	394	393	397	396	399	400	393	401
1	48	40	44	44	29	38	39	33	44	30
2	15	14	11	10	15	10	14	9	8	11
3+	6	8	6	8	14	11	3	13	10	13
Total # of patients who contacted ED services each year	69	62	61	62	58	59	56	55	62	54

4.2.3 Psychiatric Hospitalizations 10-Years after First Diagnosis of Psychosis

The frequency and timing of psychiatric hospitalizations, as well as the proportion of patients who were hospitalized by follow-up year, are presented in Figure 4.5 and Table 4.6. Overall, more than half of patients (58.7%) in our cohort had a psychiatric hospitalization at least once during the 10-year period following a first diagnosis of psychosis. Approximately one quarter of the people with any psychiatric hospitalizations over the 10-year period had two or more psychiatric hospitalizations per year. The proportion of people in the cohort with one or more psychiatric hospitalizations was highest in the first two years following a first diagnosis of psychosis, with 27.3% of people with one or more psychiatric hospitalizations in the first year and 16.0% of people with one or more psychiatric hospitalizations in the second year. The proportion with any psychiatric hospitalizations decreased gradually over the remaining follow-up period, with less than 6% of people having any psychiatric hospitalizations by years 9 and 10.

Figure 4.5 Psychiatric hospitalizations over a 10-year period following a first diagnosis of psychosis (*n*=455)

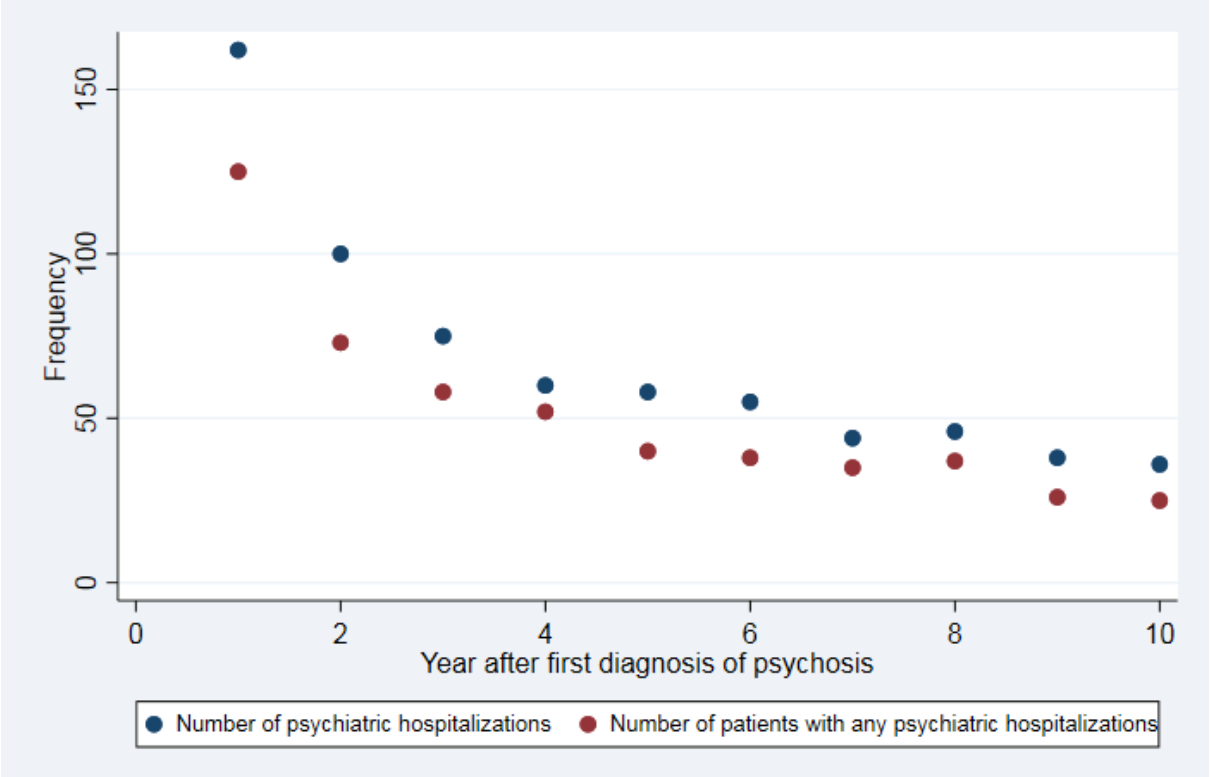


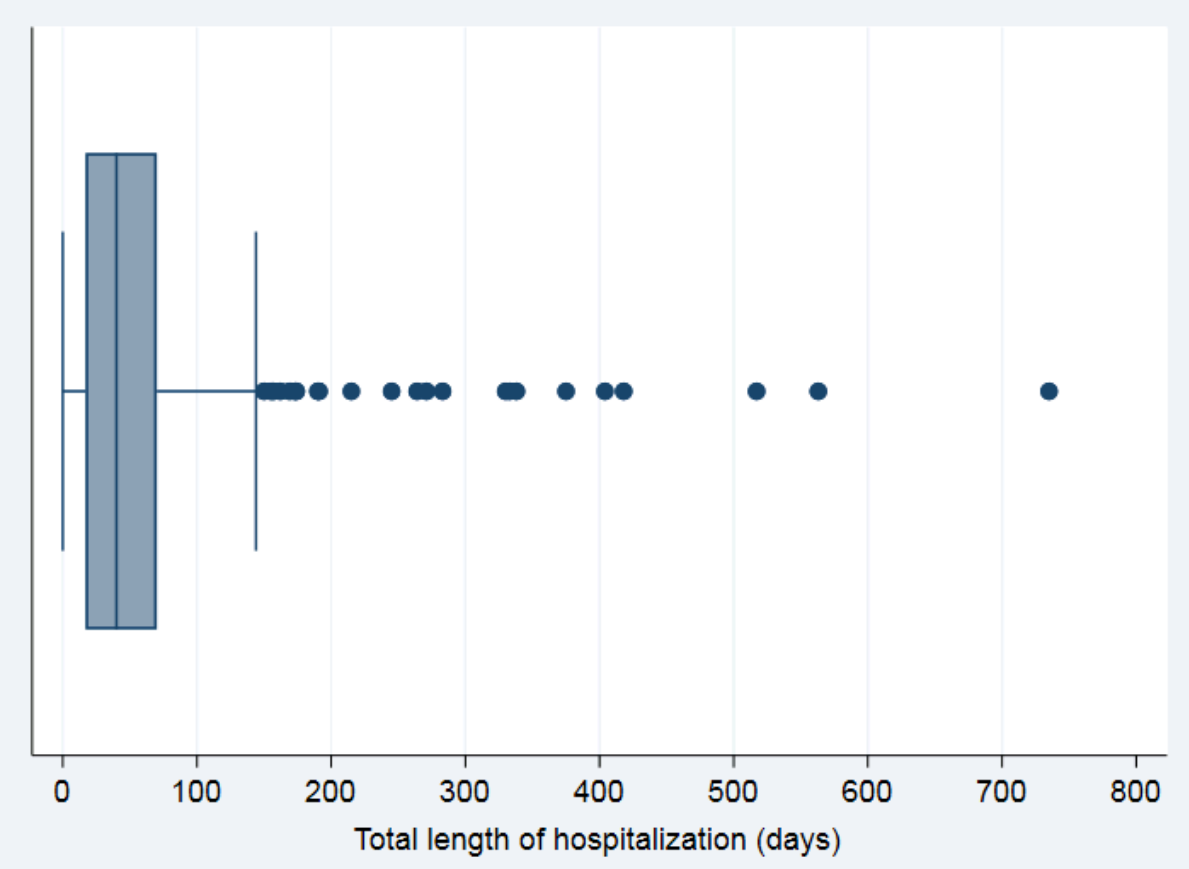
Table 4.6 Number of unique patients with psychiatric hospitalizations over a 10-year period following a first diagnosis of psychosis

Year	1	2	3	4	5	6	7	8	9	10
Frequency										
0	331	382	397	403	415	417	420	418	429	430
1	93	54	46	44	27	27	28	31	20	19
2+	31	19	12	8	13	11	7	6	6	6
Total # of people with any psychiatric hospitalizations per year	124	73	58	52	40	38	35	37	26	25

4.2.4 Total Hospital Days 10-Years after First Diagnosis of Psychosis

The total hospital days over the 10-year period following a first diagnosis of psychosis is displayed in Figure 4.7. Among those who had any psychiatric hospitalization over the follow-up period, the median total hospital days was 40 (IQR: 17-70). During the first 5 years following a first diagnosis of a psychotic disorder, 221 people with FEP were hospitalized at least once, with a mean and median total hospital days of 48 days (SD 59), and 32 days (IQR: 14-55), respectively. The mean and median total hospital days between years 5 and 10 of follow-up was 61.2 days (SD 77.5), and 35 days (IQR: 19, 70), respectively.

Figure 4.7 Total duration of psychiatric hospitalization among FEP patients during the 10-year period after a first diagnosis of a psychotic disorder



4.2.5 Involuntary Admissions 10-Years after First Diagnosis of Psychosis

Over the 5-year period following first diagnosis of psychosis, 196 patients (43.1%) had one or more involuntary admissions, and 29.3% (*n*=133) had an involuntary admission over the 5- to 10-year period following first diagnosis. Among the 133 patients with one or more involuntary admissions between 5 and 10 years postadmission, more than half 61.6% (*n*=82) also had a prior involuntary admission in the first 5 years. The median time to the first involuntary admission for the period beginning from the end of year 5 to the end of year 10 post-EPI admission was 577 days (IQR: 1116-184).

The frequency and timing of involuntary admission, and the proportion of patients in our sample contacting ED services by follow-up year, are presented in Figure 4.8 and Table 4.9. More than half (54.9%) of people in our cohort had at least one involuntary admission during the 10-year period following a first diagnosis of psychosis. Approximately one quarter of people with any psychiatric hospitalization over the 10-year period had two or more psychiatric hospitalizations per year. The proportion with any involuntary admission was highest during the first two years following a first diagnosis of psychosis, with 22% of people having an involuntary admission in the first year, and 14.7% of people having an involuntary admission in the second year. The proportion with any involuntary admissions decreased sharply after the first 2 years and stabilized at approximately 11% over the remaining 8 years following diagnosis. The proportion with involuntary admissions was lowest during year 10 at 9.5%.

Figure 4.8 Involuntary admissions over a 10-year period following a first diagnosis of psychosis (*n*=455)

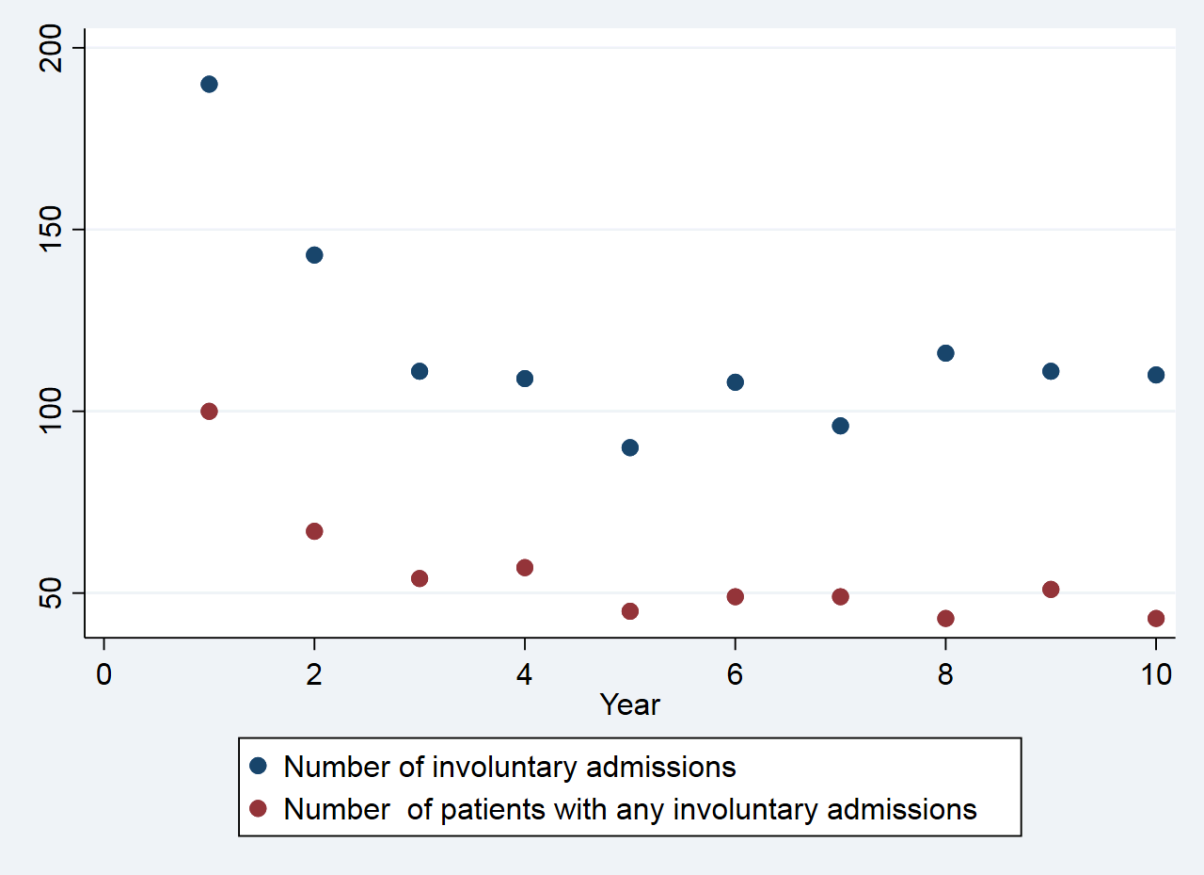


Table 4.9 Number of Unique Patients with Involuntary Admissions Over a 10-Year Period Following a First Diagnosis of Psychosis

Year	1	2	3	4	5	6	7	8	9	10
Frequency										
0	355	388	401	398	410	406	406	412	404	412
1	47	29	25	26	19	16	23	15	24	16
2	34	20	13	21	16	18	12	9	14	10
3+	19	18	16	10	10	15	14	19	13	17
Total # of people with any involuntary admissions per year	100	67	54	57	45	49	49	43	51	43

4.3 Objectives #2 and #3

Our second objective was to utilize survival analysis techniques to analyze time-to-event data for mental health service contacts during the 5- to 10-year period following a first diagnosis of a psychotic disorder, and our third objective was to identify sociodemographic, clinical, and service-use factors that are associated with the long-term use of acute mental health services.

4.3.1 Mental Health-Related ED Visits

Kaplan-Meier survival curves showing the rate and timing of first mental health-related ED visit during years 5 and 10 post-EPI admission are displayed in Figure 4.10. The results from the unadjusted and adjusted Cox proportional hazards regression analyses are displayed in Table 4.11. The median time to first contact with ED services for mental health reasons for the period beginning from the end of year 5 to the end of year 10 post-EPI admission was 587 days (IQR: 212-1127). In our unadjusted analyses, baseline sociodemographic and service-related factors such as younger age at index diagnosis, prior ED visits for mental health reasons, prior involuntary admissions, and longer total hospital days during the first 5 years postadmission were all significantly associated with contact with the ED for mental health reasons. In the fully adjusted model, only younger age on admission to EPI (16 to 20 years: HR 1.65, 95% CI 1.07, 2.56; 21 to 25 years: HR 1.64, 95% CI 1.03, 2.62) and prior involuntary admissions in the first 5 years postadmission (HR 1.62, 95% CI 1.06, 2.47) were significantly associated with a greater risk of contact with the ED for mental health reasons. Total length of psychiatric hospitalization during the first 5 years postadmission was also associated with contact

with the ED in the fully adjusted model (HR 1.03, 95% CI 0.99, 1.07) at significance level 0.10, although the 95% confidence interval includes the possibility of a null effect.

Figure 4.11 Kaplan-Meier survival plot for time to first ED visit for a mental health reason during the 5- to 10-year period following first diagnosis of psychosis

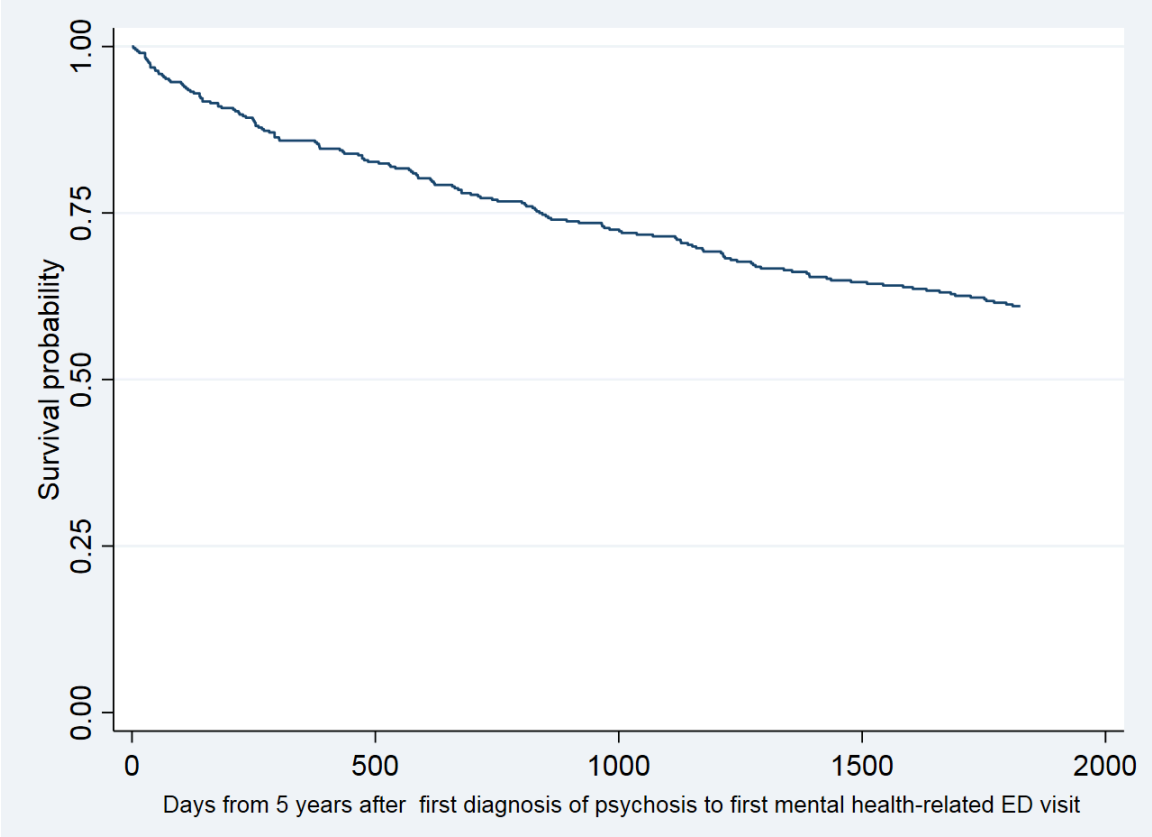


Table 4.12 Results of the Cox proportional hazards models for the time to first ED visit for a mental health reason in the 5- to 10-year period post-EPI admission (n=383).

	Unadjusted univariate estimates		Fully adjusted multivariate estimates	
	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Male sex	1.15	0.79, 1.67	0.92	0.61, 1.37
Age at index date				
16 to 20 years	1.89	1.26, 2.84	1.65	1.07, 2.56
21 to 25 years	1.71	1.10, 2.65	1.64	1.03, 2.62
26 to 30 years	Reference	-	Reference	-
Rural residence	1.18	0.66, 2.13	1.08	0.59, 1.97
High level material deprivation	0.94	0.68, 1.28	0.98	0.71, 1.37
Index diagnosis				
Schizophrenia spectrum disorder	Reference	-	Reference	-
Delusional disorder	0.86	0.44, 1.66	0.95	0.48, 1.88
Psychosis NOS	0.91	0.66, 1.27	0.89	0.64, 1.24
Use of ED services in within the first 5 years postadmission	2.30	1.66, 3.18	1.32	0.84, 2.08
Any involuntary admission during the first 5 years postadmission	2.19	1.59, 3.01	1.62	1.06, 2.47
Length of hospitalization in the first 5 years postadmission (months)	1.01	1.00, 1.01	1.03	0.99, 1,07

4.3.2 Psychiatric Hospitalizations

Kaplan-Meier survival curves showing the rate and timing of first psychiatric hospitalization during the 5- to 10-year period post-EPI admission are displayed in Figure 4.13, and the unadjusted and fully adjusted estimates from our Cox proportional hazards models are presented in Table 4.14. The median time to first psychiatric hospitalization for the period beginning from the end of year 5 to the end of year 10 post-EPI admission was 588 days (IQR: 1010-209). Among the sociodemographic, clinical, and service-related factors included in our unadjusted models, only the indicators of acute mental health service use during the first 5 years after a diagnosis of psychosis were significantly associated with an risk of psychiatric hospitalization 5 years postadmission. These service-level factors included mental health-related ED visits, involuntary admissions, and longer total hospital days.

In the fully adjusted model, longer total length of psychiatric hospitalization in the first 5 years post-EPI admission remained statistically significant (HR 1.06 95%CI 1.02, 1.10). Prior mental health-related ED visits and involuntary admissions during the first 5 years post-EPI admission were no longer significantly associated with psychiatric hospitalizations in the 5- to 10-year period after a first diagnosis of psychosis.

Figure 4.13 Kaplan-Meier survival estimate for the time to psychiatric hospitalization 5 years following a first diagnosis of psychosis

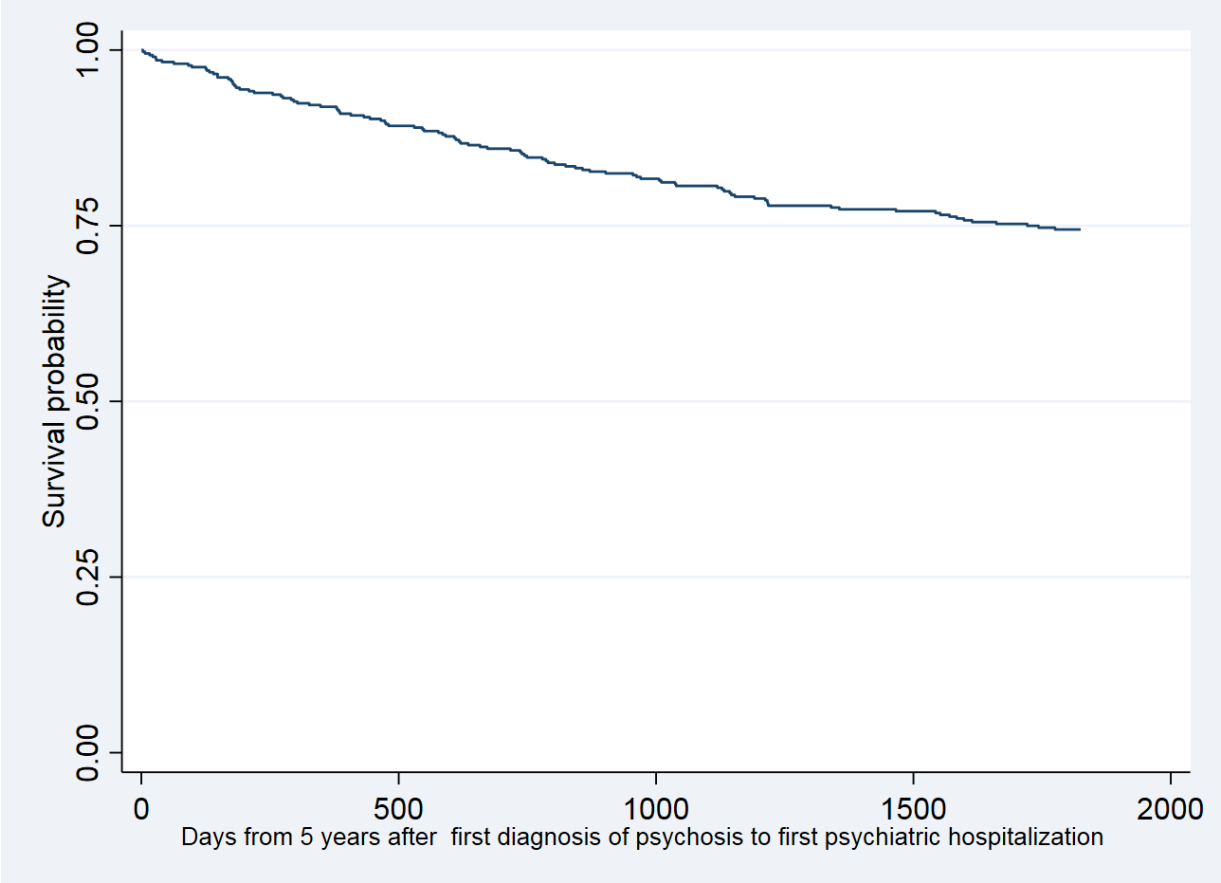


Table 4.14 Results of the Cox proportional hazards regression models for the time to first psychiatric hospitalization in the 5- to 10- year period post-EPI admission

	Unadjusted univariate estimates		Fully adjusted multivariate estimates	
	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Male sex	1.27	0.79, 2.06	1.11	0.67, 1.85
Age at index date				
16 to 20 years	1.38	0.84, 2.28	1.22	0.70, 2.11
21 to 25 years	1.65	0.99, 2.77	1.50	0.86, 2.66
26 to 30 years	Reference	-	Reference	-
Rural residence	1.26	0.61, 2.59	1.07	0.50, 2.26
High level material deprivation	0.74	0.50, 1.09	0.76	0.50, 1.17
Index diagnosis				
Schizophrenia spectrum disorder	Reference	-	Reference	-
Delusional disorder	1.50	0.73, 3.10	1.61	0.77, 3.38
Psychosis NOS	1.20	0.79, 1.83	1.20	0.78, 1.83
Use of ED services in within the first 5 years postadmission	1.60	1.05, 2.44	0.87	0.49, 1.55
Any involuntary admission during the first 5 years postadmission	1.77	1.20, 2.61	1.50	0.90, 2.50
Length of hospitalization in the first 5 years postadmission (months)	1.01	1.00, 1.01	1.06	1.02, 1.10

In terms of the total hospital days over the 5- to 10-year period post-EPI admission, estimates from the unadjusted and fully adjusted Poisson regression models are shown in Table 4.15. The unadjusted estimates suggest that younger age at index diagnosis and a longer total duration of psychiatric hospitalization during the first 5 years post-EPI admission were significantly associated with a longer total duration of hospitalization in the 5- to 10-year period post-EPI admission. In the fully adjusted final model, the associations between younger age on admission to EPI (age 16 to 20 years: RR 2.31, 95% CI 1.31,4.06; age 21 to 25 years: RR 1.77, 95% CI 1.35,3.25) and a longer total duration of prior psychiatric hospitalizations (RR 1.06, 95% CI 1.01, 1.16) remained statistically significant at significance level 0.05.

Table 4.15 Results from the Poisson regression analyses of factors associated with total duration of psychiatric hospitalization between 5- and 10-years post-EPI admission

	Unadjusted RR (95% CI)	Fully Adjusted RR (95% CI)
Male sex	0.70 (0.37, 1.32)	0.55 (0.26, 1.13)
Age at index date		
16 to 20 years	2.18 (1.38, 3.43)	2.31 (1.31, 4.06)
21 to 25 years	2.06 (1.20, 3.52)	1.77 (1.35, 3.25)
26 to 30 years	Reference	Reference
Rural place of residence	1.21 (0.68, 2.16)	1.03 (0.46, 2.30)
High level material deprivation	1.02 (0.63, 1.66)	1.08(0.71, 1.66)
Any contact with ED services in the first 5 years postadmission	1.27 (0.77, 2.07)	0.59 (0.32, 1.10)
Any involuntary admissions in the first 5 years postadmission	1.41 (0.83, 2.38)	1.08 (0.93, 2.54)
Total duration of psychiatric hospitalizations in the first 5 years postadmission (months)	1.11 (1.06, 1.16)	1.06 (1.01, 1.16)

4.3.3 Involuntary Admissions

Kaplan-Meier survival curves for the timing and rate of involuntary admissions over the 5- to 10-year period post-EPI admission are shown in Figure 4.16 and estimates from the unadjusted and fully adjusted Cox proportional hazards models are shown in Table 4.17. In the unadjusted models, younger age at diagnosis, prior use of ED services, prior involuntary admissions, and total duration of hospitalization during the first 5 years post-EPI admission were associated with an increased risk of involuntary admission in the 5-

to 10- year period post-EPI admission. In the final adjusted model, younger age on admission to EPI (16 to 20 years: HR 1.79, 95% CI 1.08, 2.95); 21 to 25 years: HR 1.76, 95% CI 1.03, 3.01), prior involuntary admissions (HR 1.64. 95% CI 1.01, 2.65), and total duration of prior hospitalizations (HR 1.07, 95% CI 1.03, 1.10) were found significantly associated with an increased risk of involuntary admissions.

Figure 4.16 Kaplan-Meier survival estimate for time to first involuntary admission in the 5- to 10-year period post-EPI admission.

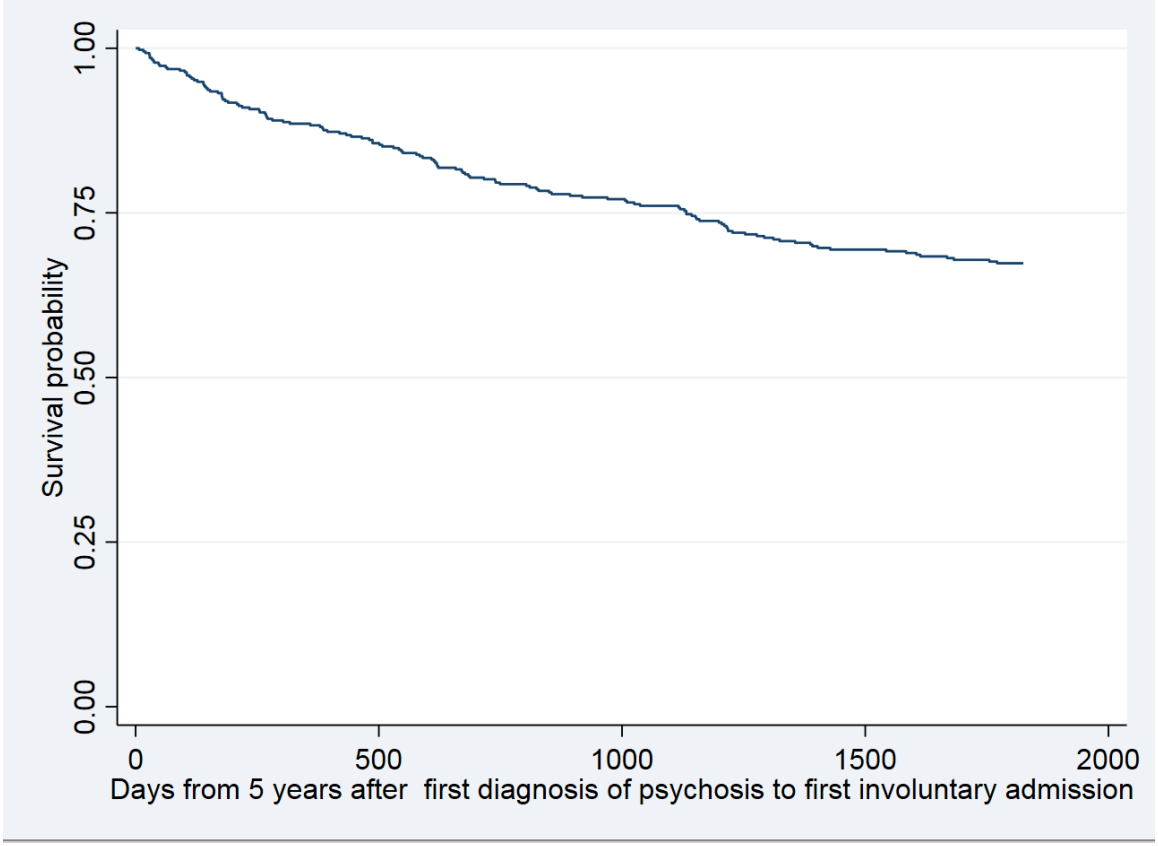


Table 4.17 Findings from the Cox proportional hazards models of the time to first involuntary admission over the 5- to 10-year period post-EPI admission.

	Unadjusted univariate estimates		Fully adjusted multivariate estimates	
	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Male gender	1.03	0.52, 2.02	0.78	0.51, 1.20
Age at index date				
16 to 20 years	2.03	1.29, 3.22	1.79	1.08, 2.95
21 to 25 years	1.89	1.16, 3.08	1.76	1.03, 3.01
26 to 30 years	Reference	-	Reference	-
Rural residence	1.03	0.52, 2.02	0.74	0.34, 1.62
High level material deprivation	0.70	0.50, 1.00	0.74	0.51, 1.07
Index diagnosis				
Schizophrenia spectrum disorder	Reference	-	Reference	-
Delusional disorder	1.61	0.86, 3.03	1.78	0.93, 3.42
Psychosis NOS	1.22	0.84, 1.77	1.24	0.85, 1.82
Use of ED services in within the first 5 years postadmission	2.58	1.81, 3.66	1.36	0.83, 2.27
Any involuntary admission during the first 5 years postadmission	2.36	1.66, 3.36	1.64	1.01, 2.65
Length of hospitalization in the first 5 years postadmission (months)	1.09	1.06, 1.12	1.07	1.03, 1.10

Chapter 5

5 Discussion

In this thesis, we examined the long-term patterns of acute mental health services use among a cohort of young people with FEP over a 10-year period following admission to an EPI program in Ontario, Canada. To the best of our knowledge, this is the first Canadian longitudinal study to use large population-based linked health administrative databases to identify the type, timing, and factors associated with increased rates of acute mental health service utilization over long-term follow-up. We described the patterns of acute mental health service use using indicators for mental health-related ED visits, psychiatric hospitalizations, and involuntary admission.

In the last chapter of this thesis, key findings from our study will be discussed and interpreted in the context of the existing literature. In Section 5.1, we discuss our study findings in relation to the main study objectives. In Section 5.2, the strengths and limitations of our study are considered. In Section 5.3, we discuss the implications of our study's findings for policy, practice, and research in FEP, and we finish with overall conclusions in Section 5.4.

5.1 Summary of Key Findings

Although it is widely accepted that continued utilization of psychiatric services is critical in the patient's transition out of EPI services and into standard mental health care, there remains a dearth of information in the current literature on long-term patterns of acute mental health service use following discharge from early intervention services. Our study

described long-term patterns of acute mental health service use in FEP, with respect to the types of mental health services contacted and the intensity of service use among patients with FEP during the 5- to 10-year period after a first diagnosis of psychosis. Across all indicators, we observed the highest proportion of acute mental health service use during the first two years following entry into an EPI program. The longer-term patterns of acute mental health service use were characterized by gradual declines in service use over the remaining 8 years post-EPI admission. However, a subset of people continued to have high rates of ongoing contact with acute mental health services. Our findings indicate that long-term use of acute mental health services is common, and people are still vulnerable to psychiatric crises after a 2-year specialized treatment. Prior evidence from longitudinal FEP cohort studies with 5- to 10-year follow-up suggests that benefits persist so long as patients continue to receive specialized treatment.[87,88,89] However, during the transition period when intensive care is stepped-down, and patients are discharged from EPI services to general psychiatric services, many of the initial gains in clinical and functional outcomes during the first 2 years of early intensive treatment are diluted by the 5-year post-EPI admission period.[51,57,90] Young people with FEP are at a high risk of service disengagement, despite having ongoing therapeutic needs, and the issue of sustaining long-term engagement with mental health services remains a key challenge for the planning and delivery of mental health services by clinicians and administrators.[39,91] A prior systematic review examining the factors influencing service disengagement in FEP has consistently shown that patient-level factors – such as greater symptom severity, longer DUP, and poor insight – are associated with a greater likelihood of service disengagement. Additionally, sociodemographic factors such as

younger age, male gender, and immigrant/ethnic minority status have been implicated as factors associated with disengagement from mental health services.[93]

Our study highlights the sizable proportion of people with FEP who have ongoing contact with ED services for mental health reasons during the 5- to 10-year post-EPI admission period, with a notable increase in the number of ED visits, suggestive of unmet need for care. This may indicate that the accessibility of mental health services following discharge from an EPI program may be insufficient or not meeting the service needs of patients, and as a result, more people are regularly contacting ED services for mental health crises. Previous studies have found a significant association between higher levels of socioeconomic disadvantage and greater use of the emergency department for mental health reasons among people with psychosis.[94] People with higher levels of socioeconomic disadvantage may have limited access to family and social supports, and preventative mental health services. Consequently, people with FEP with unmet service needs may rely more on emergency department services as the primary source of medical support for managing psychiatric symptoms and intervening during mental health crises.[94]

The current evidence on long-term patterns of psychiatric hospitalization among people with FEP suggests that most people have infrequent and brief hospital admissions, whereas a small number of individuals are known as frequent, and heavy users of acute mental health services, commonly known as the "revolving door" phenomenon.[17] Prior longitudinal studies have shown that more than half of people with FEP require one or more psychiatric hospital admissions during the 10-year period following entry into an EPI program.[29,56,55] Similarly, a recent systematic review and meta-analysis by Ajnakina and colleagues examined 60 longitudinal FEP studies containing information on 23,280

patients and found that one in two patients required hospitalization at least once during an average follow-up period of 7 years. We also found that more than half of all FEP patients (58.7%) in our cohort required psychiatric hospitalization at least once over the 10-year follow-up period. Although the proportion of patients requiring hospitalization in our study was consistent with those reported by Ajnakina and colleagues, we found a lower average duration of hospitalization during the 10-year period post-EPI admission. Ajnakina and colleagues reported a pooled average duration of 116.7 days (95% CI 95.1-138.3), which was much higher than the mean and median total hospital days reported in our study (63.8 days (SD 89.5) and 40 days (IQR 17-70).[49] The shift from inpatient care to community-based services over time is reflected in trends associated with lower duration of hospitalization over time. The average hospital length of stay has decreased over the past 20 years and decreased most drastically in the last decade, the proportion of people with FEP requiring hospitalization has declined gradually over the longer-term. It is unclear how these trends affect subsequent use of mental health services over time among people with FEP, with respect to the intensity, and types of services utilized.

Involuntary admissions are often regarded as negative contacts or interactions with the healthcare system and can be highly distressing and coercive experiences for among people with FEP. A Canadian study found that approximately one in four patients have an involuntary admission within the first two years of a first diagnosis of a psychotic disorder, and factors such as younger age at admission and immigrant status are associated with a greater likelihood of involuntary admission.[25] These initial negative interactions with mental health services may adversely affect patients' subsequent engagement with mental health services and delay help-seeking when a relapse occurs,

this impeding the likelihood of remission and recovery. The reasons for involuntary admission among people with FEP are complex, and the factors associated with increased rate of involuntary admissions involve a wide range of sociodemographic, clinical, and service-related factors. Involuntary admissions to hospital for psychiatric care can be beneficial to some people by providing crucial psychiatric treatment during an acute episode of psychosis or mental health-related crisis. Despite this, some people with psychosis report having negative interactions with involuntary admission, resulting in coercive and traumatic experiences. Initial negative contacts with mental health services may discourage and deter people from subsequent contact with the mental health system and contribute to adverse long-term outcomes.[28,94]

Taken together, our findings suggest that there is a subset of people with ongoing contact with acute care services over the long-term period following FEP, which hinders institutional recovery as they are unable to live independently outside the boundaries of the acute mental health care system.[61] Earlier research examining institutional recovery has speculated that a long lasting period without hospitalization may reflect a person's strengthened social connections and improved sense of self in the recovery process.[61]

Among the sociodemographic-, clinical- and service-related factors examined in our Cox proportional regression analysis, we found that a greater duration of psychiatric hospitalization during the first 5 years post-EPI admission was the most significant risk factor associated with patterns of acute mental health service use in the subsequent 5- to 10-year period following admission into an EPI program. We were limited in the data available to further explore the risk factors associated with patterns of acute mental health service use. A previous study by Rodrigues and colleagues using more detailed data

found that several clinical- and service-related risk factors – such as younger age at index diagnosis, diagnosis of psychosis NOS, immigrant status, and prior contact with services for substance use problems – were associated with higher rates of psychiatric hospitalization among people with FEP.[24] Clinical factors such as poor illness insight, and service use factors such as recent police involvement, and admission to a general hospital were also associated with a greater likelihood of involuntary admission.[25,81]

5.2 Strengths and Limitations

Our findings were strengthened by the use of large population-based health administrative databases linked to patient-level data from a long-standing, and well-established EPI program. This allowed us to obtain information on long-term patterns of mental health service use after discharge from the EPI program.

There are several limitations to our study that should be considered when interpreting the findings. Firstly, we do not have information on factors previously identified as important in the first-episode psychosis literature for predicting mental health service use, such as the duration of untreated psychosis, severity of symptoms, antipsychotic medications used, and the duration of time enrolled in early intervention services, which have been shown to influence hospitalization rates and patterns of service use.[95] We are also limited by the information we have on indicators of acute mental health service use, as we do not have information on the use of other services, such as the police and crisis support services. This study is focused on first-episode psychosis, and less so on the influence of early intervention services on the long-term patterns of acute mental health care because we lack detailed information on the actual date of discharge from EPI services, and

cannot identify the extent to which early intervention services influenced the longer-term trends of acute mental health care. We used the 5-year mark as a conservative approximation of discharge from the EPI program into general psychiatric services, though it is possible that people were discharged earlier or later from the EPI program. This thesis was also limited by the lack of a comparison group comprised of people with FEP who were not admitted into an EPI program. As a result, we are unable to attribute the observed trends of acute mental health service use over the longer-term to the use of EPI services during the early course of illness. Failing to consider the full context of the associated factors of hospitalization and acute service use means that our findings may not be reflective of the true patterns of acute mental health service use. The use of diagnostic codes to identify mental health related service contacts have been found to have poor sensitivity in prior validation studies using health administrative data, which may lead to underestimates of the true rates of mental health service use among people with FEP.[96] We are also limited using the index date, which we defined as the initial admission to PEPP for treatment of psychosis, as our time origin for the follow-up period. Our focus on the index date may be underestimating the total number of admissions by excluding any hospitalizations prior to the index date that may have led to the referral into the EPI program. We used the index diagnosis at the time of initial assessment and entry into the EPI program, and we did not consider longitudinal diagnoses that could have been revised over the course of illness. Prior research has examined the diagnostic stability during the early phases of psychosis and found that the stability of a diagnosis of psychosis varied by diagnosis type, with a diagnosis of schizophrenia being more stable compared to other categories, such as substance-induced psychosis and psychosis not

otherwise specified.[100,101] The accuracy of diagnostic codes in health administrative databases may also be limited by potential coding errors, different coding practices across individuals and institutions, and changes in coding criteria over time. Finally, although our study describes long-term patterns of acute mental health services following FEP, our findings may not be generalizable to other health care systems due to the large variability associated with health system-related factors, such as hospital accessibility and psychiatric bed availability. [41,43, 48]

5.3 Implications of Study Findings and Future Directions

Our study's findings have important policy, clinical, and research implications for the treatment and management of first-episode psychosis. From a policy perspective, information about the long-term patterns of acute mental health service use, and the risk factors associated with a higher likelihood of acute mental health service use, is crucial for informing decision makers on service planning, allocation of healthcare resources, and improving the efficiency of mental services for meeting the needs of young people with FEP. Service providers should consider what supports are put in place to facilitate the long-term continuity of care for patients after they are discharged from EPI services. Although long-term hospital care and institution-based services may be less desirable compared to alternatives such as community-based psychiatric services, these services should remain accessible to those who need it. Long-term strategies are needed to support patients' mental health needs and encourage long-term independence from acute mental health services. From a clinical perspective, the findings from this thesis and other studies have consistently shown that younger patients with a history of prior hospital admissions, and higher deprivation levels have a greater likelihood of contact with acute

mental health services. Identifying these high-risk groups who need ongoing assertive community treatment may provide an opportunity to extend EPI services and maintain continuity of care for this vulnerable group.[Error! Reference source not found.] Future research should continue to study the long-term trajectories of acute mental health service use in FEP, as well as a broad range of associated factors – these include the impact of temporal changes to the mental health care system, standards of care, and societal attitudes towards the treatment of psychotic disorders on the patterns of acute mental health service use after FEP. Future studies could pay greater attention to the experiences and perspectives of young people with FEP, their families, and service providers to better understand the impact of contact with acute mental health services on long-term functioning and patient-centered outcomes.

5.4 Conclusions

In this study we used patient-level data from an EPI program linked to population-based health administrative databases to depict long-term (5 to 10 years post-diagnosis) patterns of acute mental health service use. We found that the rates of acute mental health service use – including mental health-related ED visits, psychiatric hospitalizations, and involuntary admissions – were the highest in the first two-years post-EPI admission, but gradually decreased over the remaining 8 years of follow-up. Despite this steady decline, more than one third of our sample had ongoing contact with acute mental health services in the 5- to 10-year period following EPI admission. We found that factors including younger age and prior contact with acute mental health services were associated with a greater likelihood of acute mental health service use over the longer-term period

following FEP. We need to continue to develop a more comprehensive understanding of the long-term trajectories of mental health service use following a first episode of psychosis to better inform the planning and delivery of mental health services that support the needs of patients and their families.

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Appendix A Dataset Creation Plan

Project Initiation This Section must be Completed Prior to Project Dataset(s) Creation	
Project Title:	Long-Term Outcomes of First-Episode Psychosis: 10-Years After Admission to an Early Psychosis Intervention Program
Project TRIM number:	2018 0906 327 000 (ICES Western), 2018-465 (DAS)
Research Program:	MHA
Site:	DAS
Project Objectives:	*Insert Project Objectives as listed in the approved ICES Project PIA*
	1.) To identify socio-demographic and clinical factors at admission that are associated with long-term trajectories of mental health service use among people with first-episode psychosis, including mental health related emergency department visits, psychiatric hospitalizations, and involuntary admissions
	2.) To identify socio-demographic and clinical factors at admission that are associated with other outcome indicators at 10-year follow-up, including use of social assistance programs, contact for alcohol- and substance-use problems, self-harm attempts, and mortality
	3.) To describe the incidence of physical co-morbidities and multimorbidity after a first episode of psychosis
ICES Project PIA Initial Approval Date:	*The ICES Employee or agent who is responsible for creating the Project Dataset(s) is responsible for ensuring there is an approved ICES Project PIA and verifying the date of approval prior to creating the Project Dataset(s)*
	2018-Mar-22
Principal Investigator (PI):	Kelly Anderson
Check the applicable box if the PI is an ICES Student/Trainee	☐ ICES Student ☐ ICES Fellow ☐ ICES Post-Doctoral Trainee ☐ Visiting Scholar
Responsible ICES Scientist:	*Name the Responsible ICES Scientist if the PI is not a Full Status ICES Scientist*
	N/A

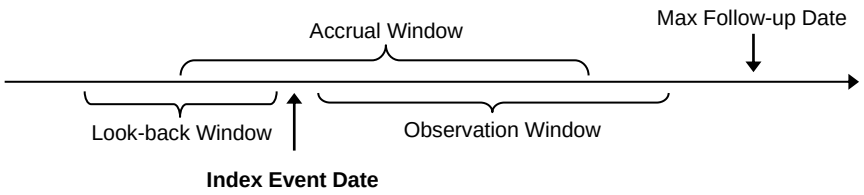
Project Initiation This Section must be Completed Prior to Project Dataset(s) Creation		
Project Team Member(s) Responsible for Project Dataset Creation and/or Statistical Analysis and date joined (list all):	*All person(s) (ICES Analyst, Appointed Analyst, Analytic Epidemiologist, PI, and/or Student) responsible for creating the Project Dataset(s) and/or statistical analysis on the Research Analytics Environment (RAE) and the date they joined the project must be recorded*	
		yyyy-mon-dd
Other ICES Project Team Members and date joined (list all):	*All other Research Project Team Members (e.g., Research Administrative Assistants, Research Assistants, Project Managers, Epidemiologists) and the date they joined the project must be recorded*	
		yyyy-mon-dd
Confirmation that DCP is consistent with Project Objectives:	*The following individuals must confirm that the ICES Data provided for in this DCP is relevant (e.g., with respect to cohort, timeframe, and variables) and required to achieve the Project Objectives stated in the ICES Project PIA prior to initial Project Dataset creation: 1) PI; 2) Responsible ICES Scientist if the PI is not a Full Status ICES Scientist, or a second ICES Scientist or the Scientific Program Lead if the PI is creating both the DCP and the Project Dataset[s]; 3) ICES Research and Analysis Staff creating the DCP; and 4) ICES Analytic Staff (ICES Employee or agent responsible for creating the Project Dataset[s]). This may be delegated either verbally or via e-mail.*	
	Principal Investigator	☒ 2018-Aug-13
	Responsible ICES Scientist or Second ICES Scientist/Lead	☐ yyyy-mon-dd
	ICES Research and Analysis Staff Creating the DCP	☐ yyyy-mon-dd
	ICES Analytic Staff	☐ yyyy-mon-dd
Designated ICES Research and Analysis Staff accountable for Project Documentation:	*The person named (ICES staff) is accountable for ensuring that the approved ICES Project PIA, ICES Project PIA Amendments, and DCP are saved on the T Drive, ensuring ICES Project PIA Amendments are submitted as required, ensuring DCP Amendments are documented, and sharing the final DCP with the PI/Responsible ICES Scientist at project completion*	
DCP Creation Date and Author:	*Date DCP was finalized prior to Project Dataset(s) creation*	*Name of person who created the DCP*
	Date	***Name***
	2018-Aug-01	Kelly Anderson

ICES Data This Section must be Completed Prior to Project Dataset(s) Creation	
The ICES Employee or agent who is responsible for creating the Project Dataset(s) must ensure that this list includes only data listed in the ICES Project PIA *Changes to this list after initial ICES Project PIA approval require an ICES Project PIA Amendment*	*Mandatory for all datasets that are available by individual year*
General Use Datasets – Health Services	***Years (where applicable)***
CCRS	1997 – 2016
CIHI DAD	1992 – 2016
CIHI SDS	1992 – 2016
CONTACT	1997 – 2016
NACRS	1992 – 2016
ODB	1997 – 2016
OHIP	1992 – 2016
OMHRS	1992 – 2016
General Use Datasets – Population	
RPDB	1997 – 2016
General Use Datasets - Other	
ASTHMA	2016
CHF	2016
COPD	2016
HIV	2016
HYPER	2016
MOMBABY	2016
OCCC	2016

ICES Data This Section must be Completed Prior to Project Dataset(s) Creation	
ODD	2016
OMID	2016
ONMARG	2006
ORAD	2016
Controlled Use Datasets	
OCR	2016
Other Datasets	

Project Amendments and Reconciliation			
ICES Project PIA Amendment History (add additional rows as needed):	*Privacy approval date*	*Person who submitted amendment*	*Note that any changes to the list of ICES Data or Project Objectives require an ICES Project PIA Amendment*
	Date	***Name***	***Amendment***
	yyyy-mon-dd		
DCP Amendment History (add additional rows as needed):	*Date DCP amended*	*Person who made the DCP amendment*	*Note that any DCP amendments involving changes to the list of ICES Data or Project Objectives require an ICES Project PIA Amendment*
	Date	***Name***	***Amendment***
	yyyy-mon-dd		
Date Programs/DCP reconciled	*The person(s) creating the dataset and/or analyzing the data are responsible for ensuring that the final DCP reflects the final program(s) when the project is completed*		
	yyyy-mon-dd		

Project Cohort	
Study Design	☒ Cohort study ☐ Matched cohort study ☐ Case-control study ☐ Cross-sectional study ☐ Other (specify):
Index Event / Inclusion Criteria	All patients admitted to the Prevention and Early Intervention Program for Psychoses (PEPP) between fiscal years 1997 and 2006, identified through a primary data linkage (previously linked on TRIM #2016 0900 300 010). Cohort members can be identified by the variable EPI_user (1). The index date from the linked dataset is admit_date (NOT the index date defined in the original database).
Estimated Size of Cohort (if known)	Approximately 450 people
Exclusions (in order)	*Step* *Description* 1 Invalid IKN 2 Admission date (admit_date) occurs after March 31 2007

Project Time Frame Definitions	
	
Accrual Start/End Dates	April 1 1997 to March 31 2007 (ie. fiscal years 1997 to 2006 inclusive)
Max Follow-up Date	March 31 2017
When does observation window terminate?	Index date + 10 years – censor people at date of last contact, loss of OHIP eligibility, death, or end of follow-up period
Lookback Window(s)	Identification of Control Group: 10 years prior to the index date Physical Comorbidities: 10 years prior to the index date

Cohort Build- Unexposed Group	
Index Event / Inclusion Criteria for unexposed group	General population comparison group
Estimated Size of Cohort (if known)	~1800 controls
Exclusions (in order)	*Step* *Description*
	1 Age < 16 or > 50 on index date
	2 Non-Ontario resident (first 2 characters of PRCDDA is NE '35' - use %GETDEMO) on index date
	3 Patient in exposed group
	4 Presence of a diagnostic code for schizophrenia, schizoaffective disorder, or psychosis NOS at any point in the medical records • OMHRS: AXIS1_DSM4CODE_DISCH1-3 code for schizophrenia, schizoaffective disorder, or psychosis NOS (lookback from database inception [October 2005] up to March 31, 2017, inclusive) • DAD: DXCODE or DX10CODE (dxtype=alldx) for schizophrenia, schizoaffective disorder, or psychosis NOS (lookback from database inception [April 1988]-March 31, 2017, inclusive) • OHIP: DXCODE for schizophrenia, schizoaffective disorder, or psychosis NOS (lookback from database inception [July 1991]-March 31, 2017, inclusive) • NACRS: DXCODE or DX10CODE (dxtype=alldx) for schizophrenia, schizoaffective disorder, or psychosis NOS (lookback from database inception [July 2000]-March 31, 2017, inclusive) NOTE 1: Diagnostic codes listed in Appendix A.
Matching Criteria	Match on age, sex, forward sortation area (FSA). Choose 4 unexposed patients for every exposed patient (1-4 matching exposed:unexposed). The control assumes the same index date as the matched case.

Variable Definitions (add additional rows as needed)	
Variable/Concept	**Definition**
Main Comparison Groups	
fep	People with first-episode psychosis, defined based on linked database from TRIM #2016 0900 300 010. All cases from the linked databasee are classified as fep = 1, and people from the matched comparison group are classified as fep = 0
censor_date	Date that the person was censored – occurs at date of last contact, end of OHIP elibigility, death, or end of follow-up period
Baseline Characteristics	
NOTE: These are already defined for the exposed group (fep = 1) but will need to be pulled for the comparison group	
sex	Sex from RPDB
age	Age on the index date, calculated based on date of birth from RPDB
age_cat	Categories for variable age, classified as follows: 1 = age 16 to 20 2 = age 21 to 25 3 = age 26 to 30 4 = age 31 to 35 5 = age 36 to 40 6 = age 41 to 45 7 = age 46 to 50
income	INCQUINT from %GETDEMO (1 = lowest income quintile, 5 = highest incomes quintile)
rural	RURAL from %GETDEMO (1 = rural, 0 = non-rural)
dependency	DEPENDENCY_Q_CSD from ONMARG (1 = least marginalized, 5 = most marginalized)

Variable Definitions (add additional rows as needed)	
deprivation	DEPRIVATION_Q_CSD from ONMARG (1 = least marginalized, 5 = most marginalized)
ethnic	ETHNICCON_Q_CSD from ONMARG (1 = least marginalized, 5 = most marginalized)
instability	INSTABILITY_Q_CSD from ONMARG (1 = least marginalized, 5 = most marginalized)
odb	Flag if patient covered by ODB on index date (1)

Variables for Exposed Group Only

NOTE: These are already defined and just need to be pulled from the original dataset

pepp_dx	Diagnosis at time of admission to the PEPP program, obtained from the linked database
index_dx	Classify index diagnosis as follows: 1 = Schizophrenia & Schizoaffective Disorder (ICD-9 = 295.X; ICD-10 = F20, F25) 2 = Delusional Disorder (ICD-9 = 297.X; ICD-10 = F22, F24) 3 = Other Psychoses (ICD-9 = 298.X; ICD-10 = F23, F28, F29)
source_dx	Source of the index diagnosis (1 = DAD or OMHRS, 2 = OHIP and/or ED)
source_ohip	If source OHIP/ED, then type of physician who made the diagnosis (1 = GP, 2 = Psychiatrist, 3 = GP + Psychiatrist, 4 = Other)
psychiatrist_index	Flag if patient had a psychiatrist involved at the index diagnosis, defined as source_dx = 1 OR source_ohip = 2 or 3 (1 = psychiatrist involved, 0 = no psychiatrist involved)
year	Fiscal year of index diagnosis
prior_alcohol	Flag if patient had prior history of contact with services for alcohol-related disorders (Appendix D)
prior_substance	Flag if patient had prior history of contact with services for substance-related disorders (Appendix E)

Variable Definitions (add additional rows as needed)	
primcare_pre6m	Number of primary care visits for a mental health reason, defined as all mental health service codes and general service codes with a mental health diagnostic code (Appendix F)
psych_pre6m	Number of visits with a psychiatrist
edtotal_pre6m	Number of ED visits with a main diagnosis - mental health diagnostic code (ICD-9 291.x,292.x,and 294.x-319.x, ICD-10 F codes), by triage category (CTAS 1-3 vs. 4-5). Use %GETNACRS, INCLscheduled=T. Exclude transfers (FROM_TYPE='E').
edharm_pre6m	Number of ED visits from edtotal_pre6m that were for self-harm (ICD 10 codes X60-X84). Use %GETNACRS, INCLscheduled=T. Exclude transfers (FROM_TYPE='E').
edmh_pre6m	Number of ED visits from edtotal_pre6m that were not for self-harm (ie. edtotal_pre6m – edharm_pre6m)
hosptotal_pre6m	Number of psychiatric hospital admissions. Use %GETCIHI and limit to non-elective admissions (ADMCAT U or E) for all hospitalizations at acute care institution (INSTTYPE AT or AP). Select first visit in an episode of care (Sort data by EPI, EPIVISIT, EPIFLAG and pll the record with FIRST.EPI=1). Limit to main diagnosis ICD-9 codes 291.x,292.x,and 294.x-319.x ICD-10 codes F10-F99 (exclude dementia and delirium). For psychiatric hospitalizations in OMHRS, use all codes except 293, 780, 290, 294, and V codes. Use only first diagnosis from Axis 1 or Axis 2, first position at discharge. Exclude discharges with no Axis 1 diagnosis
hospdays_pre6m	Total number of inpatient days for a mental health reason

Psychiatric Outcomes (10 years post admission date)

mhprimcareX_date	Date of Xth primary care visit for a mental health reason, defined as follows (DXCODE found in Appendix B): • (FP/GP [SPEC=00] or Paediatrician [SPEC=26]) and MHA diagnosis code (DXCODE) and outpatient (LOCATION: O, L, H) and non-lab service [substr(FEECODE,1,1) ne 'G'] *OR* • Paediatrician [SPEC=26] and undefined location (LOCATION =U) and MHA diagnosis code [DXCODE] and fee code (FEECODE=K122 or K123 or K704)

Variable Definitions (add additional rows as needed)	
primcareX_date	Date of Xth primary care visit for non-mental health reason, defined as all visits to primary care that do not meet the definition of mhprimcareX_date (above)
psychX_date	Date of Xth outpatient visit with a psychiatrist [SPEC=19; LOCATION: O, L, H) for a non-lab service [substr(FEECODE,1,1) ne 'G']
edX_date	Date of Xth ED visit for a mental health reason, defined as follows: • DX10CODE1 = F04-F99 *OR* • DX10CODE2 – DX10CODE10 = X60-X84, Y10-Y19, Y28 **AND** DX10CODE1 not equal to F04-F99 Include suspect diagnoses (%getnacrs where suspect = T) Exclude scheduled ED visits (%getnacrs where INCLSCHEDULED = F) Exclude transfers from another ED (FROM_TYPE ≠ 'E')
hospX_date	Date of Xth psychiatric hospital admission. Use %GETCIHI and limit to non-elective admissions (ADMCAT U or E) for all hospitalizations at acute care institution (INSTTYPE AT or AP). Select first visit in an episode of care (Sort data by EPI, EPIVISIT, EPIFLAG and pll the record with FIRST.EPI=1). Limit to main diagnosis ICD-9 codes 291.x,292.x,and 294.x-319.x ICD-10 codes F10-F99 (exclude dementia and delirium). For psychiatric hospitalizations in OMHRS, use all codes <u>except</u> 293, 780, 290, 294, and V codes. Use only first diagnosis from Axis 1 or Axis 2, first position at discharge. Exclude discharges with no Axis 1 diagnosis
hospX_los	Length of stay (days) for Xth psychiatric hospital admission
involuntaryX_date	Date of Xth involuntary admissions, defined as follows: • OMHRS: PT_STATUS = 1, 4 • DAD: ADMMETH = D, E • OHIP: FEECODE = K623, K624
ltc	Flag if patient has an admission to a long-term care facilited, defined based on presence of IKN in CCRS database
ltc_date	Date of first admission to long-term care facility (ADMDATE in CCRS)
ltc_10y	Flag if patient is a resident of a long-term care facility at the end of the follow-up period

Variable Definitions (add additional rows as needed)	
alcoholX_date	Date of Xth contact with services for alcohol-related disorders over the follow-up period (any diagnosis field in DAD, OMHRS, NACRS, OHIP – codes in Appendix C)
substanceX_date	Date of Xth contact with services for substance-related disorders over the follow-up period (any diagnosis field in DAD, OMHRS, NACRS, OHIP – codes in Appendix D)
substance_opioid	Flag if contact with services for substance-related disorder (above) was related to opioids, defined as follows (any diagnosis field in DAD, OMHRS, NACRS): • ICD-9: 30400, 30401, 30402, 30403, 30470, 30471, 30472, 30473, 30550, 30551, 30552, 30553 • ICD-10: F11 • DSM-IV: 304.00, 305.50
substance_sedative	Flag if contact with services for substance-related disorder (above) was related to sedatives or barbituates, defined as follows (any diagnosis field in DAD, OMHRS, NACRS): • ICD-9: 30410, 30411, 30412, 30413, 30540, 30541, 30542, 30543 • ICD-10: F13 • DSM-IV: 304.10, 305.40
substance_cocaine	Flag if contact with services for substance-related disorder (above) was related to cocaine, defined as follows (any diagnosis field in DAD, OMHRS, NACRS): • ICD-9: 30420, 30421, 30422, 30423, 30560, 30561, 30562, 30563 • ICD-10: F14 • DSM-IV: 304.20, 305.60
substance_cannabis	Flag if contact with services for substance-related disorder (above) was related to cannabis, defined as follows (any diagnosis field in DAD, OMHRS, NACRS): • ICD-9: 30430, 30431, 30432, 30433, 30520, 30521, 30522, 30523 • ICD-10: F12 • DSM-IV: 304.30, 305.20
substance_amphetamine	Flag if contact with services for substance-related disorder (above) was related to amphetamines, defined as follows (any diagnosis field in DAD, OMHRS, NACRS): • ICD-9: 30440, 30441, 30442, 30443, 30570, 30571, 30572, 30573 • ICD-10: F15

Variable Definitions (add additional rows as needed)	
	• DSM-IV: 304.40, 305.70
substance_hallucinogen	Flag if contact with services for substance-related disorder (above) was related to hallucinogens, defined as follows (any diagnosis field in DAD, OMHRS, NACRS): • ICD-9: 30450, 30451, 30452, 30453, 30530, 30531, 30532, 30533 • ICD-10: F16 • DSM-IV: 304.50, 305.30
substance_poly	Flag if contact with services for substance-related disorder (above) was related to multiple substances, defined as follows (any diagnosis field in DAD, OMHRS, NACRS): • ICD-9: 30470, 30471, 30472, 30480, 30481, 30482, 30483 • ICD-10: F19 • DSM-IV: 304.80
substance_unknown	Flag if contact with services for substance-related disorder (above) was related to unknown substances, defined as follows (any diagnosis field in DAD, OMHRS, NACRS): • ICD-9: 2920, 29211, 29212, 2922, 29281, 29282, 29283, 29284, 29289, 2929, 30460, 30461, 30462, 30463, 30490, 30491, 30492, 30493, 30580, 30581, 30582, 30583, 30590, 30591, 30592, 30593 • ICD-10: F18, F55 • DSM-IV: 292.00, 292.11, 292.12, 292.81, 292.82, 292.83, 292.84, 292.89, 292.90, 304.60, 304.90, 305.10, 305.90 • OHIP: 292, 304
odb_length	Length of time (days) covered by ODB over the study follow-up period
odb_10y	Flag if patient is still covered by ODB at 10-year follow-up
odb_plan	If odb_10y = 1, note the plan code (PLANCODE from ODB database)
death	Whether the patient died from any cause over the follow-up period (DTH from RPDB)
death_date	Date of death (DTHDATE from RPDB)

Variable Definitions (add additional rows as needed)	
Physical Co-Morbidities (At any point in patient record)	
ami	Flag if patient has a hospitalization for acute myocardial infarction, based on presence of IKN in OMID2016 database NOTE: Only includes patients over the age of 20
ami_date	Date of first admission for acute myocardial infarction (ADMDATE from OMID2016 database)
asthma	Flag if patient has a diagnosis of asthma, based on presence of IKN in ASTHMA2016 database
asthma_date	Date of first diagnosis of asthma (FIRSTOHIP from ASTHMA2016 database)
asthma_10y	Flag if patient is a prevalent case of asthma (PREVyyyy) at the end of the 10-year follow-up period
cancer	Flag if patient has diagnosis of cancer, based on presence of IKN in OCR database
cancer_date	Date of first diagnosis of cancer (DXDATE from OCR database)
cancer_site	Site of cancer, defined by PSITE from OCR database
cancer_stage	Stage of cancer at diagnosis, defined by BEST_STAGE_GRP from OCR database
cancer_10yr	Flag if date of last contact (DOLC) is within five years of the end of the 10-year follow-up period
chf	Flag if patient has diagnosis of congestive heart failure based on presence of IKN in CHF2016 database NOTE: Only includes patients over the age of 40
chf_date	Date of first diagnosis of congestive heart failure (DIAGDATE from CHF database)
chf_10y	Flag if patient is prevalent case (PREVyyyy) at end of 10-year follow-up period
ckd	Flag if patient has diagnosis of chronic kidney disease, defined based on the presence of one of the following codes in DAD, or two in OHIP within a 2-year period (ICD-9: DXCODE1-16; ICD-10: DXCODE1-25):

Variable Definitions (add additional rows as needed)	
	• ICD-9: 40300, 40301, 40310, 40311, 40390, 40391, 40400, 40401, 40402, 40403, 40410, 40411, 40412, 40413, 40490, 40491, 40492, 40493, 585, 586, 5888, 5889, 2504, V451 • ICD-10: E102, E112, E132, E142, I12, I13, N08, N180, N181, N182, N183, N184, N185, N188, N189 N19, T824, Z492, Z992 • OHIP: 403, 585
ckd_date	Date of first diagnosis of chronic kidney disease, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits
ckd_10y	Flag if patient has a hospitalization or visit for chronic kidney disease within 5 years of the maximum follow-up date
copd	Flag if patient has diagnosis of COPD, based on presence of IKN in COPD2016 database NOTE: Only includes patients over the age of 35
copd_date	Date of diagnosis of COPD (DIAGDATE from COPD database)
copd_10y	Flag if patient is prevalent case (PREVyyyy) at end of 10-year follow-up period
cvd	Flag if patient has diagnosis of cardiovascular disease, which includes MI, angina, peripheral vascular disease, and arrhythmia. Definitions found in the file below:  CVD Case Definition.xlsx
cvd_date	Date of first diagnosis of cardiovascular disease, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits
cvd_10y	Flag if patient has hospitalization or visit for cardiovascular disease (as defined above) within 5 years of the maximum follow-up date
dementia	Flag if patient has a diagnosis of dementia, based on presence of IKN in DEMENTIA2016 database NOTE: Only includes patients over the age of 40
dementia_date	Date of diagnosis of dementia (DIAGDATE from DEMENTIA2016)

Variable Definitions (add additional rows as needed)	
dementia_10y	Flag if patient is a prevalent case of dementia (PREVyyyy) at the end of the 10-year follow-up period
diabetes	Flag if patient has a diagnosis of diabetes, based on presence of IKN in ODD2016 database
diabetes_date	Date of diagnosis of hypertension (DIAGDATE from ODD2016 database)
diabetes_10y	Flag if patient is a prevalent case of diabetes (PREVyyyy) at the end of the 10-year follow-up period
hepatitis	Flag if patient has diagnosis of hepatitis, defined based on the presence of one of the following codes in DAD, or two in OHIP (ICD-9: DXCODE1-16; ICD-10: DXCODE1-25): • ICD-9: 0700, 0701, 0702, 07020, 07021, 0703, 07030, 07031, 0704, 07041, 07042, 07043, 07049, 0705, 07051, 07052, 07053, 07059, 0706, 0709 • ICD-10: B15, B150, B159, B16, B160, B161, B162, B169, B17, B170, B171, B172, B178, B179, B18, B180, B181, B182, B188, B189, B19, B190, B199, B942, O98401, O98402, O98403, O98404, O98409, Z2250, Z2251, Z2258 • OHIP: 070
hepatitis_date	Date of first diagnosis of hepatitis, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits.
hiv	Flag if patient has diagnosis of HIV infection, based on presence of IKN in HIV2016 database NOTE: Only includes patients over the age of 18
hiv_date	Date of diagnosis of HIV infection (DIAGDATE from HIV2016 database)
hypertension	Flag if patient has a diagnosis of hypertension, based on presence of IKN in HYPER2016 database NOTE: Only includes patients over the age of 20
hypertension_date	Date of diagnosis of hypertension (DIAGDATE from HYPER2016 database)
hypertension_10y	Flag if patient is a prevalent case of hypertension (PREVyyyy) at the end of the 10-year follow-up period
ibd	Flag if patient has a diagnosis of inflammatory bowel disease, based on presence of IKN in OCCC2016 database

Variable Definitions (add additional rows as needed)	
ibd_date	Date of diagnosis of inflammatory bowel disease (FIRSTCONTACTDATE from OCCC2016 database)
ibd_10y	Flag if patient is a prevalent case of inflammatory bowel disease (PREVyyyy) at the end of the 10-year follow-up period
lipids	Flag if patient has a diagnosis of a disorder of lipid metabolism, based on DXCODE = 272 in OHIP database
lipids_date	Date of first diagnosis of disorder of lipid metabolism (SERVDATE from OHIP database)
liver	Flag if patient has diagnosis of chronic liver disease, defined based on the presence of one hospitalization (ICD-9: DXCODE1-16; ICD-10: DX10CODE1-25) or two OHIP visit diagnoses (DXCODE) or fee codes (FEECODE) within 2 years: • ICD-9: 4561, 4562, 070, 5722, 5723, 5724, 5728, 573, 7824, V026, 571, 2750, 2751, 7891, 7895 • ICD-10: B16, B17, B18, B19, I85, R17, R18, R160, R160, B942, Z2225, E830, E831, K70, K713, K714, K715, K717, K721, K729, K73, K74, K753, K754, K758, K759, K76, K77 • OHIPDX: 571, 573, 070 • OHIPFEE: Z551, Z554
liver_date	Date of first diagnosis of chronic liver disease, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits
liver_10y	Flag if patient has hospitalization or visit for chronic liver disease during 10-year follow-up period

Variable Definitions (add additional rows as needed)	
mood	Flag if patient has diagnosis of a mood disorder, defined based on the presence of one hospitalization (ICD-9: DXCODE1-16; ICD-10: DX10CODE1-25, DSM-IV: AXIS1_DSM4CODE_DISCH1-3) or two OHIP visit diagnoses (DXCODE) within 2 years: • ICD-9: 296, 2960, 29600, 29601, 29602, 29603, 29604, 29605, 29606, 2961, 29610, 29611, 29612, 29613, 29614, 29615, 29616, 2962, 29620, 29621, 29622, 29623, 29624, 29625, 29626, 2963, 29630, 29631, 29632, 29633, 29634, 29635, 29636, 2964, 29640, 29641, 29642, 29643, 29644, 29645, 29646, 2965, 29650, 29651, 29652, 29653, 29654, 29655, 29656, 2966, 29660, 29661, 29662, 29663, 29664, 29665, 29666, 2967, 29670, 2968, 29680, 29681, 29682, 29689, 2969, 29690, 29699, 3004, 3090, 3091, 311 • ICD-10: F300, F301, F302, F308, F309, F310, F311, F312, F313, F314, F315, F316, F317, F318, F319, F320, F321, F322, F323, F328, F329, F330, F331, F332, F333, F334, F338, F339, F341, F348, F349, F380, F381, F388, F39 • DSM-IV: 296.0X, 296.2X, 296.3X, 296.4X, 296.5X, 296.6X, 296.7, 296.80, 296.89, 296.9, 300.4, 301.13, 311.00 • OHIP: 296, 311
mood_date	Date of first diagnosis of mood disorder, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits
mood_10y	Flag if patient has hospitalization or visit for a mood disorder during 10-year follow-up period
anxiety	Flag if patient has diagnosis of an anxiety disorder, defined based on the presence of one hospitalization (ICD-9: DXCODE1-16; ICD-10: DX10CODE1-25, DSM-IV: AXIS1_DSM4CODE_DISCH1-3) or two OHIP visit diagnoses (DXCODE) within 2 years: • ICD-9: 30000, 30001, 30002, 30009, 30010, 30011, 30012, 30013, 30014, 30015, 30016, 30019, 30020, 30021, 30022, 30023, 30029, 3003, 3005, 3006, 3007, 30081, 30089, 3009, 3090, 30900, 30921, 30922, 30923, 30924, 30928, 30929, 3093, 3094, 30981, 30982, 30983, 30989, 3099, 30990 • ICD-10: F400, F401, F402, F408, F409, F410, F411, F412, F413, F418, F419, F420, F421, F422, F428, F429, F431, F432, F438 • DSM-IV: 300.XX, 300.00, 300.01, 300.02, 300.21, 300.22, 300.23, 300.29, 300.3, 308.3, 309.21, 309.81 • OHIP: 300, 309

Variable Definitions (add additional rows as needed)	
anxiety_date	Date of first diagnosis of anxiety disorder, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits
anxiety_10y	Flag if patient has hospitalization or visit for mood disorder during 10-year follow-up period
osteoarthritis	Flag if patient has diagnosis of osteoarthritis, defined based on the presence of one hospitalization (ICD-9: DXCODE1-16; ICD-10: DX10CODE1-25) or two OHIP visit diagnoses (DXCODE) within 2 years: • ICD-9: 71500, 71504, 71509, 71510, 71511, 71512, 71513, 71514, 71515, 71516, 71517, 71518, 71520, 71521, 71522, 71523, 71524, 71525, 71526, 71527, 71528, 71530, 71531, 71532, 71533, 71534, 71535, 71536, 71537, 71538, 71580, 71589, 71590, 71591, 71592, 71593, 71594, 71595, 71596, 71597, 71598 • ICD-10: M150, M151, M152, M153, M154, M158, M159, M160, M161, M162, M163, M164, M165, M166, M167, M169, M170, M171, M172, M173, M174, M175, M179, M180, M181, M182, M183, M184, M185, M189, M190, M191, M192, M198, M199 • OHIP: 715
osteoarthritis_date	Date of first diagnosis of osteoarthritis, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits
osteoarthritis_10y	Flag if patient has hospitalization or visit for osteoarthritis during follow-up period
osteoporosis	Flag if patient has diagnosis of osteoporosis, defined based on the presence of one hospitalization (ICD-9: DXCODE1-16; ICD-10: DX10CODE1-25) or two OHIP visit diagnoses (DXCODE) within 2 years: • ICD-9: 73300, 73301, 73302, 73303, 73309, 7331, 73320, 73321, 73322, 73329, 73329, 73340, 73341, 73342, 73343, 73344, 73349, 7335, 7336, 7337, 73381, 73382, 73390, 73391, 73392, 73399 • ICD-10: M810, M811, M812, M813, M814, M815, M816, M818, M819, M820, M821, M828 • OHIP: 733
osteoporosis_date	Date of first diagnosis of osteoporosis, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits

Variable Definitions (add additional rows as needed)	
osteoporosis_10y	Flag if patient has hospitalization or visit for osteoporosis during 10-year follow-up period
deliveryX_date	Date of Xth delivery (B_BDATE), based on presence of IKN in MOMBABY2016 database over follow-up period
deliveryX_stillbirth	Flag if delivery X was a stillbirth based on variable M_STILLBIRTH from MOMBABY2016 record
rheumatoid	Flag if patient has a diagnosis of rheumatoid arthritis, based on presence of IKN in ORAD2016 database
rheumatoid_date	Date of diagnosis of rheumatoid arthritis (DIAGDATE from ORAD2016 database)
rheumatoid_10y	Flag if patient is prevalent case (PREVyyyy) at end of 10-year follow-up period
stroke	Flag if patient has diagnosis of osteoporosis, defined based on the presence of one hospitalization (ICD-9: DXCODE1-16; ICD-10: DX10CODE1-25) or two OHIP visit diagnoses (DXCODE) within 2 years: • ICD-9: 3623, 36230, 36231, 36232, 36233, 36234, 36235, 36236, 36237, 430, 4300, 431, 4310, 4320, 4321, 4329, 4330, 4331, 4332, 4333, 4338, 4339, 4340, 4341, 4349, 4350, 4351, 4352, 4358, 4359, 436, 4360 • ICD-10: H340, H341, G450, G451, G452, G453, G458, G459, I600, I601, I602, I603, I604, I605, I606, I607, I608, I609, I610, I611, I612, I613, I614, I615, I616, I618, I619, I620, I621, I629, I630, I631, I632, I633, I634, I635, I636, I638, I639, I64 • OHIP: 3623, 430, 431, 432, 434, 436
stroke_date	Date of first diagnosis of stroke, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits
stroke_10y	Flag if patient has hospitalization or visit for stroke during follow-up period (1)
urinary	Flag if patient has diagnosis of osteoporosis, defined based on the presence of one hospitalization (ICD-9: DXCODE1-16; ICD-10: DX10CODE1-25) or two OHIP visit diagnoses (DXCODE) within 2 years: • ICD-9: 7883 • ICD-10: N393, N394, R32

Variable Definitions (add additional rows as needed)	
	• OHIP: 788
urinary_date	Date of first diagnosis of chronic urinary problem, as defined above. Use admission date (ADMDATE) when defined by hospitalization, and the date of first OHIP diagnosis (SERVDATE) when defined by outpatient visits
urinary_10y	Flag if patient has hospitalization or visit for a chronic urinary problem within 5 years of the maximum follow-up date

Analysis Plan and Dummy Tables	
Descriptive Tables	
Table 1. Sociodemographic and clinical characteristics of the sample at baseline	
Table 2. Alcohol and substance use diagnoses at baseline	
Table 3. Univariate and multivariate analysis of factors associated with contacts with acute mental health services over the 5-10-year post-EPI admission period	
Statistical Model(s)	
Type of model	Summary statistics of baseline variables (min, max, mean, standard deviation, 95% CI)
Primary independent variable	Create separate frequency variables for each acute mental health service type (mental health-related ED visits, psychiatric hospitalizations, involuntary admissions) and sort by time period of service use (first 5 years post-EPI admission, 5- to 10-year period post-EPI admission)
Dependent variable	
Covariates	Sex, age at onset, gender, rural, ethnicity, marginalization
Type of model	Cox proportional hazards regression model for time to first contact with acute mental health services and modified Poisson regression model for total psychiatric hospital LOS during the 5- to 10-year period post-EPI admission
Primary independent variable	Use of acute services/ hospitalization during the first 5 years after FEP
Dependent variable	Contact with acute mental health services (mental health-related ED visits, psychiatric hospitalizations, involuntary admissions) during the 5- to 10-year period post-EPI admission
Covariates	Sex, age, gender, rural, material deprivation, prior mental health service use in the first 5 years post-EPI admission (ED use for mental health reasons, total length of psychiatric hospitalization, involuntary admission)

Quality Assurance Activities		
RAE Directory of SAS Programs		
RAE Directory of Final Dataset(s)	*The final analytic dataset for each cohort includes all the data required to create the baseline tables and run all the models. It should include all covariates for all models such as patient risk factors, hospital characteristics, physician characteristics, exposure measures (continuous, categorical) and outcomes. It should include covariates that were considered but didn't make the final cut. This would permit an analyst to easily re-run the models in the future.*	
RAE README file available:	☐Yes ☐No	
Date results of quality assurance tools for final dataset shared with project team (where applicable):		
	%assign	yyyy-mon-dd
	%evolution	yyyy-mon-dd
	%dinexplore	yyyy-mon-dd
	%track / %exclude	yyyy-mon-dd
	%codebook	yyyy-mon-dd
Additional comments:		

APPENDIX A – List of Diagnostic Codes to Exclude from Comparison Group

OMHRS:

29510 = SCHIZOPHRENIA, DISORGANIZED TYPE

29520 = SCHIZOPHRENIA, CATATONIC TYPE

29530 = SCHIZOPHRENIA, PARANOID TYPE

29540 = SCHIZOPHRENIFORM DISORDER

29560 = SCHIZOPHRENIA, RESIDUAL TYPE

29570 = SCHIZOAFFECTIVE DISORDER

29590 = SCHIZOPHRENIA, UNDIFFERENTIATED TYPE

29710 = DELUSIONAL DISORDER

29730 = SHARED PSYCHOTIC DISORDER

29880 = BRIEF PSYCHOTIC DISORDER

29890 = PSYCHOTIC DISORDER NOS

DAD (ICD-10):

F20 = SCHIZOPHRENIA

F200 = PARANOID SCHIZOPHRENIA

F201 = HEBEPHRENIC SCHIZOPHRENIA

F202 = CATATONIC SCHIZOPHRENIA

F203 = UNDIFFERENTIATED SCHIZOPHRENIA

F204 = POST-SCHIZOPHRENIC DEPRESSION

F205 = RESIDUAL SCHIZOPHRENIA

F206 = SIMPLE SCHIZOPHRENIA

F208 = OTHER SCHIZOPHRENIA

F209 = SCHIZOPHRENIA, UNSPECIFIED

F22 = PERSISTENT DELUSIONAL DISORDERS

F220 = DELUSIONAL DISORDER

F228 = OTHER PERSISTENT DELUSIONAL DISORDERS

F229 = PERSISTENT DELUSIONAL DISORDER, UNSPECIFIED

F23 = ACUTE AND TRANSIENT PSYCHOTIC DISORDERS

F230 = ACUTE POLYMORPHIC PSYCHOTIC DISORDER WITHOUT SYMPTOMS OF SCHIZOPHRENIA

F231 = ACUTE POLYMORPHIC PSYCHOTIC DISORDER WITH SYMPTOMS OF SCHIZOPHRENIA

F232 = ACUTE SCHIZOPHRENIA-LIKE PSYCHOTIC DISORDER

F233 = OTHER ACUTE PREDOMINANTLY DELUSIONAL PSYCHOTIC DISORDERS

F238 = OTHER ACUTE AND TRANSIENT PSYCHOTIC DISORDERS

F239 = ACUTE AND TRANSIENT PSYCHOTIC DISORDER, UNSPECIFIED

F24 = INDUCED DELUSIONAL DISORDER

F25 = SCHIZOAFFECTIVE DISORDERS

F250 = SCHIZOAFFECTIVE DISORDER, MANIC TYPE

F251 = SCHIZOAFFECTIVE DISORDER, DEPRESSIVE TYPE

F252 = SCHIZOAFFECTIVE DISORDER, MIXED TYPE

F258 = OTHER SCHIZOAFFECTIVE DISORDERS

F259 = SCHIZOAFFECTIVE DISORDER, UNSPECIFIED

F28 = OTHER NONORGANIC PSYCHOTIC DISORDERS

F29 = UNSPECIFIED NONORGANIC PSYCHOSIS

DAD (ICD-9):

295 = SCHIZOPHRENIAS

29500 = SIMPL SCHIZOPHREN-UNSPEC

29501 = SIMPL SCHIZOPHREN-SUBCHR

29502 = SIMPLE SCHIZOPHREN-CHR

29503 = SIMP SCHIZ-SUBCHR/EXACER

29504 = SIMPL SCHIZO-CHR/EXACERB

29505 = SIMPL SCHIZOPHREN-REMISS

2951 = HEBEPHRENIA-UNSPEC

29510 = HEBEPHRENIA-UNSPEC

29511 = HEBEPHRENIA-SUBCHRONIC

29512 = HEBEPHRENIA-CHRONIC

29513 = HEBEPHREN-SUBCHR/EXACERB

29514 = HEBEPHRENIA-CHR/EXACERB

29515 = HEBEPHRENIA-REMISSION

2952 = CATATONIA-UNSPEC

29520 = CATATONIA-UNSPEC

29521 = CATATONIA-SUBCHRONIC

29522 = CATATONIA-CHRONIC

29523 = CATATONIA-SUBCHR/EXACERB

29524 = CATATONIA-CHR/EXACERB

29525 = CATATONIA-REMISSION

2953 = PARANOID SCHIZO-UNSPEC

29530 = PARANOID SCHIZO-UNSPEC

29531 = PARANOID SCHIZO-SUBCHR

29532 = PARANOID SCHIZO-CHRONIC

29533 = PARAN SCHIZO-SUBCHR/EXAC

29534 = PARAN SCHIZO-CHR/EXACERB

29535 = PARANOID SCHIZO-REMISS

2954 = AC SCHIZOPHRENIA-UNSPEC

29540 = AC SCHIZOPHRENIA-UNSPEC

29541 = AC SCHIZOPHRENIA-SUBCHR

29542 = AC SCHIZOPHRENIA-CHR

29543 = AC SCHIZO-SUBCHR/EXACERB

29544 = AC SCHIZOPHR-CHR/EXACERB

29545 = AC SCHIZOPHRENIA-REMISS

2955 = LATENT SCHIZOPHREN-UNSP

29550 = LATENT SCHIZOPHREN-UNSP

29551 = LAT SCHIZOPHREN-SUBCHR

29552 = LATENT SCHIZOPHREN-CHR

29553 = LAT SCHIZO-SUBCHR/EXACER

29554 = LATENT SCHIZO-CHR/EXACER

29555 = LAT SCHIZOPHREN-REMISS

2956 = RESID SCHIZOPHREN-UNSP

29560 = RESID SCHIZOPHREN-UNSP

29561 = RESID SCHIZOPHREN-SUBCHR

29562 = RESIDUAL SCHIZOPHREN-CHR

29563 = RESID SCHIZO-SUBCHR/EXAC

29564 = RESID SCHIZO-CHR/EXACERB

29565 = RESID SCHIZOPHREN-REMISS

2957 = SCHIZOAFFECTIVE-UNSPEC

29570 = SCHIZOAFFECTIVE-UNSPEC

29571 = SCHIZOAFFECTIVE-SUBCHR

29572 = SCHIZOAFFECTIVE-CHRONIC

29573 = SCHIZOAFF-SUBCHR/EXACER

29574 = SCHIZOAFFECT-CHR/EXACER

29575 = SCHIZOAFFECTIVE-REMISS

2958 = SCHIZOPHRENIA NEC-UNSPEC

29580 = SCHIZOPHRENIA NEC-UNSPEC

29581 = SCHIZOPHRENIA NEC-SUBCHR

29582 = SCHIZOPHRENIA NEC-CHR

29583 = SCHIZO NEC-SUBCHR/EXACER

29584 = SCHIZO NEC-CHR/EXACERB

29585 = SCHIZOPHRENIA NEC-REMISS

2959 = SCHIZOPHRENIA NOS-UNSPEC

29590 = SCHIZOPHRENIA NOS-UNSPEC

29591 = SCHIZOPHRENIA NOS-SUBCHR

29592 = SCHIZOPHRENIA NOS-CHR

29593 = SCHIZO NOS-SUBCHR/EXACER

29594 = SCHIZO NOS-CHR/EXACERB

29595 = SCHIZOPHRENIA NOS-REMISS

297 = DELUSIONAL DISORDERS

2970 = PARANOID STATE, SIMPLE

2971 = PARANOIA

2972 = PARAPHRENIA

2973 = SHARED PARANOID DISORDER

2978 = PARANOID STATES NEC

2979 = PARANOID STATE NOS

298 = OTHER PSYCHOSES

2980 = REACT DEPRESS PSYCHOSIS

2981 = EXCITATIV TYPE PSYCHOSIS

2982 = REACTIVE CONFUSION

2983 = ACUTE PARANOID REACTION

2984 = PSYCHOGEN PARANOID PSYCH

2988 = REACT PSYCHOSIS NEC/NOS

2989 = PSYCHOSIS NOS

OHIP

295 = SCHIZOPHRENIA

297 = PARANOID STATES

298 = OTHER PSYCHOSES

Curriculum Vitae

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