The Impact of Primary Care on First Mental Health Contact for Children and

Adolescents:

A population-based cross-sectional cohort study in Québec, Canada

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PREFACE & CONTRIBUTION OF AUTHORS

This thesis and manuscript are products of the research I performed under the guidance of my co-authors. I conceived the study idea and created the study design and data analysis plan with Dr Patricia Li, which was executed by Marc Dorais (biostatistician). I was responsible for the interpretation of the results and writing of the thesis and manuscript. I received essential input and feedback on both the thesis and manuscript from my thesis committee members Dr. Patricia Li, Dr. Jai Shah, and Dr. Elham Rahme.

ABSTRACT

Introduction: Primary care physicians (PCP) are increasingly being recognized as playing an important role in the identification and management of mental health (MH) problems in youth. Over the past two decades, policy changes and reforms across Canada have attempted to increase access to primary care and decrease emergency department (ED) utilization. These reforms included the use of multidisciplinary team-based models of care, such as Family Medicine Groups (FMG) in Québec. Traditional, non-reform PCP models include family physicians working independent of FMGs (non-FMG) and pediatricians, whereas many children and adolescents remain without any form of primary care.

Objectives: To examine the association between primary care models and ED utilization in children and adolescents, both as the point of first MH contact and for visits subsequent to the first contact.

Methods: This was a population-based cross-sectional cohort study that used linked province-wide health administrative data for Québec children and adolescents (8-16 years as of 1/1/2012) with an index MH visit in 2012-13 (n=39,368). The preceding two-year period was used to establish absence of MH conditions and type of PCP. Cross-sectional analysis of baseline data and logistic regression was used to analyze associations between PCP models (FMG; non-FMG; pediatrician; no primary care) and setting of first MH contact (ED vs outpatient). A survival analysis with cox proportional hazards model was used to test associations between primary care models and subsequent MH ED visit within 30 days of the index visit. Models were adjusted for age, sex, co-morbidities, rurality, socio-economic status, and previous non-mental health ED use.

Results: Out of 39,368 children and adolescents with an incident MH visit, almost half did not have a PCP (47%), while 20.9%, 17.2% and 15.0% were under FMG, non-FMG, or pediatric care respectively. The ED was the point of first contact for 17.8% of index MH visits. Regardless of the specific model of care, children and adolescents

who had a usual provider of primary care, compared to those without a PCP, were significantly less likely to have had their first MH contact in an ED (Pediatrician (OR 0.41, 95% CI 0.36-0.47); FMG (OR 0.48, 95% CI 0.43-0.54); non-FMG (OR 0.59, 95% CI 0.53-0.66)). In Cox regression models, youth with a PCP were less likely to visit an ED subsequent to an index MH diagnosis (Pediatrician (HR 0.61, 95% CI 0.50-0.74); FMG (HR 0.81, 95% CI 0.70-0.94); non-FMG (HR 0.79, 95% CI 0.68-0.93)). When compared to FMGs, non-FMG family physician care was associated with increased likelihood of index MH contact in the ED (OR 1.28 (95% CI 1.13-1.45)), but not with subsequent MH ED visits (HR 1.03 (95% CI 0.85-1.24)).

Conclusion: Having a PCP decreased the likelihood of children and adolescents using the ED for MH, both at first contact and for subsequent visits. Compared to non-FMG family physicians, those under FMG care were less likely to have first MH contact in the ED, but had similar odds of subsequent MH ED visits. These results reflect the importance of primary care in promoting favourable pathways to MH care, and reveal potential benefits and shortcomings of multidisciplinary team-based PCP models.

RÉSUMÉ

Introduction: Il est de plus en plus reconnu que les médecins de soins primaires (MSP) jouent un rôle important dans l'identification et la gestion des problèmes de santé mentale chez les jeunes. Au cours des deux dernières décennies, des changements de politique et des réformes partout au Canada ont tenté d'accroître l'accès aux soins primaires et de réduire l'utilisation des services d'urgence (SU). Ces réformes comprenaient l'utilisation de modèles de soins axés sur des équipes multidisciplinaires, tels que les groupes de médecine de famille (GMF) au Québec, par opposition aux modèles MSP traditionnels tels que les médecins de famille et les pédiatres non membres de GMF.

Objectif: Examiner l'association entre le fait d'avoir une source habituelle de soins primaires et les visites à l'urgence liées à un premier épisode de SM chez les jeunes.

Méthodes: Ce projet était une étude axée sur la population qui utilisait des données administratives sur la santé, corrélées, à l'échelle de la province pour les jeunes Québécois (8-16 ans au 1/1/2012) avec une première visite en santé mentale en 2012-2013 (n = 39,368). La période de deux ans précédente a été utilisé pour établir l'absence de conditions de santé mentale et le type de MSP. Nous avons utilisé un modèle de cohorte transversale et la régression logistique pour analyser les associations entre les modèles de soins primaires (GMF; non-GMF, pédiatre; pas de soins de santé primaires) et le contexte du premier contact en santé mentale (SU vs soins ambulatoires). L'analyse secondaire a utilisé un modèle de cohorte et un modèle à risques proportionnels de Cox pour tester les associations entre les modèles de soins primaires et la visite subséquente en santé mentale aux SU dans les 30 jours suivant la première visite. Les modèles ont été ajustés pour l'âge, le sexe, les comorbidités, la ruralité, le statut socio-économique et l'utilisation antérieure des SU.

Résultats: Sur 39,368 jeunes ayant eu une visite liée à un incident de santé mentale, près de la moitié n'avaient pas de MSP (47%), alors que 20,9%, 17,2% et 15,0%

étaient respectivement sous soins GMF, non-GMF ou pédiatriques. 17,8% des premières visites en santé mentale ont eu lieu en SU. Indépendamment du modèle de soins spécifique, les jeunes qui avaient un prestataire habituel de soins primaires comparés à ceux sans MSP étaient significativement moins susceptibles d'avoir eu leur premier contact avec un problème de santé mentale dans un SU (Pédiatre (OR 0.41, IC 95% 0.36-0.47); GMF (OR 0.48, IC 95% 0.43-0.54); non-GMF (OR 0.59, IC 95% 0.53-0.66)) Dans les modèles de régression de Cox, les jeunes avec un MSP étaient moins susceptibles de se rendre à l'urgence après un premier diagnostic de santé mentale (Pédiatre (RR 0.61, IC 95% 0.50-0.74); GMF (RR 0.81, IC 95% 0.70-0.94); non-GMF (RR 0.79, IC 95% 0.68-0.93)). Comparés aux GMF, les non-GMF étaient associés à une probabilité accrue d'un premier contact avec un problème de santé mentale dans un contexte de SU (OR 1.28 (IC 95% 1.13-1.45)), mais n'étaient pas associés avec les visites ultérieures en santé mentale dans les SU (RR 1.03 (IC 95% 0.85-1.24)).

Conclusion: Avoir un médecin de soins primaires a diminué la probabilité que les jeunes utilisent les services d'urgence pour des raisons de santé mentale, à la fois lors du premier contact et lors de visites ultérieures. Comparativement aux non-GMF, les jeunes pris en charge par un GMF étaient moins susceptibles d'avoir un premier contact avec un problème de santé mentale en SU, mais présentaient des probabilités similaires de visites ultérieures pour santé mentale en SU. Ces résultats reflètent l'importance des soins primaires dans la promotion de voies favorables vers les soins en santé mentale et révèlent les avantages et inconvénients potentiels des modèles de MSP axé sur les équipes multidisciplinaires.

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CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 Introduction

The past two decades of health care in Québec have been marked by influential and far-reaching changes in both primary care and mental health. In the early 2000s, provinces and territories throughout Canada began implementing primary care reforms, which included a system-wide restructuring of healthcare systems in Québec. At the same time, mental health services in this province were also being modified via ongoing self-evaluation and policy changes outlined in a series of action plans (*plans d'actions*). While these transformative processes focused on different aspects within the health care system, they were not mutually exclusive– the primary care and mental health sectors intersected through the primary care physician (PCP (including family physicians and general paediatricians)). In this context, it is necessary to understand the impact of PCPs on mental health outcomes in Québec.

In 2000, the Clair Commission called for improvements in co-ordination, continuity, and access to primary care in Québec[1]. This report, which would lead to the reformation of primary care across the province, also emphasized the importance of access, integration and continuity of mental health services through community networks in collaboration with Family Medicine Groups (FMG). FMGs were designed to improve access to care by providing patients with limited walk-in services during holidays and weekends, and some on-call telephone service for enrolled patients[2]. These groups typically consist of 6-12 full-time physicians and 1 nurse for approximately every 7500 registered patients[3], but may include other health professionals as well. After being initially implemented in 2002, FMGs have since become the most common model of care for Québec family physicians, with plans for further expansion and coverage of care for the province[4,5]. Although FMGs are an important source of primary care for children and adolescents, some patients in this age group are still seen by traditional models of primary care, including pediatricians and general practitioners who are not enrolled with FMGs. Many youth remain, however, without any regular source of primary care at all.

The first *Plan d'Action* for mental health in Québec was introduced in 1998, and identified two priority populations: adults with serious psychiatric conditions, and children and youth with mental health disorders[6]. Since the implementation of primary care reform in the beginning of the century, two subsequent action plans have been produced by the government - in 2005 and 2015 – in order to continually update and advance mental health policies[7,8]. Both of these documents reaffirmed the importance of mental health in childhood and adolescence, while recognizing the FMG model of care as a potential source of improved access and collaboration with mental health specialists.

Efforts by the Québec government to reform primary care while also improving mental health services are consistent in their vision of primary care as a means of improving access, co-ordination and continuity of care for patients with mental illness. These efforts relate to the broader concept of 'collaborative' or 'shared' care – the integration of mental health professional services into the primary care setting – which has been supported by generalists and psychiatric associations, as well as the World Health Organization[9]. No evidence exists, however, to support this vision for Québec youth. To our knowledge, this thesis is the first to empirically assess the association of having a usual source of primary care, as well as the type of primary care, on the mental health care of children and adolescents in Québec. The outcome measures of choice were setting of first mental health contact (emergency department (ED) vs outpatient), and ED visits after the first contact. These endpoints are suggestive of poor access to primary care, and reflect negative mental health care pathways, which are associated with poor patient experiences, disengagement, and higher costs[10].

The findings of this thesis have relevance to policy-makers, clinicians, and researchers in the fields of primary care, mental health, and emergency medical services. This study will help to determine if recent governmental efforts to facilitate access to mental health services through PCPs is justified, and supports commitments to further strengthen the role of primary care in pediatric mental health. For researchers, the results of this research can serve as a basis to conduct more investigations about mental health care accessibility and pathways to care for children and adolescents.

1.2 Background

Pediatric Mental Health and Pathways to Care

Mental illness in childhood and adolescence has important psychosocial and economic consequences for individuals, families, and societies[11,12]. Conditions such as depression, anxiety and substance abuse can have a significant impact on development, and are amongst the most disabling in the world for youth[13]. Childhood and adolescence is a crucial period for prevention and early treatment, with half of all individuals who meet the criteria for a mental illness in their lifetime having an onset before the age of 14, and three quarters prior to 24[14]. Health advocates consider this issue to be an urgent research priority, in terms of advancing prevention and early intervention, expanding access to care, and transforming health-systems[15]. While the importance of early recognition and intervention has become evident, the mechanism by which this goal should be achieved remains elusive. Optimizing routes of entry into the healthcare system for children with psychiatric symptoms may be essential in ensuring timely and appropriate management for many of these conditions.

Early intervention services for youth mental illness, while predominantly focusing on psychosis, have been shown to be effective for several psychiatric disorders[16]. Researchers in this field place an emphasis on *pathways to care* in the healthcare system, defined as "the sequence of contacts with individuals and organizations prompted by the distressed person's efforts, and those of his or her significant others, to seek help"[17]. Pathways to mental health care can be complex and variable, especially for children and adolescents, who often rely on parents or teachers to identify problems and make the decision to seek help[18]. A model developed by Verhulst and Koot, based on previous work by Goldberg and Huxley on adults, describes the help-seeking process of childhood psychopathology in terms of five levels, each of which is separated by 'filters', including: 1) parental recognition; 2) PCP recognition; 3) PCP referral to psychiatric care; and 4) psychiatrist decision to refer for in-patient care[19,20]. This model, however, oversimplifies healthcare pathways by assuming that all patients have access to primary care, and that PCPs would necessarily be the first contact for children in the mental healthcare system.

Recent evidence from Ontario does not support this assumption, finding that more than half of youth requiring emergency department (ED) care for mental health issues did not previously obtain outpatient care[21]. The first mental health contact, or *index visit*, may reflect access to care, and is used as an indicator of health system performance in Ontario [22]. Although Canada has been a leader in terms of research and initiatives for early intervention in psychosis[23], Canadian youth with mental health needs continue to experience difficulties in accessing timely and efficient pathways to care[24,25].

Emergency Department Visits for Mental Health

Mental health conditions carry significant disease burden in North America. Between 1 in 4 and 1 in 5 children are estimated to be affected by these conditions every year[26,27], and health care systems in both Canada and the United States have struggled to provide adequate mental health care for these patients through established community resources[28]. The lack of community resources is further aggravated by problems of fragmentation and limited access to available services[29]. One of the most apparent and clinically significant consequences of the imbalance between the need and availability of mental health care is the use of EDs as a type of 'safety net' for behavioural and psychological distress[30]. Despite evidence of relatively stable prevalence of mental health conditions, there has been increased rates of mental health-related ED visits and hospitalizations in Canada[31,32,33]. According to the Canadian Institute for Health Information, child and youth ED visits for mental health have increased by 66% from 2007-2008 to 2017-2018[34]. The rise in child and adolescent psychiatric emergencies has likewise been viewed as a national crisis in the United States[35,36]. Making matters worse, mental health-related visits to the ED are associated with increased length of stay and increased likelihood of returning to the ED, acting as a further drain of resources and cause of overcrowding[37,38].

In terms of pathways to care, families and children in distress often use the ED as the point of first contact into the mental healthcare system[39]. The ED, however, is generally a suboptimal setting for children experiencing a mental health crisis, and is likewise a poor starting point for individual clinical pathways[40]. Using the ED as a point

of first mental health contact has important implications for patients, healthcare workers, and healthcare systems in general. Patients presenting to the ED with mental health complaints may be further distressed by long wait times[41], stressful, high-stimulation environments and possible limitations on privacy[42]. From the view of physicians, nurses, and other ED workers, mental health visits are often seen as disruptive to typical workflow[43], a view which is unfortunate and likely reflective of the stigma associated with mental illness. These encounters may also be limited by time constraints, difficulty in establishing clinical rapport, inadequate equipment/resources[44], and insufficient training and/or confidence in caring for pediatric psychiatry patients[45]. These limitations can consequently contribute to inadequate recommendations and follow-up care after discharge[46], in addition to already poor patient adherence[47]. From a broader perspective, the management of psychiatric conditions in the emergency setting is an added burden and inefficient use of resources for healthcare systems in North America that are already overburdened and inefficient[43], with complex and fragmented mental health systems that generally have no reliable, established method of referral from the ED to the community[48,49]. Fundamentally, increasing ED utilization is a symptom of a larger problem – the inability of current service structures to meet increasing knowledge and demand for youth mental healthcare.

Role of Primary Care in Mental Health

Primary care physicians have a crucial role in the recognition and management of child and adolescent mental health disturbances. Multiple medical organizations have acknowledged the importance of this role, and have released policy statements reinforcing the need for primary care involvement in pediatric mental health[50,51]. Several characteristics of primary care make it an appropriate setting for the management of psychiatric problems. Recognizing the 'primary care advantage', the American Academy of Pediatrics outlines several unique strengths and inherent opportunities of the primary care setting, including the establishment of longitudinal, trusting therapeutic relationships, a family-centered medical home, the focus on preventive care and anticipatory guidance, a more profound understanding of the child's social, emotional,

and educational context, experience working with specialists and coordinating care, and familiarity with practice improvement methods[50,52]. Compared to specialist services, primary care should also be easier to access and afford - especially in rural and remote regions - and seems to be associated with less stigma for many children and families than visits to mental health professionals[53].

Despite the advantages of primary care, several factors may compromise the ability of PCPs to adequately manage pediatric patients with psychiatric conditions. To begin, many aspects of healthcare in Canada and the United States continue to be troubled by an ostensible division between physical and mental health- possibly a result of historical and ongoing stigmatization of psychiatric illness[53]. This cultural and professional discord is made evident by the separation of government health agencies, insurance programs, and healthcare delivery systems. Consequently, the collaboration between primary care physicians and mental health specialists is effectively hindered, leading to a reduction in the overall quality of patient care. Additionally, payment for mental health services in primary care may be insufficient, or even completely lacking in some cases, further disincentivizing general practitioners from managing these patients[54].

Another important barrier is that primary care physicians may be insufficiently trained, or lacking confidence to manage psychiatric cases. At both the undergraduate and residency levels, most physicians report minimal training in mental health, especially with regards to children and adolescents[55]. Pediatricians and family physicians have often described feeling uncomfortable with the diagnosis and treatment of psychiatric disorders, despite being responsible for 85% of psychotropic medications taken by children[56]. Unfortunately, this inadequacy even extends to recognizing and screening for suicidality- the third leading cause of death amongst adolescents and a critical opportunity for preventive care[57,58,59,60]. In addition to training, other PCP factors that affect recognition of psychopathology include familiarity with patients, length of interview, interview technique, and use of screening measures[61].

Many solutions have been suggested and/or implemented in order to address the barriers to mental health care for primary care physicians. Programs have attempted to improve integration and collaboration with mental health professionals[62,53,63]; others have suggested improved financial incentives[54]; many pediatrics and family medicine

residencies have already placed increased focus on previous deficiencies[50,64], while continuing medical education has been offered to physicians who have already completed residency[65].

In terms of pathways to care, contact with a primary care provider has been shown to be predictive of health services use, and an important target for reducing treatment delay[66]. Having a family doctor or pediatrician should theoretically simplify pathways to care, improve outcomes, and potentially prevent the need for mental health specialists in some cases. Effective primary care would be expected to reduce the need for ED utilization, at least with non-severe presentations, and especially with regards to behaviours and concerns that are sub-threshold or even developmentally appropriate. Early intervention for milder disorders and during sub-threshold stages - when symptoms do not reach the level required for a psychiatric diagnosis – may prevent more severe and complex future presentations[67,68]. Screening, assessment, diagnosis and treatment of non-severe mental health disorders are primary care competencies that can improve patient care, but in some instances, reassurance and effective communication with patients and families may be all that is necessary to prevent costly and stressful ED visits[50].

Investigators continue to evaluate the effectiveness of these programs, but the underlying assumption remains constant: despite issues that need to be addressed, primary care has an important role to play in the early identification and management of mental health conditions in children and adolescents. In Québec, this realization has contributed to policy changes specifically directed toward mental health, but within the context of ongoing primary care reform.

Mental Health Policy and Primary Care Reform in Québec

In the 1960s, Québec joined many jurisdictions in Canada and the western world in implementing a policy of psychiatric deinstitutionalization. The purpose of this movement was to restore the dignity, rights, and freedoms of psychiatric patients by discharging them from province-run facilities and returning them to their communities[69]. While the number of patients in psychiatric facilities diminished significantly, mental health services and resources in the community were unable to provide adequate care,

leaving many individuals at increased risk of homelessness and incarceration. Inadequate community services has unfortunately remained an important limiting factor in the quality of care for many patients with mental health problems.

Since 1989, the government of Québec has explicitly adopted policies meant to support psychiatric patients in their own living environment, as opposed the hospital or other inpatient setting[70]. These efforts led to the publication of 'action plans' focused on the transformation of mental health services. The *Plan d'Action En Santé Mentale* (PASM- Mental Health Action Plan) reinforced the role of family doctors in mental health, and attempted to increase collaboration with mental health specialists[7]. The PASM was updated in 2015, with further emphasis on supporting primary care physicians and facilitating corridors of service for those in need of mental health care[8]. The primary medical sector, according to the PASM, is composed of three groups: family physicians, pediatricians, and Family Medicine Groups (FMGs). FMGs, created as part of the primary care reforms in Québec, are specifically targeted by the PASM as a potential means of improved access and collaboration in mental health care[12].

In the 2000s, federally commissioned reports exposed numerous problems related to the quality of primary care in Canada, drawing particular attention to fragmentation and inaccessibility of care[71]. These reports led the province of Québec to initiate primary care reforms that included the implementation of FMGs and network clinics[2,72]. The Québec PASM developed in the context of these reforms, and notes the potential of FMGs to improve mental health care by means of improving access to primary care and allowing for collaboration with designated specialists in psychiatry (*médecin spécialiste répondant en psychiatrie*). Qualitative participatory research has indicated some positive trends in collaboration and partnership as a result of this reform process[73]. Other investigators, however, have remarked that these reforms have yet to demonstrate a significant impact on mental health outcomes[74]. Members of our research team are currently evaluating the impact of primary care reform on ED visits and hospitalization in the general pediatric population[75]. Little is known, however, regarding the impact of primary care models on care pathways for children and adolescents suffering from mental health conditions in Québec.

1.3 Research Questions

The primary research questions in this study were:

- For Québec youth, to what extent is having a usual source of primary care associated with improved mental health care pathways, as measured by:
    1. Setting of first mental health contact (ED vs outpatient)?
    2. Subsequent utilization of the ED after the first mental health contact?

The secondary research questions were:

- For Québec youth with a PCP, to what extent is being part of an FMG associated with improved health care pathways, as measured by:
    1. Setting of first mental health contact (ED vs outpatient)?
    2. Subsequent utilization of the ED after the first mental health contact?

CHAPTER 2: LITERATURE REVIEW

This literature review aims to summarize the literature that addressed the following question: for children and adolescents, what is the impact of having a primary care physician on mental health-related emergency department (ED) visits? Seven studies were chosen for analysis in this review. A detailed explanation of the study selection process used in this literature can be found in the appendix.

Of the seven studies selected for the final stage of analysis, five were focused on patients diagnosed with psychotic disorders, one examined mental health problems in general, and one did not focus on mental health specifically, but included data about mental health-related ED visits. Publication dates spanned from 2009 to 2017. One study limited the study population to an adolescent age range, with the others including adolescents and young adults, or not including any specified age limits. Five of the seven investigations took place in Canada, with one taking place in England, and one in Belgium. See Table 1 for further details on study characteristics.

Two studies took place in Québec. In one article, Anderson et al. (Sept. 2013)[76] used administrative data to identify incident cases of schizophrenia-spectrum psychosis in Montréal, and then determined if patterns of MH-related service use preceding psychosis was associated with socio-demographic, clinical, and health service indicators. The study found that patients – ages 14 to 30 years old - who were in contact with primary care for mental health reasons were less likely to have had contact with an ED or inpatient services (Odds Ratio [OR] = 0.15, 95% Confidence Interval [CI] = 0.06–0.39), and were also less likely to have received the index psychosis diagnosis in the ED (OR = 0.36, 95% CI = 0.24–0.54). This study conversely found that contact with primary care was associated with longer time to contact with a psychiatrist (Hazard Ratio [HR] = 0.32, 95% CI = 0.23–0.45). The other article by Anderson et al. (Jan. 2013)[66] was conducted at the Prevention and Early Intervention for Psychoses Program (PEPP) in Montréal, collecting data from patients, family members, clinical staff, and medical records using a standardized semi-structured interview. This study also investigated associations of socio-demographic, clinical, and service-level factors with negative pathways to care and treatment delay. The investigation found that contact with primary care prior to psychosis

onset was associated with increased contact during the prodrome (OR = 2.70, 95% CI = 1.48–4.96), and decreased likelihood of first contact with emergency services (OR = 0.07, 95% CI = 0.04–0.14), as well as decreased referral to PEPP by emergency services (OR = 0.42, 95% CI = 0.24–0.74). In both studies, Anderson highlighted the importance of primary care as a potential target to reduce burden on EDs and inpatient units, as well as to decrease negative pathways to care for patients with first episode psychosis.

The largest of the studies included in this analysis was by Gill et al.[21], and took place in Ontario, Canada. Using administrative and demographic datasets available through the Institute for Clinical and Evaluative Sciences (ICES), a population-based, cross-sectional cohort study was performed, focusing on all youth (10 to 24 years) who had an unscheduled incident visit to the ED for any mental health condition. A total of 118, 851 patients were included in the final study. The researchers then used statistical models to determine the association between demographic, clinical, and health service characteristics with the ED visit being a 'first contact' for mental health (defined as no prior outpatient mental health care in the previous 2-year period). Out of all factors that were analyzed, including age, sex, socio-economic characteristics, and previous non-mental health ED utilization, the element that had the highest association with the ED being the first mental health contact was the absence of a usual provider of primary care (Relative Risk [RR] = 1.78, 95% CI = 1.77-1.80). Similar to Québec, Ontario has recently implemented significant reforms to primary care, including the creation of primary care models designed to improve patient access[77]. Gill et al. considered both reform and non-reform (i.e. fee-for-service) models of primary care in their study- as well as the use of pediatricians- and found that compared to reform models, having a traditional fee-for-service family practitioner increased the likelihood of using the ED as a first MH contact (RR = 1.11, 95% CI = 1.09-1.13), while pediatric primary care was associated with decreased risk (RR = 0.90, 95% CI = 0.87-0.93). In addition to patient factors, this study also used data on the characteristics of primary care for patients who had a usual provider of primary care. Physicians in the lowest tertile of MH visit volume had the highest risk of patients presenting the ED for a first MH contact. The discussion section of this study emphasizes the 'major and underrecognized role of primary care in managing MH problems', noting the importance of access and the potential for improved

screening/identification of psychiatric problems in order to obviate the use of the ED as a first MH contact.

A smaller study that also took place in Ontario was performed by Flora et al.[78], and focused on pathways to early intervention services for psychosis. Interviews were conducted with patients 14 years of age and older in order to obtain data about health or social service encounters from patients in early intervention services in Toronto and Hamilton, Ontario. This data was supplemented by information from medical records, case managers, and family members. Important aspects of pathways to care, as well as duration of untreated psychosis and referral delay were compared between the two cities. The investigators demonstrated that compared to Hamilton, pathways to care appear to be more complex in the larger city of Toronto, with pathway maps showing patterns of repeated encounters between and within services. The authors conclude that larger centres may be able to gain insight from the organization and service delivery in smaller cities in order to promote more direct pathways to care. This study was limited by a relatively small sample size in both cities, and therefore may not be generalizable to all patients with first-episode psychosis. Of interest to this review, general practitioners were more involved in the pathway to care in Toronto, as opposed to Hamilton (56.0% vs. 33.3%), while the ED was more frequently the point of first contact in Hamilton (23.8% vs. 9.3%). *Overall* use of the ED, however, was higher in Toronto (88.0% vs, 76.1%). These differences were not found to be statistically significant, and the authors did not specifically measure the association between general practitioner (GP) contact and ED utilization. However, a separate study that used the same dataset[79] noted that patients with GP involvement in their pathway to care had decreased odds of using the ED as a first contact (OR = 0.13, 95% CI = 0.05 - 0.33).

In Alberta, Soleimani et al.[80] explored adolescent ED revisits and hospitalizations after an index ED visit for psychotic symptoms, and how they relate to physician-based care factors. The study utilized the Ambulatory Care Classification System (ACCS), an administrative database of Alberta Health, and focused specifically on the 90-day period following the index visit. The investigators noted within the text of this article that mental health follow-up visits to physicians did not significantly affect time to ED revisit or hospitalization, though they did not provide the specific data or adjusted hazard ratio to

support this particular assertion. Hazard ratios are only provided for the physician-based care factors that were found to be significantly associated with a reduced time to ED revisit or hospitalization. Most relevant to this review are findings that *multiple* physician visits after discharge (compared to 0 or 1 visit) was associated with reduced time to ED revisit (HR = 5.93, 95 % CI = 2.09–16.82) in the 90-day post-discharge period, as was hospital-based outpatient care, compared to 'No visit/community mental health facility/practitioner's office/other' (HR = 3.07, 95 % CI = 1.77–5.29). The type of physician (GP vs pediatrician vs psychiatrist) seen did not affect time to revisit (HR not provided), but follow-up with a pediatrician, as opposed to 'No visit/general practitioner/psychiatrist/other' was associated with earlier inpatient hospitalization (HR = 4.45, 95 % CI = 1.43–13.87). The investigators argue that the lack of effect of follow-up physician visits on time to ED revisit may be explained by an inability of GPs to adequately recognize subtle, negative psychotic symptoms and early onset illness. This study may be limited by important methodological flaws, however, as variables such as 'multiple physician visits after discharge' may have been an indicator of increased severity of disease, which would therefore increase the likelihood of reduced time to ED revisit.

Both the Philips et al.[81] study in Belgium and the Lester et al.[82] study conducted in England were included in this review because they reported data about primary care utilization, and mental health-related ED visits. Neither of these studies, however, directly measured the association between these elements of health service utilization. Philips et al. used a mixed methods approach, interviewing patients who presented either to the ED or GP out-of-hours to determine the reason for selecting one service over the other. This research was performed in the context of attempts by Belgian policy-makers and physicians to redirect minor medical problems to primary care through the implementation of general practitioner cooperatives (GPC) that improved access during off-hours. The quantitative aspect of this paper did provide information about whether patients have family GPs (709 of 787 (90.1%) of participants), and how many patients presented for psychological reasons to either the ED (17) or the GPC service (6). Unfortunately, no further details were given regarding these psychiatric visits, so it is

unclear if some patients were in a pediatric age range, or what was the distribution of patients that had a family GP.

The Lester et al. study was part of the REDIRECT trial (BiRmingham Early Detection In untREated psyChosis Trial), a cluster randomized control trial of practices in Birmingham[83]. The aim of this study was to assess the effect of training GPs about first episode psychosis on duration of untreated psychosis and referrals to early-intervention services. The investigators did not find a significant effect with regards to the primary outcomes, but information about pathways to care were also included, and found to be pertinent to this review. In the intervention group, 27 of 40 (67.5%) patients had their first point of contact for mental health with a GP, while 5 of 40 (12.5%) were first seen in the ED. In the control group, 13 of 28 (46.4%) patients had their contact with a GP, as opposed to 6 of 28 (21.4%) in the ED. In terms of *last* point of contact (before referral to early intervention service) for the intervention group, 15 of 40 (37.5%) took place with the GP, and 3 of 40 (7.5%) in the ED. For the control group, the last point of contact was the GP in 14 of 28 (50%) cases, and the ED for 2 of 28 (7.1%) patients. Although statistical analyses were not performed and associations not confirmed, this data at least suggests that in practices where GPs receive training on first-episode psychosis, the first contact seemed more likely to have taken place with the GP, as opposed to the ED.

Overview

The majority of articles included in this narrative synthesis focused on first episode psychosis or pathways to care in psychosis. Studies in Québec and Ontario indicate that primary care has an important role to play in promoting favourable pathways to care, and potentially reducing ED utilization, while a study in Alberta did not find a significant association between primary care visits and time to ED revisit after an index visit for psychosis. It is difficult, however, to generalize these results to other mental health conditions in children and adolescents.

The study by Gill et al. adopted an important shift in perspective for this field of research, by extending the concept of 'first contact' to include any mental health-related diagnosis. While the study of pathways to care for psychosis-spectrum disorders is

unquestionably worthwhile and deserving of ongoing attention, it has become increasingly evident that any mental illness in childhood has far-reaching and potentially life-long consequences. Many researchers have suggested that the challenge of youth mental health requires a different conceptual approach than the model of diagnostic categorization currently applied to adult psychiatric illness[84]. A general mental health disturbance in childhood, for example, may resolve, or progress, or transform into a different category of disorder, such as depression or even psychosis[85,86]. Gill et al. is the first study to evaluate youth with a first presentation to the ED for any MH-related condition, and its results indicate that timely primary care can potentially prevent these visits. More research is needed to confirm and further elucidate the role of primary care in the pathway to mental health care for children and youth.

Addendum/Update

Since the completion of the original literature review, additional research has been published which may shed further light on this subject. An updated review was performed in May 2019, and two additional articles were found to be relevant to the literature review.

Kozloff et al.[87] performed a population-based retrospective cohort study in Ontario, Canada examining the care and aftercare for youth (16-24 years old) with a first ED visit for a psychotic disorder. The primary outcome was rate of outpatient mental health care within 30 days and 1 year of the ED presentation. This study included information about mental health-related visits to PCPs in the year prior to the initial ED presentation for psychosis, and did not demonstrate that these visits had a significant impact on aftercare with outpatient psychiatry at 30 days (HR 1.01 (95% CI 0.82-1.26)) and 1 year (HR 1.13 (95% CI 0.95-1.34)) after the index ED visit.

Anderson et al.[16], evaluated the impact of early intervention programs for 16 to 25 year-olds with mood and anxiety disorders relative to standard care. The investigators used administrative data to conduct a retrospective cohort of cases accepted to the First Episode Mood and Anxiety Program (FEMAP) in London, Ontario from 2009 to 2014. Proportional hazards models were used to compare indicators of service use compared to

a propensity score-matched group of non-FEMAP users receiving care elsewhere. In terms of outcome indicators, FEMAP users were more likely to see, and have more rapid access to a psychiatrist, and were less likely to access primary care (HR, 0.84; 95% CI, 0.71 to 0.98) and EDs (HR, 0.73; 95% CI, 0.53 to 0.99) for mental health reasons. Having a mental health visit with a family physician visit in the 6 months prior to the index diagnosis was not associated with increased use of the FEMAP program. While most studies in this field focus on psychotic disorders, or examine mental health diagnoses in general, this study differed with respect to the focus on early intervention for mood and anxiety disorders in youth.

MacDonald et al.[10] published a meta-analysis with articles relevant to mental healthcare pathways for young people, but not specifically fitting the criteria for this review. Although this review is not meant to be comprehensive, and is limited in scope, it is important to note that research into mental health care pathways for youth is growing and investigators continue to add to this literature on a regular basis.

Table 1. Characteristics of studies included in literature review

Study				Population			Method Details			
Authors	*Year*	*Design*	*Country/Province*	*Patient Population*	*Age (years)*	*N*	*Data Source*	*Primary Care Information*	*Primary Outcome (s)*	*Outcome of Interest for Literature Review*
Lester et al.	2009	Stratified cluster randomised controlled trial	England	Patients with first-episode psychosis referred to early-intervention services	Range: 14-30 Mean: 21.6	179	Patient interviews at baseline and 4 months	GP training (intervention group) vs GP with no training	difference in the number of referrals to early-intervention services	First contact (GP vs ED); last contact prior to referral
Philips et al.	2013	Mixed Methods	Belgium	Out-of-hours visitors to ED and GP	Range: 0-93 Mean: 35.42	787	Interviews with patients	Family GP (Yes/No)	Reason for using ED vs GP	Psychological reason for ED visit
Anderson et al.	Jan. 2013	Standardized semi-structured interview	Canada (Québec)	Patients at the Prevention and Early Intervention for Psychoses Program (PEPP)	Range: 14-30	324	Patients, family members, clinical staff, and medical records using the Course of Onset and Relapse Schedule (CORS)	Contact with primary care prior to psychosis onset	Elements related to negative pathways to care	Prodromal Contact First Contact
Anderson et al.	Sept. 2013	Population-Based Cohort Study	Canada (Québec)	Patients with first episode schizophrenia-spectrum psychosis	Range: 14-25 Mean: 20.7	456	Administrative data from Régie de l'assurance maladie du Québec	Contact with primary care for MH before psychosis	Predictors of health service utilization	Index Diagnosis in ED
Soleimani et al.	2016	Population-based	Canada (Alberta)	Adolescents discharged from	Range: 13-17	208	Alberta Health database with	GP/pediatric visits prior to	Time to: 1) ED re-	Time to ED re-visit for MH

		Retrospective Cohort Study		ED with main diagnosis of psychosis	Mean: 14.95		ambulatory care data, including ED	and following index visit	visit for MH; 2) inpatient hospitalization for MH	
Gill et al.	2017	Population-Based Cross-Sectional Cohort	Canada (Ontario)	Youth with incident MH ED visit	Range: 10-24	118, 851	Institute for Clinical Evaluative Sciences (ICES) linked administrative datasets	UPC (yes/no); PC model; O/P PC visits in prior 2 years	Characteristic of patients using ED for first MH contact	Primary care characteristics for patients with First MH contact in ED
Flora et al.	2017	Comparative analysis between two cities	Canada (Ontario)	Patients admitted to early intervention services in Toronto and Hamilton	Range: >14 Mean: 22.7	171	Patient interviews, medical records, clinicians/key informants	GP involvement in pathway to care	Components of pathway to care; duration of untreated psychosis; referral delay	Use of ED in pathway

Rationale and Relevance of Study

In recent years, the need to address mental health has gained international acknowledgment as not only important, but *essential* to healthcare[88]. For several countries, this knowledge has led to action in the form of changing policies, services, and research priorities, many of which place particular emphasis on early identification and intervention in children and youth[89,90]. Provincial policies in Québec have recognized primary care as playing a crucial role in the management of pediatric mental health issues. Problems with access, continuity and organization of primary and mental healthcare systems, however, continue to limit the ability of the primary care physician to help these patients. By examining the association between having a usual provider of primary care and the setting of first mental health contact, this study begins to interrogate the effectiveness of current primary care models in preventing negative pathways to mental health care for Québec youth. Shedding light on this issue can potentially help to guide clinical practice, healthcare policy, and future research in childhood and adolescent mental health.

Specific Research Objectives

The main objective of this study is to investigate the association between Québec primary care models with differences in outcomes reflecting the pathway to care for childhood and adolescent mental health. More specifically, this research investigated an outcome reflective of negative care pathways: the utilization of the emergency department (ED). In order to achieve this objective, the health service utilization patterns of a cohort of Québec children identified as having an initial mental health presentation

was examined. For this cohort of children, the aims of this study included:

1) Identifying the first contact within the healthcare system for mental health and describing their pathway to care according to: A) whether the point of first contact was made in an ED, as opposed to outpatient setting, and B) the need for a subsequent ED visit related to mental health.

2) Determining the association between primary care models and the elements of the pathway to care described in objective 1A (setting of first contact) and 1B (ED visits after first contact), in comparison to patients with no primary care physician.

3) Determining if FMGs, relative to other models of primary care, are associated with a decreased likelihood of ED utilization with respect to objectives 1A and 1B.

CHAPTER 3: METHODS

Study Design and Data Sources

This population-based study used a cross-sectional cohort design[91]. The study used Québec administrative data that was linked for children and adolescents across healthcare settings from 2010 to 2013 (inclusive). In Québec, all permanent residents are eligible for universal health care, which is administered by the Régie de l'Assurance Maladie du Québec (RAMQ). The data was derived from a larger study examining the impact of primary healthcare reforms in children, containing a random sample of children from birth to 18 years old in Québec, as well as all children with administratively defined asthma, diabetes, and chronic complex diseases (see appendix for details). For the current study, three databases obtained from the RAMQ were used: 1) Database of registered persons, which contained information about age, sex, and postal code for each insured patient; 2) Physician claims database, which contained records of all remunerated services provided in ED and in outpatient clinics, with the associated diagnoses as per the Québec version of the International Classification of Diseases, 9th edition (ICD-9); and 3) Hospital discharge database, which included information on hospital admissions and the associated ICD-10 diagnoses.

Study Population

A cohort of children was selected, aged 8 to 16 years as of January 1st, 2012, who were identified through administrative health records as having been seen by a physician or having had a hospital admission for one or more mental health problems from January 1st, 2012 to November 30th, 2013. The ICD-9/10 mental-health diagnostic categories included: mood/affective disorders (manic episode, depressive episode, dysthymic disorder), anxiety disorders (separation anxiety, specific phobia, social phobia, PTSD, agoraphobia, OCD, panic disorder and generalized anxiety disorder), psychotic disorders (schizophrenia, schizoaffective disorder, schizophreniform disorder, and psychosis NOS),

substance-related disorders (polysubstances, cocaine, stimulants, cannabis, alcohol, and opiates), neurodevelopmental disorders, personality and behaviour disorders, eating disorders, and other mental health disorders not included in the previous categories (see appendix for full list). Although the allocation of an ICD code does not necessarily coincide with the diagnosis of the specific corresponding illness, it was considered as at least indicative of the presence of mental health-related distress. This line of reasoning is in keeping with the shift away from specific diagnostic categories that often lack therapeutic validity, especially for the earliest stages of mental illness[92].

The reason for selecting the age range of 8 to 16 was in order to obtain a baseline period of two years (2010-2011) to determine the previous identification or ongoing treatment of a mental illness, as well as the primary exposure (primary care model) in children with a minimum age of 6 years at the start of the period of observation (i.e. 2010), and a maximum age of 18 years at the end of this period (i.e. 2013). Individuals with a diagnosis of one or more mental health problems in the baseline period of two years (2010-2011) were excluded to ensure that the cohort represented those with first contact for a mental health problem in the outcome period (2012-2013). Prior to 6 years of age, the point prevalence of mental illness is small[93,94], and for the purposes of this study 18 years was considered the upper age limit of adolescence. A cut-off date of November 30th, 2013, was selected for the initial mental health diagnosis, in order to allow for a minimum 30-day observation period subsequent to the first contact. This 30-day period, based on Canadian expert consensus, is the standard adopted by Québec in the PASM for maximal acceptable delay to access a psychiatric specialist in a variety of non-urgent circumstances[95,96].

Diagram 1 provides a timeline of the study design explained above.

Diagram 1. Study Timeline/Design
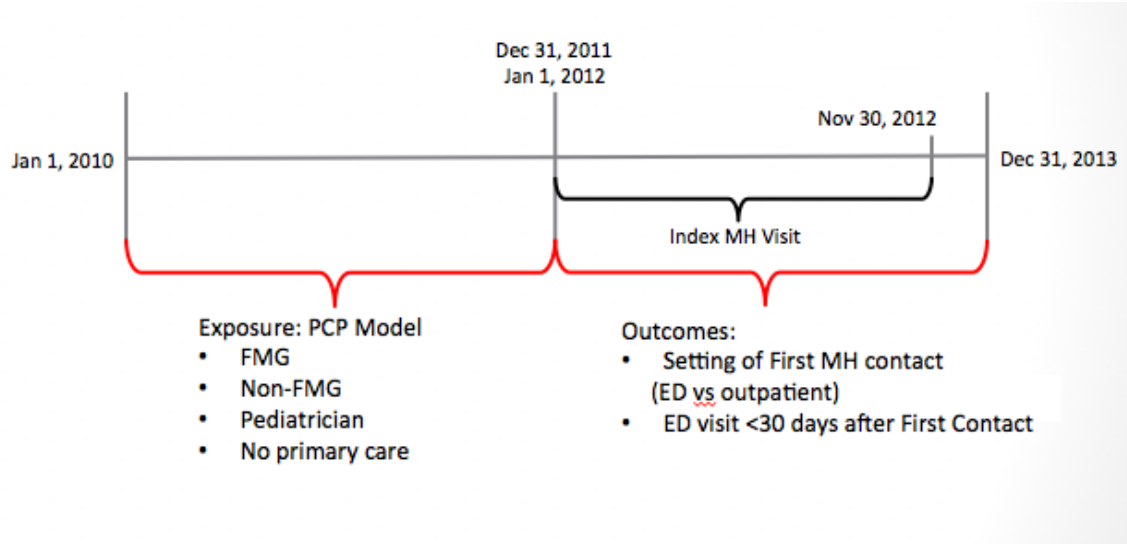
Main Exposure

Each child was assigned to one of four models of primary care (pediatrician, FMG, non-FMG, no primary care) based on their usual provider of primary care. We examined all physician claims from January 1, 2010 to December 31, 2011 and assigned the usual provider of primary care based on the following hierarchy that we have previously used in the Québec pediatric population[97]: 1) A supplemental billing code identifying a child as being enrolled with a provider was available (for family physicians only); 2) The usual provider of primary care billed codes used for monitoring routine growth and development (available to pediatricians); 3) The usual provider of primary care provided the majority of the primary health care visits and billed at least 2 of these; 4) In the case of a tie in the latter step, a family physician was assigned as the usual provider of primary care if they had billed 2 complete annual medical exams, otherwise a pediatrician was assigned. The remaining children were assigned in the "no primary care" category.

Outcomes

The primary outcome was the setting of first mental health contact made by a

patient during the two-year outcome period of January 1, 2012 to November 30, 2013. The point of first contact was determined by identifying the first physician visit that used a mental health-related ICD-9 diagnostic code, then using the establishment code to determine the setting of this visit as a binary outcome: ED vs outpatient. This method is in line with previous research performed in Ontario[98].

The secondary outcome was the use of the ED for mental health related reasons following the first mental health contact. This outcome was determined using a follow-up period of 30 days.

Patient Covariates

Age, sex, and healthcare region were obtained from RAMQ records. For comorbidities, we used RAMQ-identifiable chronic conditions using previously published algorithms, including asthma, diabetes and an administratively defined group of complex chronic conditions[99]. Although it is not possible to account for all childhood comorbidities in the available data, these conditions account for a large proportion of common chronic childhood illnesses, and are associated with increased healthcare use[100,101,102]. Rurality was defined and categorized into one of three groups based on population sizes of less than 10,000 people (most rural), 10,000 to 100,000 people (medium rurality) and greater than 100,000 people(least rural), used in studies published by the INSPQ (Institut national de santé publique du Québec)[103]. while individual-level data about socioeconomic status is not contained within the available databases, the Pampalon social and material deprivation index for Canada was used as a proxy measure for SES[104]. This index is assigned to a census dissemination area and linked to individuals using postal codes (linkage performed by RAMQ). Derived from census questions involving education, employment, income, and other household information, the Pampalon index is regularly used in Québec government reports and is considered the preferred deprivation index in national reports[105].

Statistical Analysis

The individual patient was the unit of analysis. Because the data contained a random sample of children, as well as all children with administratively defined asthma, diabetes, and chronic complex diseases, a weight of 1.774 (331,672 out of 588,386 children 8-16 years old in Quebec insured with RAMQ on January 1, 2012) was applied to the random sample (see appendix for details). Results were presented and statistical analyses performed after weight-adjustment. The cohort was summarized using descriptive statistics - proportions for categorical data and median or mean (with standard deviation) for continuous data.

To test the association between the primary, binary outcome (ED vs outpatient setting) and the exposure (primary care models), a multivariable logistic regression analysis was used, with generalized estimating equations to account for clusters of local community service centers (centre locales de services communautaires (CLSC)) regions[106,107]. From this analysis, the adjusted odds ratios (OR) and 95% confidence intervals (CI) were reported. To test the association between the exposure and the secondary outcome (ED visit within 30 days) a survival analysis using Cox proportional hazards model was performed, using intracluster correlation to account for clustering effect related to CLSC regions. From this analysis, the hazard ratios (HR) and 95% CI were reported. Models were adjusted for the variables age, sex, health status, rurality, SES, and previous non-mental health ED visits. The primary analysis used the 'No Primary Care' group as the reference model of care. The secondary analysis only examined patients with a primary care provider (i.e. excluded the 'No Primary Care' group) and used the FMG group as the reference model of care. A sensitivity analysis was also performed, which excluded neurodevelopmental disorders in order to ensure that this diagnostic category did not have a disproportionately large impact on the final results.

All statistical analyses were performed in SAS 9.4 (SAS Institute Inc., North Carolina).

CHAPTER 4: MANUSCRIPT

Primary Care and Emergency Department Utilization for First Mental Health Contact in Children and Adolescents

Gabriel Cartman, Jai Shah, Elham Rahme, Marc Dorais, Patricia Li

4.1 Abstract

Introduction: Primary care physicians (PCP) are increasingly being recognized as playing an important role in the identification and management of mental health (MH) problems in youth. Over the past two decades, policy changes and reforms across Canada have attempted to increase access to primary care and decrease emergency department (ED) utilization. These reforms included the use of multidisciplinary team-based models of care, such as Family Medicine Groups (FMG) in Québec. Traditional, non-reform PCP models include family physicians working independent of FMGs (non-FMG) and pediatricians, whereas many children and adolescents remain without any form of primary care.

Objectives: To examine the association between primary care models and ED utilization in children and adolescents, both as the point of first MH contact and for visits subsequent to the first contact.

Methods: This was a population-based cross-sectional cohort study that used linked province-wide health administrative data for Québec youth (8-16 years as of 1/1/2012) with an index MH visit in 2012-13 (n=39,368). The preceding two-year period was used to establish absence of MH conditions and type of PCP. Cross-sectional analysis of baseline data and logistic regression was used to analyze associations between PCP models (FMG; non-FMG; pediatrician; no primary care) and setting of first MH contact (ED vs outpatient). A survival analysis with cox proportional hazards model was used to test associations between primary care models and subsequent MH ED visit within 30 days of the index visit. Models were adjusted for age, sex, co-morbidities, rurality, socio-economic status, and previous non-mental health ED use.

Results: Out of 39,368 children and adolescents with an incident MH visit, almost half did not have a PCP (47%), while 20.9%, 17.2% and 15.0% were under FMG, non-FMG, or pediatric care respectively. The ED was the point of first contact for 17.8% of index MH visits. Regardless of the specific model of care, children and adolescents who had a usual provider of primary care, compared to those without a PCP, were

significantly less likely to have had their first MH contact in an ED (Pediatrician (OR 0.41, 95% CI 0.36-0.47); FMG (OR 0.48, 95% CI 0.43-0.54); non-FMG (OR 0.59, 95% CI 0.53-0.66)). In Cox regression models, children and adolescents with a PCP were less likely to visit an ED subsequent to an index MH diagnosis (Pediatrician (HR 0.61, 95% CI 0.50-0.74); FMG (HR 0.81, 95% CI 0.70-0.94); non-FMG (HR 0.79, 95% CI 0.68-0.93)). When compared to FMGs, non-FMG family physician care was associated with increased likelihood of index MH contact in the ED (OR 1.28 (95% CI 1.13-1.45)), but not with subsequent MH ED visits (HR 1.03 (95% CI 0.85-1.24)).

Conclusion: Having a PCP decreased the likelihood of children and adolescents using the ED for MH, both at first contact and for subsequent visits. Compared to non-FMG family physicians, those under FMG care were less likely to have first MH contact in the ED, but had similar odds of subsequent MH ED visits. These results reflect the importance of primary care in promoting favourable pathways to MH care, and reveal potential benefits and shortcomings of multidisciplinary team-based PCP models.

4.2 Introduction

By the time an individual has reached adulthood, many aspects of their lifelong health and well-being have already been determined. Mental health conditions in particular are known to manifestation at an early age, with half of all individuals who meet the criteria for a mental illness in their lifetime having an onset before the age of 14, and three quarters prior to 24[1]. As a consequence, childhood and adolescence are considered to be essential age periods for mental health promotion, and potential targets through which the heavy burden of adult mental illness can be alleviated[2,3]. Many researchers have described youth mental health as 'the starting point of overall mental health', and argued for its advancement as the top health service priority[4]. Apart from the most privileged segments of the population, however, access to pediatric mental health care is hampered by fragmented healthcare systems, competition for limited public funding, and the short supply of specialized care[5]. This realization has had a demonstrable impact on policy and approach to mental health around the world, and has correspondingly expanded the mandate of primary care and the role of primary care physicians.

In the province of Québec, nominal efforts to improve mental health care through community resources have existed for almost three decades[6]. Since the implementation of primary care reform in the early 2000s, Québec mental health policy has focused on supporting primary care physicians and facilitating collaboration with specialty care, placing a particular emphasis on doctors working within the reformed, team-based model of care, known as Family Medicine Groups (FMGs)[7]. The strengths and opportunities of primary care- described as 'the primary care advantage' by the American Academy of Pediatrics[8] – make it a potentially ideal setting to address and prevent mental health problems in children and youth, thereby decreasing the associated psychosocial and economic impact of these diseases on patients, families, and communities.

A useful way of conceptualizing the ability of youth to access mental health services within the context of their healthcare system is by examining 'pathways to care', defined as "the sequence of contacts with individuals and organizations prompted by the distressed person's efforts, and those of his or her significant others, to seek help"[9]. An

especially important component of a healthcare pathway is the point of first contact. Using the emergency department (ED) as the point of first mental health contact is generally indicative of a negative pathway to care, as these visits can be distressing to patients, and are associated with higher healthcare costs and increased rate of return visits to the ED[10,11].

In Québec, having a primary care provider has been associated with decreased rate of ED visits in elderly patients[12]. Enrolment in an FMGs amongst adults of older age or with chronic illnesses has also been associated with statistically significant decreases in ED use[13,14]. It is unknown, however, whether the protective effects of primary care also extend to mental health ED visits in children and adolescents. The primary objective of this study was to determine the association between having a usual source of primary care and improved mental health care pathways for Québec youth, as measured by: 1) Setting of first mental health contact (ED vs outpatient), and 2) Subsequent utilization of the ED after the first formal mental health contact. The secondary objective of this study was to determine the association between being enrolled in an FMG for primary care and improved health care pathways for Québec youth, as measured by: 1) Setting of first mental health contact (ED vs outpatient), and 2) Subsequent utilization of the ED after the first formal mental health contact.

4.3 Methods

Study Design and Data Sources

This population-based study used a cross-sectional cohort design. The study used Québec administrative data that was linked for children and adolescents across healthcare settings from 2010 to 2013 (inclusive). In Québec, all permanent residents are eligible for universal health care, which is administered by the Régie de l'Assurance Maladie du Québec (RAMQ). The data was derived from a larger study examining the impact of primary healthcare reforms in children, containing a random sample of children from birth to 18 years old in Québec, as well as all children with administratively defined asthma, diabetes, and chronic complex diseases (see appendix for details). For the current

study, three databases obtained from the RAMQ were used: 1) Database of registered persons, which contained information about age, sex, and postal code for each insured patient; 2) Physician claims database, which contained records of all remunerated services provided in ED and in outpatient clinics, with the associated diagnoses as per the Québec version of the International Classification of Diseases, 9th edition (ICD-9); and 3) Hospital discharge database, which included information on hospital admissions and the associated ICD-10 diagnoses.

Study Population

A cohort of children was selected, aged 8 to 16 years as of January 1st, 2012, who were identified through administrative health records as having been seen by a physician or having had a hospital admission for one or more mental health problems from January 1st, 2012 to November 30th, 2013. The ICD-9/10 mental-health diagnostic categories included: mood/affective disorders (manic episode, depressive episode, dysthymic disorder), anxiety disorders (separation anxiety, specific phobia, social phobia, PTSD, agoraphobia, OCD, panic disorder and generalized anxiety disorder), psychotic disorders (schizophrenia, schizoaffective disorder, schizophreniform disorder, and psychosis NOS), substance-related disorders (polysubstances, cocaine, stimulants, cannabis, alcohol, and opiates), neurodevelopmental disorders, personality and behaviour disorders, eating disorders, and other mental health disorders not included in the previous categories (see appendix for full list). Although the allocation of an ICD code does not necessarily coincide with the diagnosis of the specific corresponding illness, it was considered as at least indicative of the presence of mental health-related distress. This line of reasoning is in keeping with the shift away from specific diagnostic categories that often lack therapeutic validity, especially for the earliest stages of mental illness[15].

The reason for selecting the age range of 8 to 16 was in order to obtain a baseline period of two years (2010-2011) to determine the previous identification or ongoing treatment of a mental illness, as well as the primary exposure (primary care model) in children with a minimum age of 6 years at the start of the period of observation (i.e. 2010), and a maximum age of 18 years at the end of this period (i.e. 2013). Individuals

with a diagnosis of one or more mental health problems in the baseline period of two years (2010-2011) were excluded to ensure that the cohort represented those with first contact for a mental health problem in the outcome period (2012-2013). Prior to 6 years of age, the point prevalence of mental illness is small[16,17], and for the purposes of this study 18 years was considered the upper age limit of adolescence. A cut-off date of November 30th, 2013, was selected for the initial mental health diagnosis, in order to allow for a minimum 30-day observation period subsequent to the first contact. This 30-day period, based on Canadian expert consensus, is the standard adopted by Québec in the PASM for maximal acceptable delay to access a psychiatric specialist in a variety of non-urgent circumstances[18,19].

Main Exposure

Each child was assigned to one of four models of primary care (pediatrician, FMG, non-FMG, no primary care) based on their usual provider of primary care. All physician claims from January 1, 2010 to December 31, 2011 were examined and assigned the usual provider of primary care based on the following hierarchy that has previously been used in the Québec pediatric population[20]: 1) A supplemental billing code identifying a child as being enrolled with a provider was available (for family physicians only); 2) The usual provider of primary care billed codes used for monitoring routine growth and development (available to pediatricians); 3) The usual provider of primary care provided the majority of the primary health care visits and billed at least 2 of these; 4) In the case of a tie in the latter step, a family physician was assigned as the usual provider of primary care if they had billed 2 complete annual medical exams, otherwise a pediatrician was assigned. The remaining children were assigned in the "no primary care" category.

Outcomes

The primary outcome was the setting of first mental health contact made by a patient during the two-year outcome period of January 1, 2012 to November 30, 2013. The point of first contact was determined by identifying the first physician visit that used

a mental health-related ICD-9 diagnostic code, then using the establishment code to determine the setting of this visit as a binary outcome: ED vs outpatient. This method is in line with previous research performed in Ontario[21].

The secondary outcome was the use of the ED for mental health related reasons following the first mental health contact. This outcome was determined using a follow-up period of 30 days.

Patient Covariates

Age, sex, and healthcare region were obtained from RAMQ records. For comorbidities, RAMQ-identifiable chronic conditions using previously published algorithms, including asthma, diabetes and an administratively defined group of complex chronic conditions were used[22]. Although it is not possible to account for all childhood comorbidities in the available data, these conditions account for a large proportion of common chronic childhood illnesses, and are associated with increased healthcare use[23,24,25]. Rurality was defined and categorized into one of three groups based on population sizes of less than 10,000 people (most rural), 10,000 to 100,000 people (medium rurality) and greater than 100,000 people(least rural), used in studies published by the INSPQ (Institut national de santé publique du Québec)[26]. while individual-level data about socioeconomic status is not contained within the available databases, the Pampalon social and material deprivation index for Canada was used as a proxy measure for SES[27]. This index is assigned to a census dissemination area and linked to individuals using postal codes (linkage performed by RAMQ). Derived from census questions involving education, employment, income, and other household information, the Pampalon index is regularly used in Québec government reports and is considered the preferred deprivation index in national reports[28].

Statistical Analysis

The individual patient was the unit of analysis. Because the data contained a random sample of children, as well as all children with administratively defined asthma,

diabetes, and chronic complex diseases, a weight of 1.774 (331,672 out of 588,386 children 8-16 years old in Quebec insured with RAMQ on January 1, 2012) was applied to the random sample (see appendix for details). Results were presented and statistical analyses performed after weight-adjustment. The cohort was summarized using descriptive statistics - proportions for categorical data and median or mean (with standard deviation) for continuous data.

To test the association between the primary, binary outcome (ED vs outpatient setting) and the exposure (primary care models), a multivariable logistic regression analysis was used, with generalized estimating equations to account for clusters of local community service centers (centre locales de services communautaires (CLSC)) regions[29,30]. From this analysis, the adjusted odds ratios (OR) and 95% confidence intervals (CI) were reported. To test the association between the exposure and the secondary outcome (ED visit within 30 days) a survival analysis using Cox proportional hazards model was performed, using intracluster correlation to account for clustering effect related to CLSC regions. From this analysis, the hazard ratios (HR) and 95% CI were reported. Models were adjusted for the variables age, sex, health status, rurality, SES, and previous non-mental health ED visits. The primary analysis used the 'No Primary Care' group as the reference model of care. The secondary analysis only examined patients with a primary care provider (i.e. excluded the 'No Primary Care' group) and used the FMG group as the reference model of care. A sensitivity analysis was also performed, which excluded neurodevelopmental disorders in order to ensure that this diagnostic category did not have a disproportionately large impact on the final results.

All statistical analyses were performed in SAS 9.4 (SAS Institute Inc., North Carolina).

4.4 Results

Descriptive Statistics

This study included 23,562 individuals, with a weighted population total of 39,368.

Unless otherwise indicated, the results presented in this manuscript are based on weighted calculations.

Table 1 shows the characteristics of the children based on the primary care model, as well as total population results. As of January 1, 2012, 47.0% of Québec children in this study did not have a primary care provider. For patients who were identified as having a primary care provider, 20.9% were enrolled in an FMG, while 17.2% and 15.0% were under the care of pediatricians and non-FMG physicians, respectively. There was a slightly higher percentage of children without comorbidities (asthma, diabetes, or complex chronic diseases) in the no primary care group compared to those who had a primary care provider, with pediatricians having the highest proportion of patients with co-morbidities. The pediatrician group had a higher percentage of patients from high socioeconomic backgrounds, as well as from urban areas, in comparison to the other groups. FMGs had a lowest percentage of patients from urban backgrounds. The pediatrician model of care also had the highest proportion of children without a previous visit to the ED.

Association between primary care and outcomes related to index MH visit

Table 2 represents outcomes related to the first (index) mental health contact based on the model of primary care. More than half (4283 of 7000 children) who had the index mental health visit in the ED setting did not have a primary care provider. The group with no primary care physician had the highest percentage of children with the first mental health contact occurring in the ED (23.2%), as opposed to the outpatient setting, followed by the non-FMG (16.9%), FMG (13.3%), and pediatrician group (9.3%). The 'no primary care' group also had the highest proportion of first mental health contacts leading to a hospital admission (4.6%). Across all primary care models, the most likely diagnostic category for the first mental health contact was 'Behavioural/Neurodevelopmental disorders', which includes Attention-deficit hyperactivity disorders. The second most prevalent diagnostic category for all models of care was 'Anxiety disorders'.

Table 3 shows outcomes occurring subsequent to the first mental health contact, according to primary care models. The pediatrician group had the highest percentage of patients with no subsequent mental health-related ED visit within 30 days of the first mental health visit (98.1%), followed by FMG (96.9%), non-FMG (96.5%) and the 'no primary care' group (96.0%). The 'no primary care' group had the highest proportion of follow-up visits with a psychiatrist. The rate of MH-related ED visits subsequent to the index visit was similar across models, with medians of zero, and means approaching zero. Likewise, for patients with a primary care physician, the number of MH-related PCP visits subsequent to the index visit was similar across models, with medians of zero, and means approaching zero.

Multivariable logistic regression analysis was performed to further evaluate the relationship between the exposure (primary care models) and the outcome (setting of first mental health contact - ED vs outpatient). The outcomes of this analysis are displayed in Table 4. This analysis showed that regardless of the specific model of care, children who had a primary care physician, compared to those without a PCP, were less likely to have had their first mental health contact in an ED setting (Pediatrician (OR 0.41, 95% CI 0.36-0.47); FMG (OR 0.48, 95% CI 0.43-0.54); non-FMG (OR 0.59, 95% CI 0.53-0.66)). Males were also less likely to have their index mental health visit in the ED. Variables that increased the likelihood of having a first mental health contact in the ED setting included increased age, lower socioeconomic status, having a medical comorbidity, and having a previous (non-mental health) ED visit. Compared to neurodevelopmental disorders, all other categories of mental health conditions were less likely to have been diagnosed in the outpatient setting.

The results of the survival analysis using Cox proportional hazard model are shown in Table 5. This analysis revealed that compared to the 'no primary care' group, children who have either a pediatrician, or a family physician (FMG or non-FMG) are less likely to have an ED visit in the 30-day period subsequent to a mental health diagnosis (Pediatrician (HR 0.61, 95% CI 0.50-0.74); FMG (HR 0.81, 95% CI 0.70-0.94); non-FMG (HR 0.79, 95% CI 0.68-0.93)). In addition, older age and having a previous

(nonmental health) ED visit increased the likelihood that a child would use the ED after an index mental health visit. Males had a decreased likelihood of using the ED following a mental health diagnosis. Relative to neurodevelopmental disorders, all other mental health categories were more likely to have an ED visit subsequent to the index visit.

The results of the analyses with FMGs as the reference model of care are displayed in Table 6 and Table 7. In order to specifically explore the impact of the FMG model of care amongst individuals with a primary care provider, the 'no primary group' was excluded in these analyses. Similar to Table 4, Table 6 shows the outcome of a multivariable logistic regression analysis of the relationship between primary care models and the index mental health visit taking place in the ED. Compared to the FMG model of care, patients with a non-FMG primary care physician were significantly more likely to have had their index mental health visit in the ED setting (OR 1.28, 95% CI 1.13-1.45), whereas pediatric care was associated with a decreased likelihood of using the ED for the index MH visit (OR 0.84, 95% CI 0.73-0.96). Table 7 displays the results of the survival analysis using Cox proportional hazards model to evaluate the association between primary care models and the use of the ED at any point in the 30 day period following the index MH visit. There was no statistically significant difference between FMG and non-FMG primary care with respect to the likelihood of ED visits after the first mental health contact (HR 1.03, 95% CI 0.85-1.24). Pediatric primary care was found to decrease the likelihood of this type of ED visit compared to FMGs (HR 0.72, 95% CI 0.58-0.90).

The results of the sensitivity analysis, which excludes the diagnostic category of neurodevelopmental disorders, are displayed in the appendix, and did not differ significantly in the main outcomes.

4.5 Discussion

Main Findings

Out of all children and adolescents who had an initial mental health-related

presentation during the 2-year observation period, 47% did not a have a usual provider of primary care. The remaining patients were identified as having a primary care physician, with 20.9%, 17.2% and 15.0% under FMG, non-FMG, or pediatric care respectively. Most index mental health visits took place in an outpatient setting, while 17.8% of these visits occurred in an ED setting. Regardless of the specific model of care, having a usual provider of primary care was associated with a significantly decreased likelihood of using the ED for the first mental health contact (compared those without a PCP: Pediatrician (OR 0.41, 95% CI 0.36-0.47); FMG (OR 0.48, 95% CI 0.43-0.54); non-FMG (OR 0.59, 95% CI 0.53-0.66)). Similarly, children with a primary care physician were found to be less likely to present to the ED in the 30-day period following the index mental health visit. Further analysis demonstrated that compared to FMGs, non- FMG care was associated with an increased likelihood of using the ED as the point of first MH contact, but not of subsequent ED visits. In contrast, pediatric primary care, when compared to FMGs, was associated with a decreased likelihood of ED visits, both for the index MH visit, and for the 30-day period subsequent to the index visit.

Other variables found to have a significant association with using the ED as point of first contact include: female sex, increased age, lower socioeconomic status, having a medical comorbidity, and having a previous (non-mental health) ED visit. Female sex, increased age and having a previous (non-mental health) ED visit were also associated with using the ED after the index mental health visit. Relative to neurodevelopmental disorders, all other mental health categories were associated with both using the ED as a point of first mental health contact and subsequent ED utilization.

Interpretation

Children and adolescents with a usual source of primary care were significantly less likely to use the ED, both as the point of first contact for mental health, and for visits following the index mental health diagnosis. This result is consistent with results from a large study performed in Ontario, which found that children and youth without a usual provider of primary care were at the highest risk of having their first mental health contact in the ED setting[31]. Previous research in the field of first episode psychosis has

also suggested that patients with a primary care physician were less likely to receive the index diagnosis in the ED[32]. There are several mechanisms by which access to primary care physicians can be associated with reduced mental health-related ED utilization. Primary care is considered ideal for the initial management of common pediatric mental health problems, as this setting can more readily allow for early identification, intervention, guidance, and coordination of care, in addition to concomitant management of comorbid and chronic conditions[33]. Compared to other professionals, primary care clinicians may also be more accessible and associated with less stigma from the perspective of patients and their families[34,35]. The advantages of primary care should theoretically improve key elements of mental health care pathways, including first contact, referral source, duration of untreated psychosis and duration of untreated illness. The results of the current study support the theory that access to primary care has a positive effect on first mental health contact. These results also suggest that primary care can decrease visits to the ED - an important indicator of negative pathways to care associated with poor patient experiences and service disengagement[36]. Many countries have recognised the importance of primary care as a cornerstone for youth mental health, which has led to a variety of policy changes, healthcare reforms, and novel models of care. The findings of the current study suggest that primary care is important for mental health, and validate system-wide efforts to improve quality and access to this care for children and youth.

The highest proportion of incident mental health visits that led to a hospital admission was in the group of patients with no primary care. Although the databases used in this study did not include direct measurements of symptom severity, an increased rate of hospitalization may be suggestive of more patients with severe disease, at least on presentation. The primary care setting may provide the opportunity for both early recognition - such that any subsequent psychiatric hospitalization would not be associated with an index mental health visit - as well as early intervention - such that the progression to severe symptoms requiring hospitalizations are avoided entirely. Alternatively, it is possible that some of these admissions may not be due solely to the severity of psychiatric symptoms, but also to the lack of a definite source of follow-up care, or for another related social deficiency. Another potential consideration is that some patients

that are already predisposed to severe mental health conditions are also less likely to have a primary care physician. Refugee and immigrant children, for example, are more likely to have experienced traumatic events and discrimination that can contribute to mental health disturbance[37,38]. This population is concomitantly known to have poor access to primary care and disparities in help-seeking behaviours[39,40,41]. Further research and policy changes may be needed to improve the identification of children at increased risk of mental health problems, and to ensure proper access to primary health care in these populations.

Compared to family physicians that were not part of a FMG, the FMG model of care was associated with a reduced likelihood of using the ED as the point of first MH contact, but did not decrease the risk of ED visits subsequent to the index visit. Previous investigations have demonstrated an association between the implementation of Quebec primary care reform and minor decreases in ED utilization for ambulatory care sensitive conditions (ACSCs) in adult populations[13,14,42]. A systematic review in 2016 examined the impact of Canadian primary care reform on health system performance in their respective provinces, and found moderate quality evidence of reduced ED visits associated with team-based models of care in Quebec and Alberta[43]. Few researchers, however, have focused on the impact of primary care reform on mental health outcomes, and even less so in pediatric populations. In Ontario, youth with a PCP that was not part of the provincial reform model of care, compared to those who were part of the primary care reform, were also found to be at increased risk for using the ED as their first mental health contact[31]. While differing with respect to province-specific goals and characteristics, recent primary care strategies in Quebec, Alberta, and Ontario involved the implementation of comprehensive reforms developed in similar contexts and with comparable overarching objectives, such as improved access, coordination, and integration of care, as well as the development of the team-based model of care[44].

Several other risk factors for having index and subsequent mental health visits in the ED were identified. Using a socio-economic deprivation index, it was determined that patients from more deprived neighbourhoods are more likely to use the ED as the point of first contact, and in the period following first contact. This finding is consistent with previous research regarding underserved populations and mental health service

utilization[31,45]. Multiple indicators, such as governmental assistance and insurance status, have been used demonstrate a socioeconomic status as a significant risk factor for mental health related ED use[11,46]. Other studies have further identified race/ethnicity[47,48] and immigration/refugee status[49] as important socio-demographic risk factors, though these factors were not explored in the current study. Female sex and increased age were also found to be statistically significant demographic factors associated with increased ED utilization. While most studies examining biological sex have resulted in non-significant findings, some studies have suggested a trend toward older youth being at increased risk for mental health ED utilization[45]. Adolescents in general are at increased risk of poor utilization of primary care services[50,51], but mental health problems can further impair access to primary care in this age group[52]. Adolescence is a foundational age for subsequent physical and mental health in adulthood, and lack primary care during this period may represent an important missed public health opportunity[53,54].

Previous non-MH ED visits and medical comorbidities were also found to be statistically associated with increased MH-related ED visits. Whereas many studies have demonstrated that previous ED utilization and poor health are important predictors of future ED utilization in general, this association has not been demonstrated with respect to pediatric mental health visits to the ED[55,56,57]. In fact, previous evidence has suggested the inverse - that the presence of a medical comorbidity may be associated with a decreased likelihood of returning to the ED for mental health reasons[58].

Limitations

This investigation uses a retrospective population-based cohort study design. This study design allows for the discovery of associations that are likely to be representative of the actual population, but cannot be used to establish causality. A randomized control trial, though unlikely to be feasible in this instance, is a more appropriate method for determining the effectiveness of a given intervention. Although administrative datasets can provide information and insights about a large proportion of the population, they contain important limitations and are susceptible to both diagnostic and administrative errors[59].

This study focused exclusively on mental health contacts with physicians, including family doctors, pediatricians, psychiatrists, and emergency medical physicians. Pathways to youth mental healthcare, as previously indicated, can be complex, and rarely follow a straightforward, predetermined course. Although physicians are typically responsible for the diagnosis of mental health conditions, many other contacts can have an important influence on care, including social workers, clinical psychologists, nurses and nurse practitioners, and psycho-education specialists (psychoéducatrice/psychoéducateur). The administrative databases used in this study did not include data regarding these non-physician professionals that can contribute to the recognition, direction, and management of mental health conditions in childhood.

The administrative databases used in this study were also missing information about potentially influential patient and physician characteristics. Patient co-variates that were not included in this study include immigration/refugee status, and acuity of ED visits (both previous and current). In addition, although there are many possible medical co-morbidities in youth, we only accounted for asthma, diabetes, and complex chronic diseases because these conditions are identifiable in health administrative data through validated algorithms and account for a significant proportion of morbidity and costs. Primary care physician covariates that were not included in this study include sex, full vs part-time status, years in practice, foreign vs domestic training, and previous mental health volume.

Similar to previous research performed in Ontario[31], this study increases external validity by including all mental health diagnoses across all primary care and hospital settings in a healthcare system with universal access. Psychiatric conditions, particularly for children and youth, are inherently prone to misdiagnosis and discord between initial clinical judgment and diagnosis assigned after subsequent re-evaluation and more comprehensive examination[60]. Nevertheless, it may be reasonable to assume that some diagnoses given on presentation (e.g. psychotic disorders) should be predictive of more severe disease necessitating ED visits both for initial diagnosis and for subsequent visits, while other diagnoses (e.g. ADHD) may be more predictive of less severe disease that can typically be managed in the outpatient setting. Due to its relatively high prevalence amongst mental health disorders in youth, a sensitivity analysis was performed

specifically with respect to neurodevelopmental disorders such as ADHD, which did not reveal a significant difference in the study outcomes.

Finally, the algorithm used to assign patients to a primary care model has not yet been validated, but was adapted from an algorithm developed by the INSPQ to identify adult patient attachment to family physicians, and has been used in previous published studies examining the role of primary care on outcomes in children and youth[61,20].

4.6 Conclusions

Children and adolescents with a usual source of primary care were less likely to use the ED for mental health, both as the point of first contact and in the period following the initial diagnosis. Compared to non-FMG family physicians, the FMG model of care in Quebec decreased the likelihood of using the ED for the first mental health contact, but did not decrease the likelihood of subsequent ED visits. These results reflect the importance of access to primary care in promoting favourable mental health pathways for youth, while providing insight into potential strengths and shortcomings of Quebec primary care reform in this regard.

4.7 Tables

Table 1. Characteristics of Children and Youth With First Mental Health Contact in the 2012-2013 Period

Characteristics	Primary care model				
	No Primary Care	Pediatrician	FMG	Non-FMG	Total
weighted N (%)	18484 (47.0)	6761 (17.2)	8209 (20.9)	5914 (15.0)	39368 (100.0)
Age, y, mean (± SD)	13.0 (3.5)	12.0 (3.3)	12.9 (3.6)	13.0 (3.6)	12.8 (3.5)
Sex, n (% female)	8810 (47.7)	3155 (46.7)	4334 (52.8)	3247 (54.9)	19546 (49.7)
Deprivation Index (social/material), n (%)					
1 (low)	7640 (42.8)	3632 (55.6)	3915 (49.5)	2695 (47.0)	17882 (47.0)
2 (medium)	3634 (20.4)	1116 (17.1)	1633 (20.7)	1070 (18.7)	7453 (19.6)
3 (high)	6573 (36.8)	1789 (27.4)	2360 (29.8)	1972 (34.4)	12693 (33.4)
Rurality, n (%)					
1 Least Rural	12085 (65.7)	5546 (82.4)	4537 (55.5)	4197 (71.2)	26366 (67.3)
2 Medium	2362 (12.8)	529 (7.9)	1497 (18.3)	584 (9.9)	4971 (12.7)
3 Most Rural	3943 (21.4)	655 (9.7)	2138 (26.2)	1111 (18.9)	7846 (20.0)
Health Status, n (% without comorbidity)	17567 (95.0)	5851 (86.5)	7536 (91.8)	5316 (90.0)	36270 (92.1)
Previous non-MH ED Visits					
≥3 visits, n (%)	1214 (6.6)	327 (4.8)	718 (8.8)	519 (8.8)	2778 (7.1)
2 visits, n (%)	1361 (7.4)	424 (6.3)	689 (8.4)	486 (8.2)	2960 (7.5)
1 visit, n (%)	3146 (17.0)	1225 (18.1)	1627 (19.8)	1109 (18.8)	7107 (18.1)
None, n (%)	12763 (69.1)	4785 (70.8)	5175 (63.0)	3800 (64.3)	26523 (67.4)
Previous non-MH Hospital Admissions					
≥3 visits, n (%)	33 (0.2)	17 (0.2)	26 (0.3)	22 (0.4)	98 (0.2)
2 visits, n (%)	125 (0.7)	45 (0.7)	62 (0.75)	60 (1.0)	292 (0.7)
1 visit, n (%)	821 (4.4)	348 (5.15)	503 (6.1)	416 (7.0)	2088 (5.3)
None, n (%)	17505 (94.7)	6351 (93.9)	7619 (92.8)	5416 (91.6)	36891 (93.7)

Table 2. Characteristics of First Mental Health Contact

Characteristics	Primary care model				
	No Primary Care n=18484	Pediatrician n=6761	FMG n=8209	Non-FMG n=5914	Total n=39368
Setting, n (% in ED)	4283 (23.2)	629 (9.3)	1087 (13.3)	1000 (16.9)	7000 (17.8)
ED visit on weekend/statutory holiday, n (%)	1049 (24.5)	151 (24.1)	271 (24.9)	217 (21.6)	1687 (24.1)
Admitted to hospital, n (%)	858 (4.6)	125 (1.9)	217 (2.7)	203 (3.4)	1403 (3.6)
Mental health diagnosis, n (%)					
Mood/Affective	1494 (8.1)	265 (3.9)	613 (7.5)	511 (8.7)	2884 (7.3)
Anxiety	6107 (33.0)	2194 (32.5)	2898 (35.3)	2184 (36.9)	13383 (34.0)
Psychotic	102 (0.6)	33 (0.5)	41 (0.5)	31 (0.5)	206 (0.5)
Substance-Related	942 (5.1)	111 (1.6)	256 (3.1)	216 (3.7)	1525 (3.9)
Eating	201 (1.1)	172 (2.6)	76 (0.9)	61 (1.0)	510 (1.3)
Neurodevelopmental	7932 (42.9)	3263 (48.3)	3785 (46.1)	2391 (40.4)	17371 (44.1)
Personality/behavioural	318 (1.7)	57 (0.9)	126 (1.5)	105 (1.8)	607 (1.5)
Other	1387 (7.5)	665 (9.8)	415 (5.1)	416 (7.0)	2883 (7.3)

Table 3. Outcomes Subsequent to Index Mental Health Contact

Characteristics	Primary care model				
	No Primary Care	Pediatrician	FMG	Non-FMG	Total
Mental Health Visit, n (%)					
None	4987 (65.8)	58 (20.6)	3366 (85.7)	1997 (78.6)	10935 (64.8)
Pediatrics	1906 (25.1)	2088 (73.6)	338 (8.6)	351 (13.8)	4683 (27.7)
Psychiatry	688 (9.1)	163 (5.8)	226 (5.7)	193 (7.6)	1269 (7.5)
Time to MH Visit, days					
Mean (± SD)	113.5 (174.0)	141.8 (179.8)	116.9 (166.5)	121.2 (173.6)	120.2 (173.7)
Median (min, max)	56 (1, 703)	89 (1, 691)	61 (1, 686)	63 (1, 687)	63 (1, 703)
Follow up MH visit with PCP					
Within 30 days, n (%)	-	322 (4.8)	714 (8.7)	308 (5.2)	1344 (6.4)
At any point, n (%)	-	1655 (24.5)	2973 (36.2)	1387 (23.5)	6015 (28.8)
MH-Related ED Visits Within 30 Days					
≥3 visits, n (%)	37 (0.2)	6 (0.1)	21 (0.3)	14 (0.2)	78 (0.2)
2 visits, n (%)	107 (0.6)	10 (0.2)	26 (0.3)	23 (0.4)	166 (0.4)
1 visit, n (%)	591 (3.2)	114 (1.7)	208 (2.5)	171 (2.9)	1084 (2.8)
None, n (%)	17750 (96.0)	6631 (98.1)	7953 (96.9)	5706 (96.5)	38041 (96.6)

Table 4. Odds Ratios of First Mental Health Contact in Emergency Department

Variable	Unadjusted Odds Ratios (95% CI)	Adjusted Odds Ratios (95% CI)
Primary Care Model		
No Primary Care	1.00 (ref)	
Pediatrician	0.32 (0.24-0.42)	0.41 (0.36-0.47)
FMG	0.46 (0.36-0.59)	0.48 (0.43-0.54)
Non-FMG	0.67 (0.52-0.86)	0.59 (0.53-0.66)
Age	1.14 (1.10-1.18)	1.11 (1.09-1.13)
Sex		
Female	1.00 (ref)	
Male	0.88 (0.71-1.08)	0.81 (0.75-0.88)
Socio-Economic Index		
1 (least deprived)	1.00 (ref)	
2	1.44 (1.06-1.96)	1.16 (1.01-1.35)
3	1.56 (1.13-2.14)	1.29 (1.13-1.48)
4	1.77 (1.29-2.43)	1.39 (1.21-1.60)
5 (most deprived)	2.39 (1.76-3.25)	1.81 (1.58-2.08)
Rurality		
1 (least rural)	1.00 (ref)	
2	1.11 (0.75-1.65)	1.04 (0.86-1.26)
3 (most rural)	1.09 (0.81-1.47)	1.01 (0.86-1.18)
Prior Medical Comorbidity		
0	1.00 (ref)	
≥1	2.01 (1.68-2.41)	1.34 (1.20-1.51)
Previous non-MH ED visits		
0	1.00 (ref)	
≥1	1.48 (1.26-1.75)	1.55 (1.43-1.69)
MH Diagnostic Categories		
Neurodevelopmental	1.00 (ref)	
Mood/Affective	5.34 (4.65-6.13)	4.34 (3.78-4.99)
Anxiety	5.84 (4.13-8.25)	5.48 (3.97-7.58)
Psychotic	11.23 (9.73-12.95)	8.01 (6.87-9.33)
Substance-Related	7.24 (5.91-8.86)	6.70 (5.55-8.10)
Eating	32.16 (20.15-51.32)	28.48 (18.13-44.76)
Personality/behavioural	15.59 (11.76-20.68)	12.61 (9.36-16.99)
Other	29.09 (23.95-35.34)	20.67 (16.78-25.47)

Table 5. Hazard Ratios of ED Visit in 30 Day Period Following Index Mental Health Contact

Variable	Unadjusted Hazard Ratios (95% CI)	Hazard Ratios (95% CI)
Primary Care Model		
No Primary Care	1.00 (ref)	
Pediatrician	0.55 (0.32-0.96)	0.61 (0.50-0.74)
FMG	0.62 (0.37-1.02)	0.81 (0.70-0.94)
Non-FMG	1.15 (0.72-1.84)	0.79 (0.68-0.93)
Age	1.15 (1.08-1.23)	1.09 (1.07-1.12)
Sex		
Female	1.00 (ref)	
Male	0.56 (0.40-0.79)	0.84 (0.75-0.94)
Socio-Economic Index		
1 (least deprived)	1.00 (ref)	
2	0.80 (0.48-1.33)	1.27 (1.07-1.50)
3	0.84 (0.49-1.42)	1.13 (0.94-1.35)
4	0.78 (0.44-1.39)	1.17 (0.97-1.41)
5 (most deprived)	1.23 (0.73-2.06)	1.49 (1.25-1.77)
Rurality		
1 (least rural)	1.00 (ref)	
2	1.02 (0.61-1.69)	0.61 (0.50-0.74)
3 (most rural)	0.73 (0.45-1.19)	0.76 (0.66-0.88)
Prior Medical Comorbidity		
0	1.00 (ref)	
≥1	1.27 (0.72-2.26)	1.03 (0.84-1.27)
Previous non-MH ED visits		
0	1.00 (ref)	
≥1	1.54 (1.08-2.19)	1.36 (1.21-1.52)
MH Diagnostic Category		
Neurodevelopmental	1.00 (ref)	
Mood/Affective	14.74 (11.97-18.14)	10.57 (8.47-13.18)
Anxiety	5.64 (4.65-6.85)	4.45 (3.63-5.44)
Psychotic	25.16 (17.32-36.55)	19.22 (13.17-28.03)
Substance-Related	11.01 (8.57-14.13)	8.04 (6.20-10.43)
Eating	6.55 (4.23-10.12)	5.68 (3.65-8.83)
Personality/behavioural	9.25 (6.48-13.20)	7.11 (4.93-10.25)
Other	6.74 (5.30-8.57)	5.90 (4.62-7.53)

Table 6. Odds Ratios of First Mental Health Contact in Emergency Department (FMG as reference)

Variable	Unadjusted Odds Ratios (95% CI)	Adjusted Odds Ratios (95% CI)
Primary Care Model		
FMG	1.00 (ref)	
Pediatrician	0.68 (0.58-0.80)	0.84 (0.73-0.96)
Non-FMG	1.21 (1.06-1.38)	1.28 (1.13-1.45)
Age	1.14 (1.12-1.16)	1.21 (1.19-1.23)
Sex		
Female	1.00 (ref)	
Male	0.88 (0.81-0.96)	0.72 (0.64-0.82)
Socio-Economic Index		
1 (least deprived)	1.00 (ref)	
2	1.23 (1.07-1.42)	1.05 (0.86-1.27)
3	1.43 (1.25-1.64)	1.21 (0.99-1.47)
4	1.52 (1.31-1.75)	1.31 (1.05-1.62)
5 (most deprived)	2.08 (1.80-2.41)	1.81 (1.49-2.20)
Rurality		
1 (least rural)	1.00 (ref)	
2	1.29 (1.05-1.59)	0.92 (0.71-1.20)
3 (most rural)	1.28 (1.08-1.53)	0.96 (0.81-1.15)
Prior Medical Comorbidity		
0	1.00 (ref)	
≥1	1.04 (0.92-1.18)	1.33 (1.14-1.55)
Previous non-MH ED visits		
0	1.00 (ref)	
≥1	1.58 (1.43-1.73)	1.47 (1.31-1.64)

Table 7. Hazard Ratios of ED Visit in 30 Day Period Following Index Mental Health Contact (FMG as reference)

Variable	Unadjusted Hazard Ratios (95% CI)	Adjusted Hazard Ratios (95% CI)
Primary Care Model		
FMG	1.00 (ref)	
Pediatrician	0.62 (0.50-0.76)	0.72 (0.58-0.90)
Non-FMG	1.13 (0.94-1.36)	1.03 (0.85-1.24)
Age	1.22 (1.20-1.25)	1.17 (1.13-1.21)
Sex		
Female	1.00 (ref)	
Male	0.59 (0.53-0.66)	0.70 (0.59-0.83)
Socio-Economic Index		
1 (least deprived)	1.00 (ref)	
2	1.26 (1.07-1.50)	1.43 (1.12-1.83)
3	1.17 (0.98-1.40)	1.34 (1.03-1.75)
4	1.27 (1.06-1.52)	1.36 (1.04-1.79)
5 (most deprived)	1.74 (1.46-2.06)	1.79 (1.37-2.33)
Rurality		
1 (least rural)	1.00 (ref)	
2	0.69 (0.57-0.83)	0.48 (0.36-0.66)
3 (most rural)	0.86 (0.75-0.99)	0.65 (0.51-0.82)
Prior Medical Comorbidity		
0	1.00 (ref)	
≥1	0.96 (0.79-1.18)	1.07 (0.82-1.39)
Previous non-MH ED visits		
0	1.00 (ref)	
≥1	1.35 (1.21-1.51)	1.45 (1.22-1.71)

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CHAPTER 5: FINAL DISCUSSION

5.1 Discussion

Improving childhood and adolescent mental healthcare is a major public health challenge throughout the world[108]. Although more than a decade has passed since the Canadian government recognized that children and youth are disproportionately disadvantaged by the 'failings of the mental health system'[48], the problem of inadequate youth mental health services persists. In Québec, primary care reform and mental health policies have placed attention on the primary care setting as a potential avenue by which access to mental health care for young people can be improved. This thesis explores the underlying assumption that having access to a primary care physician, such as a family physician or a paediatrician, is associated with a reduction in ED utilization in youth help-seeking pathways, specifically with respect to the first mental health contact and the period following this visit. The manuscript of the thesis additionally investigates whether Family Medicine Groups - the reformed model of care in Québec, which theoretically improve access to family physicians - is associated with reduced ED utilization.

Although research into mental healthcare pathways for youth has previously focused on the study of first-episode psychosis, it is a growing field whose concepts are being applied for various psychiatric disorders[109,110,111]. Few studies have directly addressed the impact of access to primary care on ED utilization for youth mental health. In the literature review section of this thesis, evidence from Québec and Ontario indicated that primary care has an important role to play in promoting favorable pathways to care, and potentially reducing ED utilization, while a study in Alberta did not find a significant association between primary care visits and time to ED revisit after an index visit for psychosis. The study by Gill et al. [21] was unique in adopting different perspective for this field, by extending the concept of 'first contact' to include any mental health-related diagnosis. Many researchers have suggested that the traditional model of diagnostic categorization for adult psychiatric illness may not apply to youth mental health[84]. Mental health presentations in youth, for example, can be short-lived and overlapping, and may be difficult to distinguish from normal developmental behaviours or mood changes[10]. Gill

et al. [21] evaluated youth with a first presentation to the ED for any MH-related condition, and suggested that timely primary care can potentially prevent these visits.

A similar conceptual approach to the Gill et al.[21] study was used in the manuscript section of this thesis to determine the association between the models of primary care in Québec and youth ED utilization, both for first mental-health contact and for subsequent visits. One of the main findings in the thesis manuscript was that 47% of children and adolescents presenting with mental health diagnosis for the first time did not have a usual provider of primary care. Regardless of the specific model of care, having a usual provider of primary care compared to no primary care was associated with a 41% to 59% decreased odds of using the ED for the first mental health contact. Similarly, children with a primary care physician were found to be less likely to present to the ED in the 30-day period following the index mental health visit. The manuscript contributes new data regarding primary care reforms in Quebec. Compared to FMGs, non-FMG care was associated with an increased likelihood of using the ED as the point of first MH contact, but not of subsequent ED visits. Meanwhile, primary care through a pediatrician, when compared to the FMG group, was associated with a decreased likelihood of ED visits in the 30-day period subsequent to the index visit, but not of using the ED for the first MH visit itself.

The findings of this study are consistent with results from Ontario, which found that children and youth without a usual provider of primary care were at the highest risk of having their first mental health contact in the ED setting[21]. Previous research in the field of first-episode psychosis has also suggested that patients with a primary care physician were less likely to receive the index diagnosis in the ED[76]. Mechanisms by which access to primary care physicians can be associated with reduced mental health-related ED utilization include early identification, leading to intervention and decreased need for acute ED care, and increased accessibility of primary care physician compared to mental health specialists[53, 54, 112]. Theoretically, primary care should also improve important elements of mental health care pathways, including first contact, referral source, duration of untreated psychosis and duration of untreated illness. The results of this study support the notion that access to primary care can have a positive effect on first mental health contact. These results suggest that primary care can decrease visits to the

ED - an important indicator of negative pathways to care associated with poor patient experiences and service disengagement[66].

Many countries have recognised the importance of primary care as a cornerstone for youth mental health, which has led to a variety of policy changes, healthcare reforms, and novel models of care. Our findings suggest that primary care can be an important resource for youth mental health, and validate system-wide efforts in Québec to improve quality and access to this care for children and youth.

5.2 Recommendations and Future Directions

1. A strong and consistent finding across primary care models was the association between having a primary care physician and decreased emergency department visits. Unfortunately, almost half of the patients in this study did not have a regular source of primary care. Renewed efforts and policies should be directed towards fulfilling the Canadian Paediatric Society position that 'all children and youth must have a primary care provider'[113].

2. The results of this study suggest that primary care can help in the early identification and management of mental health conditions in youth. Children and adolescents should have timely access to a primary care physician trained in youth mental health.

3. In addition to the ability to identify, and in some cases manage childhood mental illness, primary care physicians should be able to provide rapid referral and coordination of care with other mental health professionals, such as psychiatrists, psychologist, or social workers when necessary. Referral delays should not exceed previously recommended wait-time benchmarks by the Canadian Psychiatric Association[96].

4. Multidisciplinary, team-based primary care (compared to other family physicians) was associated with decreased ED use for first MH contact, but not for subsequent ED visits. The identification of an index MH diagnosis should necessitate a prompt follow-up appointment, especially if rapid specialist assessment is unavailable.

5. Further research is needed to improve understanding of the impact of primary care and primary care reforms on childhood and adolescent mental health pathways to care and outcomes. Additional studies can attempt to capture the full scope and complexity of pathways to care, take into consideration the perspectives of

patients and families, and investigate a wider age range, including the transition to adult care and beyond.

5.3 Conclusions

Primary care is important for the prevention, early diagnosis, and appropriate management of disease. For children and adolescents with a mental health problem, having a usual source of primary care is associated with decreased odds of using the ED for mental health, both as the point of first contact and in the period following the initial diagnosis. In Quebec, having a usual provider of care as a family physician in a FMGs (multidisciplinary team-based primary care models) compared to a family physician in a traditional non-FMG was associated with a decreased the likelihood of using the ED for the first mental health contact, but not for subsequent ED visits. These results reflect the importance of access to primary care in promoting favourable mental health pathways for youth, while providing insight into potential strengths and shortcomings of Quebec primary care reform in this regard.

APPENDIX A: LITERATURE REVIEW

A.1 Methods

The health-related database PubMed was searched to identify and retrieve relevant articles. The search strategy for PubMed was developed with the assistance of a librarian. The initial search strategy employed four concepts: 1) primary health care, 2) accessibility, 3) mental health, and 4) emergency department. Search terms appropriate for each concept were developed and applied. The search terms for the concept of 'primary health care' was derived and modified from a search filter created by Flinders Filters and the Primary Health Care Research & Information Service using validated developmental methods[114]. The result of this search was further restricted using the Pubmed search filter specifying the 'Child' age range of birth to 18 years.
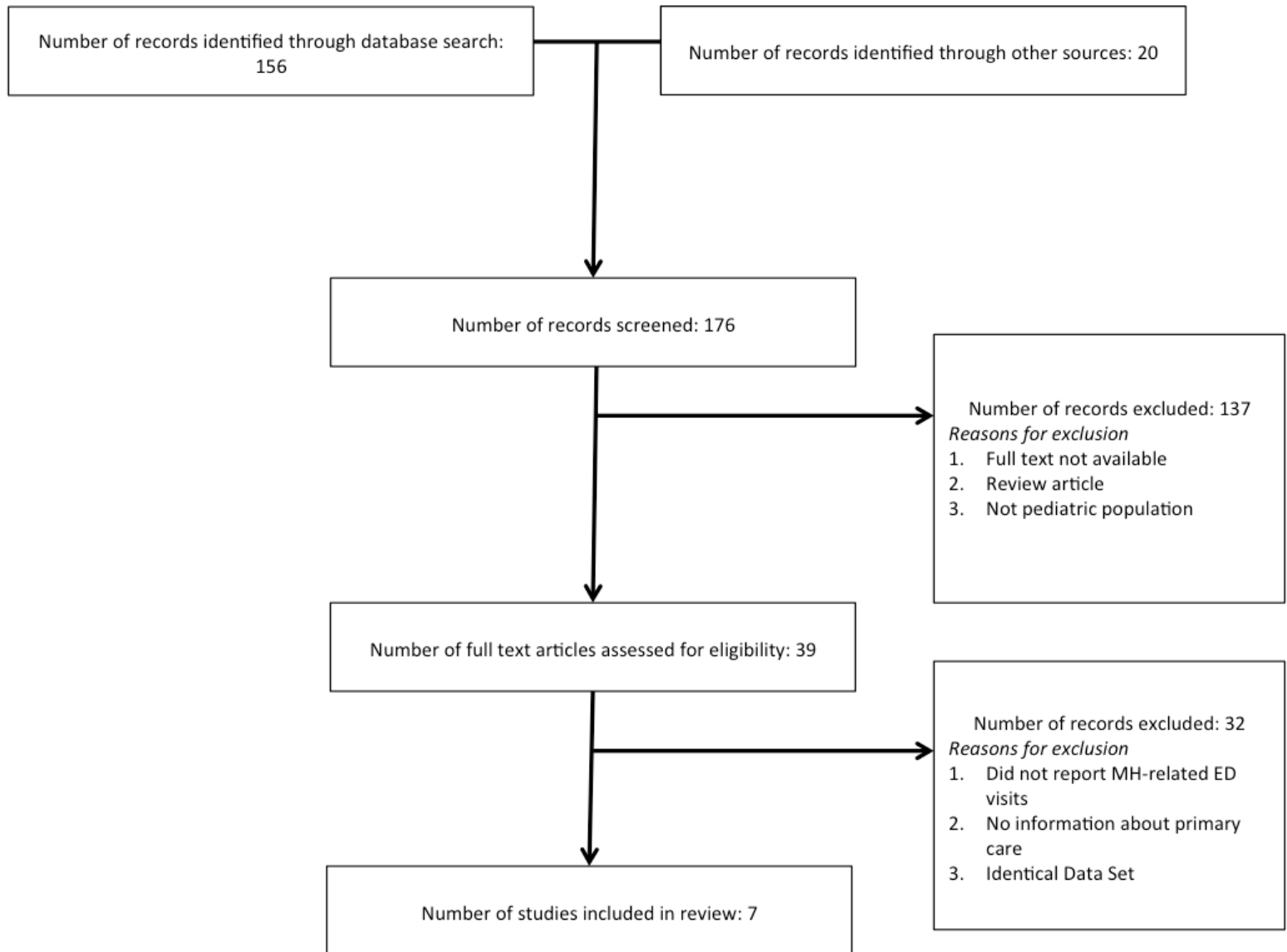
The specific search terms used in the final search strategy can be found outlined in Appendix A. The search was limited to literature published from January 1990 to August 2018, and for which the full text was available. Only primary research papers published in English or French were selected. Since our current study employs a quantitative design, only articles containing quantitative results were included. Research protocols, policy briefs, commentaries, and review articles were not included. Studies were excluded if they did not report objective data regarding both mental health-related ED visits and contact or access to a primary care physician.

The search strategy executed in PubMed retrieved a total of 156 articles (Figure 1). An additional 20 articles were identified either through forward citation tracking, or after being suggested by researchers familiar with this area of investigation. The titles and abstracts of these papers were initially screened to retain only empirical research investigating either the impact of primary care, or causes/predisposing factors for ED visits. Articles were excluded if the study population was restricted to an adult age range (i.e. >18 years old), but was not excluded if the age range included both pediatric and adult populations. After initial screening, a total of 39 articles were selected for further, full-text screening. Out of these 39 articles, 7 papers included both data about contact or access to primary care, and mental health-related ED visits. These papers were eligible for the final stage of data extraction and synthesis.

Due to the heterogeneity of the selected studies in terms of study design, patient populations, and outcome measurements, it was determined that a synthesis through meta-analysis would be unlikely to provide any meaningful results. As a more appropriate alternative, the method of *narrative synthesis* was chosen. This type of approach synthesizes findings from multiple studies - primarily using words and text to summarise and explain findings - and has been used in previous reviews to evaluate the impact of specific interventions[115].

Figure 1.   Flow Diagram of Study Selection Process

Number of records identified through database search: 156

Number of records identified through other sources: 20

Number of records screened: 176

Number of records excluded: 137
Reasons for exclusion
1.   Full text not available
2.   Review article
3.   Not pediatric population

Number of full text articles assessed for eligibility: 39

Number of records excluded: 32
Reasons for exclusion
1.   Did not report MH-related ED visits
2.   No information about primary care
3.   Identical Data Set

Number of studies included in review: 7

A.2 Eligibility Criteria

Inclusion Criteria

1. Articles are empirical (original research)

2. Quantitative research

3. Investigation focuses on impact of primary care, or causes/predisposing factors for emergency department visits

4. Contains objective data measuring access to primary care and mental-health related emergency department visits

Exclusion Criteria

1. Research protocols, policy briefs, commentaries, review articles

2. No quantitative component to study

3. Not published in English or French

4. Study population restricted to adult age range (>18years old)

A.3 Search Strategy

1. Primary care[tiab] OR General practi*[tiab] OR Primary health*[tiab] OR Community mental health*[tiab] OR Family practice[tiab] OR Family medicine[tiab] OR Family physician*[tiab] OR Home care[tiab] OR Home based[tiab] OR Home health*[tiab] OR Community health*[tiab] OR Community nurs*[tiab] OR health visit*[tiab] OR Community pharmac*[tiab] OR Preventive care[tiab] OR Prevention program*[tiab] OR Preventive service*[tiab] OR Preventive health[tiab] OR Health promotion[tiab]
2. emergency [tiab]
3. psychiatry and psychology category[MeSH Terms]
4. accessibility of health services[MeSH Terms]
5. infant[MeSH] OR child[MeSH] OR adolescent[MeSH]
Complete search strategy: 1 and 2 and 3 and 4 and 5

APPENDIX B: DETAILED METHODS

B.1   Data Sources

Information from three RAMQ databases were obtained:

1.   Registered persons database

    a.   Contains the encrypted health identification number, age, sex, postal code, and healthcare region of residence for all insured patients in Québec

2.   Physician claims database

    a.   Contains information for every remunerated medical service or "claim" provided by a physician

    b.   Includes information on the patient (health identification number, age, sex, postal code, healthcare region of residence) and the service delivered (date, physician specialty, diagnostic codes, billing codes, establishment, region of establishment, role during execution of service, and documents any referring professionals)

3.   Hospital discharge summary database (Maintenance et exploitation des données pour l'étude de la clientèle hospitalière, Med-Echo)

    a.   Contains information on all hospitalizations in acute care institutions within the province of Québec since 1980 (123)

    b.   Each record includes patient information (health identification number, age, sex, postal code), dates of admission and discharge, length of stay, and diagnosis as coded by the International Classification of Diseases, Ninth Revision, Québec (CIM-9)

The data from the three databases was linked by the RAMQ for each patient using the encrypted patient health identification numbers.

B.2 Study population

Criteria for inclusion in the study cohort:

1. Québec children with a valid Québec healthcare card from 2010-2013 and aged 8-16 on January 1st, 2012
2. no prior MH-related physician visit from January 1st, 2010 to December 31st, 2011
3. first-time (incident) physician visit for a MH condition from January 1st, 2012 to November 30th, 2013

All the ICD-9/10 Québec diagnosis codes used to identify mental health conditions are outlined in Table B.2.1.

Table B.2.1   ICD Québec diagnosis codes used to identify mental health conditions

Mental Health Diagnosis Categories	ICD-10 Codes	ICD-9 codes
Mood/Affective Disorders	F30X F31X F32X F33X F34X F38 F39 F53.0	2960 2962, 2963, 2964, 2965, 2966 3004, 2980, 2961, 3119 2961 3011, 3004 2968 2969 3119
Anxiety Disorders	F40X F41X F42X F43X F93.1 F93.2 F48.8 F48.9	3002 3000, 3004 3003 3083, 3098, 3090, 3089 3130 3132 3008 3009
Psychotic Disorders	F20X (excluding F20.4) F22X F23X	2953, 2951, 2952, 2958, 2956, 2950 2971, 2978, 2979 2983, 2954, 2988

	F24X	2973
	F25X	2957
	F28	2988
	F29	2989
	F53.1	2938
Substance-Related Disorders	F10X	3050, 3039, 2918, 2910, 2913, 2911, 2912, 2918, 2919
	F11X	2922, 3055, 3040, 2920, 2921, 2928, 2929
	F12X	2922, 3052, 3043, 2920, 2921, 2928, 2929
	F13X	2922, 3054, 3041, 2920, 2921, 2928, 2929
	F14X	2922, 3056, 3042, 2920, 2921, 2928, 2929
	F15X	2922, 3057, 3044, 2920, 2921, 2928, 2929
	F16X	2922, 3053, 3045, 2920, 2921, 2928, 2929
	F17X	2922, 3051, 2920, 2921, 2928, 2929
	F18X	2922, 3059, 3046, 2920, 2921, 2928, 2929
	F19x	2922, 3059, 3049, 2920, 2921, 2928, 2929
	F55	3059
Eating Disorders	F50X	3071, 3075
Neurodevelopmental disorders	F84X	2990, 3308, 2991, 2998
	F88	3158
	F89	3159
	F90X	3140, 3142, 3148, 3149
	F91	3128, 3120, 3121, 3128, 3129
	F92X	3123
	F93X (excluding F93.1, F93.2)	3092, 3133, 3138, 3139
	F94X	3132, 3138, 3133
	F95X	3072
Selected personality and behavior disorders	F60X	3010, 3012, 3017, 3013, 3015, 3014, 3018, 3016, 3019
	F61	3018
	F62X	3019, 3018
	F68X	3001, 3015, 3019
	F69	3019
	F21	2955

Other	F04-F99 MINUS all codes used in above categories X60 to X84 Y10 to Y19 ALSO, exclude F80, F81, F82, F83, F98	

B.3   Primary Exposure

The primary exposure of interest was primary care model. Children were assigned into one of four possible models (pediatrician, FPs in FMGs, FPs in non-FMGs, or no primary care) based on the model of care in which the associated UPPC practices. We used RAMQ data elements from the exposure period 2010-2011 to assign a UPPC to each child. The algorithm presented in Table B.3.1. details the steps to identify 1) the presence of a UPPC, and 2) whether the UPPC was a FP or pediatrician.

Table B.3.1   Algorithm to identify the UPPC

STEP 1	Identify codes for "enrollment" under a FP. If subject has one of the following codes, then "primary care model" is a <u>FP practicing in either an FMG or non-FMG</u>: – 08875, 08877, 15144, 15145, 00059, 15158, 15159, 15148, 15169, 15170, 15171, 19952, 19951, 19954, 19955, 15156, 15157, 15189, 19074 The UPPC is the family physician who billed any of the above codes, except for the code 19074.
STEP 2	If subjects do not have a code identifying a FP, search for enrollment by a <u>pediatrician</u> using the 09194 code. This code is not specific to "enrollment" of patients under a pediatrician but it is used by pediatricians for follow-up or growth and development milestones. If this code is found, the "primary care model" is pediatrician; the UPPC is the pediatrician who has billed the most 09194 codes.

STEP 3	If a subject does not have a code identifying a FP or pediatrician, calculate the number of visits by a FP using the following codes:
	  – 09092, 08870 (00005), 08871 (00056), 08872 (00097), 08901 (08807), 08902 (08809), 15161, 15230, 00474, 00002, 08873, 08874, 08855, 00007, 00075
	  – NOTE: brackets indicate these codes are billed by CHSGS/CLSC* outpatient clinic
	Also, calculate the number of visits by a pediatrician using the following codes:
	  – 09129, 09127, 09171, 09172
	  – These codes must be ALL billed by a pediatrician and not any other specialist
	
	Only one act per day per doctor can be included when calculating number of visits. Only physicians with at least 2 visits can be considered for STEP 3. The following are ways that a usual provider of care can be assigned in STEP 3:
	
	  a. <u>FP (FMG or non-FMG) is assigned for the "primary care model"</u>: if the number of visits by the **same** FP > the number of visits by the **same** pediatrician. The "usual provider of care" in this case is the FP with the most complete major exams (00872 or 00097). If there are no complete major exams, select the FP with the most visits.
	
	  b. <u>Pediatrician is assigned for the "primary care model"</u>: if the number of visits

	by the **same** pediatrician > the number of visits by the **same** FP. The "usual provider of care" is the pediatrician with the most visits.
	c. For the "primary care model" if the number of visits (>=2) by the **same** pediatrician equals number of visits (>=2) by the **same** FP, then <u>FP</u> (FMG or non-FMG) is assigned if there are at least 2 complete major exams (00872, 00097) by the same FP. Otherwise, <u>Pediatrician</u> is assigned. For the "usual provider of care", if FP is assigned as the "primary care model", select the FP with the most complete major exams (00872 or 00097). If there are no complete major exams, select the FP with the most visits. If the "primary care model" is Pediatrician, the "usual provider of care" is the pediatrician with the most visits.
STEP 4	If no UPPC is identified through steps 1 through 3, then the subject does not have a UPPC and is classified as "no primary care"

* CHSGS = centre hospitalier de soins généraleaux et spécialisés
　CLSC = centre locales de services communautaires

　　　　If the UPPC was a FP, we used the codes displayed in Table B.3.2 to differentiate FPs practicing in FMGs from those practicing in non-FMGs. The codes were applied in a hierarchy; in other words, looked for code d'acte 08875 first, then code d'acte 19074, and finally code d'établissement 54x.

Table B.3.2   Codes to Identify FPs in FMGs

Code	Coding	Description
Code d'acte 08875 (for any visits)	FMG	Inscription of patients in FMG
Code d'acte 19074 (for any visits)	FMG	Temporary inscription of pregnant patient in FMG (followed by another FP in the same FMG)
Code d'établissement 54x: look specifically for 54x for visits made with the "usual provider of care"	FMG	Medical clinic coded for FMGs or as a Network Clinic

The primary exposure variable was coded as displayed below in Table B.3.3.

Table B.3.3   Primary Exposure Variable

Variable Description	Variable Name	Coding	Type
Primary care models	pcm_cat	0 = no primary care 1 = pediatrician 2 = FMGs 3 = non-FMGs	Categorical

B.4   Co-Variates

Age and sex of the patient was obtained from the RAMQ records. SES was determined using the Pampalon index, which is an ecologic measure of material and social deprivation that divides the population into quintiles (Q1 = most privileged, Q5 = most deprived)[104,116]. Québec is divided into spatial units of 400-700 people called dissemination areas (DA), and an index value is assigned to each DA based on six indicators: education, employment, income, marital status, single parenting and living alone. Using data from the *2011 Census,* individual postal codes were linked to a DA to determine the neighbourhood SES. The linkage was performed by RAMQ.

As previously described, rurality was defined and categorized into one of three groups based on population sizes of less than 10,000 (most rural), 10,000 to 100,000 (medium rurality) and greater than 100,000 (least rural). This categorization has been used in studies published by the INSPQ (Institut national de santé publique du Québec)[103].

For co-morbidities, we used RAMQ-identifiable chronic conditions using previously published algorithms, including asthma, diabetes and an administratively defined group of complex chronic conditions[99]. Although it is not possible to account for all childhood co-morbidities in the available data, these conditions account for a large proportion of common chronic childhood illnesses, and are associated with increased healthcare use[100,101,102].

The number of prior non-MH related ED visits and hospitalizations occurring prior to the outcome period (ie before January 1, 2012) were counted and created into two continuous variables.

All co-variates were determined on January 1, 2012. Coding information for co-variates are displayed below in Table B.4.1.

Table B.4.1.   Co-Variates

Variable Description	Database Name	Coding	Type
Age	age_c	Age in years	Continuous
Sex	gender	0 = female 1 = male	Dichotomous
Material & Social Deprivation (SES)	ses_combined	0 = Q5 (least deprived) 1 = Q4 2 = Q3 3 = Q2 4 = Q1 (most deprived)	Categorical
Rurality	sgc_cat	0 = least rural 1 = medium rurality 2 = most rural	Categorical
Health status	health_status_cat	0 = no co-morbidity 1 = identifiable comorbidity	Categorical
Previous ED use	prev_ED_c	Number of ED visits	Continuous
Previous hospital admissions	prev_adm	Number of hospital admissions	Continuous

B.5   Outcomes

The setting of first contact was determined by identifying the first physician visit that used a mental health-related ICD-9 diagnostic code, then using the establishment code to determine the setting of this visit as a binary outcome: ED vs outpatient. The other outcome ofinterest was any use of the emergency department for mental health related reasons following the first mental health contact. This outcome was determined using a follow-up period of 30 days.

The coding for the main outcomes and other related descriptive variables are presented in Table B.5.1.

Table B.5.1.   Outcome Variables

Variable Description	Database Name	Coding	Type
Setting of first (index) MH contact	MH_first_contact_b	0= ED 1= outpatient setting	Binary
Subsequent MH-related ED visits – 30 days	MH_ED_visits_30_b	0=no 1=yes	Categorical
Other outcomes related to first MH contact			
first contact MH diagnosis	first_MH_diagnosis_cat	1 = mood/affective 2 = anxiety 3 = Psychotic 4 = substance 5 = eating 6= neurodevelopmental 7= personality 8= self-harm/other	Categorical
admission to hospital with 1st MH contact	MH_admission_b	0=no 1=yes	binary
1st MH contact in ED on weekend/holiday	offhour_ED_visit_b	0=no 1=yes	binary
Other outcomes subsequent to first MH contact			
MH specialist	MH_specialist_c	0=no	Categorical

visit		1=pediatrician 2=MH specialist	
Time to MH specialist visit	Time_MH_specialist_c	Number of days between first contact and MH specialist visit	Continuous
MH-related PCP visit subsequent to first contact	MH_PCP_b	0=yes 1=no	Binary
Time to MH-related PCP f/u visit	Time_MH_PCP_c	Number of days between first MH contact and subsequent MH-related PCP visit	Continuous

APPENDIX C: SENSITIVITY ANALYSIS

As previously described in the manuscript section, a sensitivity analysis was performed excluding the neurodevelopmental disorders category in order to ensure that this diagnositic category did not have a disproportionately large impact on the final results. The tables below demonstrate the results of this analysis, which did not reveal a significant difference in the main study outcomes.

Table C.1 Odds Ratios of First Mental Health Contact in Emergency Department (Without Neurodevelopmental Category)

Variable	Adjusted Odds Ratios (95% CI)
Primary Care Model	
No Primary Care	1.00 (ref)
Pediatrician	0.43 (0.37-0.50)
FMG	0.49 (0.44-0.55)
Non-FMG	0.59 (0.52-0.67)
Age	1.10 (1.07-1.12)
Sex	
Female	1.00 (ref)
Male	0.80 (0.73-0.88)
Socio-Economic Index	
1 (least deprived)	1.00 (ref)
2	1.12 (0.96-1.30)
3	1.26 (1.09-1.45)
4	1.34 (1.15-1.56)
5 (most deprived)	1.75 (1.51-2.03)
Rurality	
1 (least rural)	1.00 (ref)
2	1.05 (0.88-1.26)
3 (most rural)	1.03 (0.87-1.22)
Prior Medical Comorbidity	
0	1.00 (ref)
≥1	1.16 (1.01-1.34)
Previous non-MH ED visits	
0	1.00 (ref)
≥1	1.59 (1.45-1.74)

Table C.2 Hazard Ratios of ED Visit in 30 Day Period Following Index Mental Health Contact (Without Neurodevelopmental Category)

Variable	Hazard Ratios (95% CI)
Primary Care Model	
No Primary Care	1.00 (ref)
Pediatrician	0.61 (0.50-0.75)
FMG	0.85 (0.73-0.99)
Non-FMG	0.77 (0.65-0.91)
Age	1.08 (1.06-1.11)
Sex	
Female	1.00 (ref)
Male	0.88 (0.78-0.99)
Socio-Economic Index	
1 (least deprived)	1.00 (ref)
2	1.34 (1.12-1.60)
3	1.17 (0.96-1.42)
4	1.23 (1.01-1.49)
5 (most deprived)	1.54 (1.28-1.85)
Rurality	
1 (least rural)	1.00 (ref)
2	0.57 (0.46-0.70)
3 (most rural)	0.76 (0.65-0.89)
Prior Medical Comorbidity	
0	1.00 (ref)
≥1	1.00 (0.80-1.25)
Previous non-MH ED visits	
0	1.00 (ref)
≥1	1.35 (1.19-1.52)

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