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TITLE PAGE

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Patient and Physician Factors Associated with First Diagnosis of Non-Affective Psychotic Disorder in Primary Care

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ABSTRACT

Purpose: Primary care physicians play a central role in pathways to care for first-episode psychosis, and their increased involvement in early detection could improve service-related outcomes. We estimated the proportion of psychosis first diagnosed in primary care, and identified associated patient and physician factors.

Methods: We used linked health administrative data to construct a retrospective cohort of people aged 14–35 years with a first diagnosis of non-affective psychosis in Ontario, Canada between 2005–2015. We restricted the sample to those with help-seeking contacts for mental health reasons in primary care in the six months prior to first diagnosis of psychotic disorder. We used modified Poisson regression models to examine patient and physician factors associated with a first diagnosis of psychosis in primary care.

Results: Among people with early psychosis (n=39,449), 63% had help-seeking contacts in primary care within six months prior to first diagnosis. Of those patients, 47% were diagnosed in primary care and 53% in secondary/tertiary care. Patients factors associated with lower likelihood of diagnosis in primary care included male sex, younger age, immigrant status, and comorbid psychosocial conditions. Physician factors associated with lower likelihood of diagnosis in primary care included solo practice model, urban practice setting, international medical education, and longer time since graduation.

Conclusions: Primary care is an important contact for help-seeking and diagnosis for a large proportion of people with early psychosis. Physicians less likely to diagnose psychosis in primary care could be targeted with resources and interventions to support them in caring for patients with early psychosis.

MAIN TEXT

Introduction

Early detection and intervention for first-episode psychosis has primarily focused on specialized psychiatric services (Marshall & Rathbone, 2011), despite evidence suggesting that primary care plays a critical role in the pathway to care (Anderson et al., 2010; Anderson, Archie, et al., 2018). Approximately two-thirds of young people with first-episode psychosis make help-seeking contacts in primary care in the period preceding their first diagnosis of psychotic disorder (Anderson et al., 2010; Anderson, Fuhrer, Wynant, et al., 2013; Anderson & Kurdyak, 2017), and these contacts tend to increase in the year prior to the first diagnosis (Anderson, Fuhrer, Wynant, et al., 2013; Schoer et al., 2021). One in three youth with early psychosis received their first diagnosis of psychotic disorder from a primary care physician, while an additional third had prior help-seeking contacts in primary care but were subsequently diagnosed in secondary or tertiary care (Anderson & Kurdyak, 2017). The involvement of the primary care physician in help-seeking for early psychosis is associated with a lower likelihood of adverse and coercive pathways to care (Anderson, Fuhrer, Schmitz, et al., 2013; Rodrigues et al., 2020), but it is also associated with longer wait times for specialized services (Anderson, Fuhrer, Wynant, et al., 2013). Collectively, these findings suggest that primary care physicians are well positioned to identify and manage young people at an earlier stage of illness, and increasing their involvement in early psychosis intervention could be beneficial for reducing duration of untreated psychosis and ultimately improving clinical outcomes.

Prior research indicates that there may be barriers related to detection and intervention for early psychosis at the primary care level. From the patient perspective,

the pathway to care is a complex series of contacts with multiple health care providers, which can have a considerable impact on their subsequent therapeutic relationships (Anderson, Fuhrer, & Malla, 2013; Ferrari et al., 2015). Patients often report negative experiences during these interactions, particularly feeling misunderstood, dismissed, and stigmatized while continually recounting distressing details of their story (Anderson, Fuhrer, & Malla, 2013; Ferrari et al., 2015). Primary care physicians recognize the importance of their role in early psychosis intervention, but the majority express a lack of confidence in their ability to diagnose and treat psychotic disorders (Lester et al., 2005; Oud et al., 2009; A. E. Simon et al., 2009). The prevalence of early psychosis in primary care is low, such that physicians may only see one or two cases per year (Gavin et al., 2006; Le Galudec et al., 2014; A. E. Simon et al., 2005, 2009). Many physicians report a preference for referring these cases to more specialized psychiatric services, and tend to avoid prescribing medication until a diagnosis is confirmed by a psychiatrist (El-Adl et al., 2009; Gavin et al., 2006; Nkire et al., 2015). Indeed, surveys of primary care physicians have demonstrated that many lacked the requisite knowledge and skills for identification of early psychosis, which involves a variety of complex, unspecific, and fluctuating symptoms (Le Galudec et al., 2014; Nkire et al., 2015; A. E. Simon et al., 2005, 2009; Turrina et al., 2006). Primary care physicians also cited a lack of time as a major barrier, as the assessments are particularly time consuming in a primary care setting, and multiple consultations may be necessary to get a clear clinical picture (Leahy et al., 2018; Zantinge et al., 2005).

To date, the majority of research on first-episode psychosis in primary care has used surveys of physicians. These studies offer useful insight into the attitudes,

knowledge, and experience of these physicians, but they do not provide information on clinical activities, service provision, and factors associated with diagnosis. This information is necessary for identifying the patient-, physician-, and service-related factors that may need to be addressed for improving early detection and intervention for first-episode psychosis in a primary care context. Therefore, the objective of this study was to understand the factors associated with the diagnosis of first-episode psychosis in a primary care setting. Using health administrative data from Ontario, Canada over a ten-year period, we sought to: (1) estimate the proportion of young people with a psychotic disorder who were first diagnosed in primary care; and (2) identify patient and physician characteristics that were associated with receiving a diagnosis of psychotic disorder in primary care.

Methods

Study Design

We conducted a retrospective cohort study using population-based health administrative data from Ontario, Canada. This study followed the guidelines for Reporting of studies Conducted using Observational Routinely-collected Data (RECORD) (Benchimol et al., 2015), as described in Appendix A.

Study Setting

In Ontario, the publicly funded health care system covers expenses for all medically necessary physician services through the Ontario Health Insurance Plan (OHIP). The practices of primary care physicians are characterized by various attributes, including panel size (i.e., number of formally enrolled patients), team size (i.e., number of physicians), and payment model (i.e., method of physician remuneration) (Healthforce

Ontario, 2015; McLeod et al., 2016). Primary care practices may also be distinguished by their location (e.g., urban, rural, remote), services provided (e.g., after-hours care, urgent care), and organizational structure (e.g., multidisciplinary health team, community health centre) (Healthforce Ontario, 2015; McLeod et al., 2016).

Data Sources

We used health administrative databases from ICES – an independent, non-profit research institute whose legal status under Ontario's health information privacy law allows it to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement. The databases at ICES contain information on physician billings, hospital admissions, and emergency department visits, as well as characteristics of patients and physicians. Databases were linked at the patient level using unique, encoded identifiers and analyzed onsite at ICES. Missing data were minimal (<1%) and were regrouped into stable categories where possible. A complete list of the databases and variables used in this study is available in Appendix B.

Cohort Definition

We constructed a retrospective cohort of Ontario residents between the ages of 14 and 35 years with an incident diagnosis of non-affective psychotic disorder (i.e., schizophrenia, schizoaffective disorder, schizophreniform, psychosis not otherwise specified) between April 2005 and March 2015. Cases were identified by either a diagnosis of non-affective psychosis from an inpatient hospitalization, or at least two visits to an emergency department or outpatient clinic (e.g., primary care) for non-affective psychosis within a one-year period. A modified version of this algorithm has been previously validated at ICES using medical charts (Kurdyak et al., 2015). The index event

was defined as either the date of discharge from hospital or the date of first visit to an emergency department or outpatient clinic. Prevalent cases were excluded by removing cases with a diagnosis of non-affective psychosis prior to cohort inception. For the current analyses, the sample was restricted to cases of non-affective psychosis who had a visit to primary care with a mental health diagnostic code in the six months prior to first diagnosis of psychotic disorder (i.e., help-seeking contact). The sample was restricted to cases with help-seeking contacts to ensure that the primary care physician had an opportunity to assess and diagnose the patient, and the six-month window was selected to increase the likelihood that the patient was in the early stages of psychotic illness. The characteristics of help-seeking contacts within the cohort have been described in detail elsewhere (Schoer et al., 2021).

Variable Definitions

Outcome

All cases in our cohort were considered to have been diagnosed in primary care if the first billing code for psychosis was from a primary care physician (i.e., family physician or pediatrician); all other cases were classified as diagnosed in secondary/tertiary care. For cases diagnosed in primary care, we extracted information on the physician who diagnosed the patient (i.e., diagnosing physician). For cases diagnosed in secondary/tertiary care, we extracted information on the primary care physician who saw the patient closest to the date of first diagnosis (i.e., terminal physician).

Covariates

Patient sociodemographic characteristics included age, sex, residence (i.e., urban or rural), and immigrant status (i.e., immigrant, refugee, or non-immigrant). We used the

Ontario Marginalization Index as an ecological indicator of neighbourhood-level dependency, deprivation, residential instability, and ethnic concentration (Matheson et al., 2012).

Clinical characteristics of patients were derived from the Johns Hopkins Adjusted Clinical Group® System (Version 10), which categorizes health conditions into groups with similar clinical criteria and health care resource needs, including 32 Aggregated Diagnosis Groups (ADGs) and 264 Expanded Diagnostic Clusters (EDCs). These groupings are based on International Classification of Disease codes obtained from both physician billing claims and hospital discharge abstracts (Austin et al., 2011). We determined the total number of ADGs for each patient and classified the numbers as low (≤5), medium (6-9), or high (≥10). We also used the ADGs to identify whether patients had chronic medical and psychosocial conditions, and the EDCs to identify the specific types of psychosocial conditions.

Service use characteristics of patients included the number of help-seeking contacts in primary care, the number of those contacts with the diagnosing or terminal physician, and whether the terminal visit was with their regular physician. Continuity of care was defined as the proportion of visits with the diagnosing or terminal physician (and if applicable, their team) among all primary care physician visits in the six months prior to first diagnosis, and was classified as low (<50%), moderate (50-79%), or high (≥80%). This method for defining continuity of care corresponds with the Usual Provider of Care Index, which describes the proportion of visits to a patient's regular physician among all physician visits, although there is no standard classification for degree of continuity (Salisbury et al., 2009).

Physician characteristics included age, sex, number of years since medical school graduation, international medical graduate status (i.e., international or Canadian), and speciality (i.e., family physician, pediatrician, or other); 'other' physicians were those who trained in family medicine but effectively practiced in emergency or community medicine.

We also characterized the physicians' practices in terms of panel size, location (i.e., urban or rural), model (i.e., solo practitioner, physician team, or multidisciplinary team), and comprehensiveness (i.e., comprehensive, focused, specialist, or 'other'). A comprehensive practice was defined as one with ≥50% of billings for services in ≥7 activity areas, whereas a focused practice was one with ≥50% of billings for services in one activity area. Specialist physicians were those with a self-reported specialty that was not family medicine but whose billings most closely aligned with those of a family physician, whereas 'other' physicians did not meet any of the above criteria (e.g., mixed practice, worked <44 days/year). These methods for identifying comprehensive primary care practices in ICES data has been previously described (Schultz & Glazier, 2017).

Statistical Analysis

We described the cohort using frequencies and proportions, as well as medians and interquartile ranges (IQR). Standardized differences were computed to examine differences between cases diagnosed in primary care and in secondary/tertiary care; standardized differences ≥0.10 were considered meaningful between-group differences (Austin, 2009). We used a modified Poisson regression model to estimate the risk ratios (RR) and 95% confidence intervals (CI) for patient and physician factors associated with a first diagnosis of psychosis in primary care (Zou, 2004). Adjusted estimates (aRR) were computed using a multivariable model with covariates selected based on clinical

relevance and standardized differences indicative of meaningful between-group differences. For sets of covariates that we anticipated to have high collinearity, we prioritized the covariate with greater clinical relevance and/or meaningful standardized differences between groups. Robust variance estimation in the model accounted for repeated appearances of physicians within the dataset.

The final multivariable model included the following covariates: patient age, sex, immigrant status, neighbourhood-level ethnic concentration, number of ADGs, comorbid psychosocial condition, substance use, help-seeking contacts in primary care, terminal visit with regular primary care physician, and continuity of care with primary care physician at terminal visit; and physician sex, years since graduation, international medical graduate status, type of physician, location of practice, and comprehensiveness of practice. All analyses were conducted using SAS (Version 9.4).

Results

Proportion of Diagnoses in Primary Care

We identified 39,449 incident cases of non-affective psychotic disorder in Ontario over the ten-year period. In the six months prior to first diagnosis of psychosis, 59% (n=23,469) of people had help-seeking contacts in primary care. Of those, 59% (n=13,906) were diagnosed in primary care and 41% (n=9,563) were diagnosed in secondary or tertiary care. We also identified a total of 17,478 primary care physicians in Ontario over the ten-year period, which was comprised of 16,430 family physicians and 1,048 pediatricians. Approximately 48% (n=8,426) of these physicians encountered a patient with first-episode psychosis on a help-seeking contact (50% of family physicians, n=8,243; 17% of

pediatricians, n=183) in the six-month period preceding the first diagnosis of psychotic disorder.

Factors Associated with Diagnosis in Primary Care

The characteristics of incident cases of non-affective psychosis with prior help-seeking contacts in primary care (n=23,469) are described in Table 1, and the characteristics of the diagnosing or terminal physicians are described in Table 2. Patients diagnosed in primary care differed from those diagnosed in secondary or tertiary care across several socioeconomic factors, including age, residence, neighbourhood-level ethnic concentration, and chronic psychosocial conditions. Diagnosing physicians differed from terminal physicians in terms of sex, international medical education, practice location, and practice comprehensiveness.

The factors associated with diagnosis in primary care, compared to diagnosis in secondary or tertiary care, are summarized in Table 3. Patient factors associated with a lower likelihood of diagnosis in primary care included being younger (e.g., 14-19 vs. 30-35: aRR=0.83, 95%CI=0.79-0.86), male (aRR=0.96, 95%CI=0.94-0.98), an immigrant (aRR=0.93, 95%CI=0.90-0.96), and living in areas with high ethnic concentration (aRR=0.89, 95%CI=0.81-0.98). Those with a chronic psychosocial condition (aRR=0.58, 95%CI=0.56-0.59), a substance use disorder (aRR=0.91, 95%CI=0.89-0.94), a high number of ADGs (≥10; aRR=0.96, 95%CI=0.93-0.99), and multiple help-seeking contacts in primary care (>3; aRR=0.94, 95%CI=0.91-0.98) were also less likely to be diagnosed in primary care. In addition, patients had a higher likelihood of being diagnosed in primary care when the continuity of help-seeking contacts with their diagnosing or terminal

physician was low (aRR=1.83, 95%CI=1.78-1.88) and moderate (aRR=1.09, 95%CI=1.04-1.14) compared to high continuity of care.

Physician factors associated with a lower likelihood of diagnosing a case in primary care included being an international medical graduate (aRR=0.93, 95%CI=0.91-0.96) and having more than 20 years since medical school graduation (aRR=0.95, 95%CI=0.92-0.98). Physicians had a greater likelihood of diagnosing a case in primary care if they were male (aRR=1.06, 95%CI=1.04-1.09), practiced in a rural setting (aRR=1.14, 95%CI=1.10-1.19), and practiced in a team-based model, with either a physician team (aRR=1.23, 95%CI=1.20-1.27) or multidisciplinary team (aRR=1.18, 95%CI=1.14-1.23). Relative to physicians with a comprehensive practice, the likelihood of diagnosing a case in primary care was greater among physicians in non-mental health focused practices (aRR=1.07, 95%CI=1.03-1.11) and other non-comprehensive practices (aRR=1.06, 95%CI=1.02-1.11).

Discussion

We found that nearly two-thirds of people with early psychosis had help-seeking contacts with primary care physicians in the six months prior to first diagnosis of psychotic disorder, and over half of these people were formally diagnosed with non-affective psychotic disorder by a primary care physician. Our findings are consistent with the results of a previous study on early psychosis intervention and primary care in Ontario (Anderson & Kurdyak, 2017). In addition, nearly half of all primary care physicians in Ontario encountered at least one case of first-episode psychosis on a help-seeking contact, which is to be anticipated in a province in which primary care is the most frequently used service for mental health reasons (Vasiliadis et al., 2005).

We identified subgroups of patients who may be less likely to receive a first diagnosis of psychotic disorder in primary care, including those who were male and of younger age. A recent study found that patients who exhibited minimal or no prodromal symptoms of psychosis during help-seeking contacts prior to their first episode of psychosis, which could make a diagnosis in primary care more difficult, were more likely to be male and younger in age compared to those exhibiting multiple prodromal symptoms (Chen et al., 2019). It has also been proposed that many of the tools for detecting and diagnosing psychotic disorders in primary care may not be appropriately designed for younger people for reasons such as an absence of age-specific criteria a lack of testing in adolescent samples from the general population (Kennedy et al., 2020); however, to our knowledge, these tools are not being systematically used in practice within Ontario. Other factors that may have contributed to a lower likelihood of males and younger patients being diagnosed in primary care include sex differences in clinical presentation of first-episode psychosis (Carter et al., 2022), and differences in physician practices for different age groups of patients. Prior research from Ontario has shown that women and older patients with first-episode psychosis were less likely to be referred to early psychosis intervention services and more likely to be treated in a primary care setting (Anderson, Norman, et al., 2018). Thus, primary care physicians may be referring males and younger patients to these specialized programs for diagnosis and treatment, while diagnosing and treating females and older patients within their own practice.

We found that immigrants and people living in areas of high ethnic concentration were less likely to receive their first diagnosis of psychotic disorder in primary care. Several studies have indicated that immigrant and ethnic minority groups generally have

lower intensity of primary care use on the pathway to care for first-episode psychosis (Anderson et al., 2014, 2015, 2017), and would therefore be underrepresented in our sample. Given that our analyses were restricted to those who had help-seeking contacts with primary care, our findings could suggest that there may be cultural and/or language barriers impeding the recognition of psychosis among certain racialized groups in primary care. In prior studies of immigrant access to mental health services in Canada, these barriers were found to hinder service utilization and timely recognition of various psychiatric conditions (Thomson et al., 2015).

People with chronic psychosocial conditions and substance use disorders were less likely to receive their first diagnosis of psychotic disorder in primary care. An earlier study from Ontario similarly found that patients being treated for other mental health conditions at the time of the first episode of psychosis had longer delays in diagnosis and treatment (Norman et al., 2004). Prior to a first diagnosis of psychotic disorder, people may be diagnosed with or exhibit symptoms of more prevalent psychiatric disorders that overlap in symptomatology of psychosis, including major depressive disorder (MDD) and attention-deficit/hyperactivity disorder (ADHD) (G. E. Simon et al., 2018; Sullivan et al., 2018). For example, negative psychotic symptoms such as blunted affect and social withdrawal are often found in MDD (Müller et al., 2001), whereas positive psychotic symptoms such as emotional dysregulation and disorganized behaviour are also characteristic of ADHD (Corbisiero et al., 2017). Primary care physicians may misattribute psychotic symptoms to a previously diagnosed psychiatric disorder, or to disorders that are more common in their practices (Ogdie et al., 2012; Richie & Josephson, 2018). Alternatively, primary care physicians may choose to refer patients to specialist care for

diagnosis when they present with overlapping symptomatology (A. E. Simon et al., 2009). These findings illustrate the difficulties of diagnosing psychotic disorders in clinically complex patients within a primary care setting.

Interestingly, we found that lower continuity with primary care physicians during help-seeking was associated with greater likelihood of diagnosis in primary care. These counterintuitive findings may be explained by heuristic biases that can impact a physician's clinical decision making. Physicians who have a more established relationship with a patient may be more likely to attribute psychotic symptoms to a previously diagnosed disorder (i.e., anchoring bias), especially more common disorders (i.e., availability bias) (Richie & Josephson, 2018). As well, physicians may be reluctant to make a stigmatizing diagnosis such as psychotic disorder for a long-time patient (i.e., visceral bias) and may even find alternative explanations for the psychotic symptoms (i.e., confirmation bias) (Ogdie et al., 2012). Alternatively, greater continuity of care may allow for enhanced monitoring of patients during the initial phases of psychosis, which could result in an earlier referral to a specialist for a formal diagnosis.

We identified physician factors that were associated with a greater likelihood of diagnosing a first episode of psychosis in primary care, including whether the practice was rural, focused, and team-based. Compared to physicians practicing independently and providing comprehensive care, physicians with team-based and focused practices may have the additional time, support, and resources that are necessary when caring for patients with serious mental illnesses; these factors have been identified as facilitators to diagnosing psychotic disorders in a primary care setting (Zantinge et al., 2005). In Ontario, the majority of psychiatrists practice within urban regions (Kurdyak et al., 2014),

and rural primary care physicians have noted access issues when referring patients to psychiatric care (e.g., long waitlists, minimal availability) (Steele et al., 2012; Zayed et al., 2015). Due to these barriers, rural physicians may have greater involvement in the mental health care of their patients, and may be more willing to provide a formal diagnosis for psychotic disorder.

We also identified physician factors that were associated with a lower likelihood of diagnosing a first episode of psychosis in primary care, including being female, an international medical graduate, and practicing for a longer duration. In Ontario, female primary care physicians have been found to refer patients to specialist care more often than their male counterparts (Liddy et al., 2014), and it is possible that these physicians were more likely to refer suspected cases of psychosis to psychiatric care for confirmation of diagnosis. The differences observed among physicians who graduated from international medical programs and had more time elapsed since graduation may reflect the practical challenges faced by these physicians in adapting to complex clinical practice (Lee & Weston, 2012; Triscott et al., 2016). However, it should be noted that our findings may not be reflective of the physicians and their practices, but rather with associated factors that we did not capture in our study. In particular, physicians may have been less likely to record a diagnosis in primary care because they had enhanced access to or collaborative care with specialists (Kates et al., 2011), who ultimately provided the formal diagnosis of psychotic disorder.

The literature on interventions for improving detection and referral of early psychosis in primary care is equivocal. Educational materials and programs for primary care physicians were associated with improved referral rates and reduced delays in

diagnosis and treatment in some studies (Chong et al., 2005; Joa et al., 2007, 2008; Power et al., 2007; Renwick et al., 2008; A. E. Simon et al., 2010; Turrina et al., 2008), whereas others found that these interventions had no discernable effect on service-related outcomes (Krstev et al., 2004; Lester et al., 2009; Slade et al., 2008); none found a significant reduction in duration of untreated psychosis (Lloyd-Evans et al., 2011; Oliver et al., 2018). In order for primary care physicians to fully benefit from continuing medical education, it has been recommended for sessions to be short, clear, manageable, and recurring, with material that is multimodal in delivery and targeted in clinical relevance (A. E. Simon et al., 2010). Based on our findings, some primary care physicians in Ontario may benefit from continuing medical education on first-episode psychosis and early intervention.

Primary care physicians have indicated a preference for improved collaboration with mental health specialists rather than continuing medical education (A. E. Simon et al., 2005, 2009). Some physicians cited difficulties with specialist care as barriers to early psychosis intervention in primary care, including poor communication and delays in consultations and referrals (Gavin et al., 2006, 2008; Leahy et al., 2018; Oud et al., 2007; Verdoux et al., 2005). As such, there has been interest in the implementation of mental health specialist liaisons in primary care to provide more accessible and timely consultation on suspected cases of psychosis. Liaisons were found to be effective in increasing appropriate referrals to specialist care by primary care physicians in two studies, and the physicians indicated high levels of satisfaction with the intervention (Perez et al., 2015; Sved-Williams & Poulton, 2010). In Ontario, primary care physicians

with considerably limited time and resources may benefit from the involvement of a specialist liaison within their practices.

Future studies should explore the underlying reasons behind our study findings, particularly the physician characteristics associated with first diagnosis of psychosis in primary care. Examination of electronic medical records may provide details that are not available in health administrative data, and qualitative methods may help contextualize our findings from the physician's perspective. Moreover, it would worthwhile to examine whether a formal diagnosis of psychotic disorder in primary care is associated with improvements in service provision, patient care, and clinical outcomes.

Limitations

This study was limited by the use of data created for administrative purposes. First, the algorithm used to identify cases was limited to non-affective psychosis (Kurdyak et al., 2015), which limits the generalizability of our findings to affective psychotic disorders. As well, the algorithm was validated for chronic schizophrenia rather than first-episode psychosis (Kurdyak et al., 2015), and so its performance in our study may differ from that of the original validation study. Second, the database does not contain information on certain factors that may have confounded our findings, notably the exact date of psychosis onset. Thus a patient's help-seeking visits may have occurred during the prodromal phase, which could influence the presentation of symptoms and in turn the physician's ability to diagnose psychotic disorder (Chen et al., 2019). Third, the diagnostic codes for primary care visits in the ICES database are used for billing purposes, and physicians are limited to one diagnostic code per visit. These codes may not provide an accurate representation of the reasons for the visit, due to over- and under-coding of

diagnoses, as well as lack of diagnostic standardization between physicians (Lucyk et al., 2017; Tang et al., 2017). Given that primary care physicians are often apprehensive to formally diagnose psychotic disorders without confirmation from specialists (A. E. Simon et al., 2009), they may have recognized a first-episode of psychosis during the terminal visit but ultimately did not bill a diagnostic code for psychotic disorders for that visit.

Conclusions

Primary care is an important contact for help-seeking and diagnosis for a substantial proportion of people with early psychosis in Ontario. Several characteristics of patients and physicians are associated with the likelihood of a formal diagnosis of psychosis during help-seeking contacts in primary care. Physicians less likely to diagnose psychosis in primary care could be targeted with tailored interventions and resources to better support them in their central role in pathways to care for first-episode psychosis. Future studies should employ methodologies to explore the underlying reasons for our study findings, as well as the impact of diagnosis in primary care on service-related, patient-centered, and clinical outcomes.

DECLARATIONS

Competing Interests

The authors declared the following potential conflicts of interest: LP reports personal fees from Janssen Canada, Otsuka Canada, SPMM Course Limited UK, Canadian Psychiatric Association; investigator-initiated educational grants from Janssen Canada, Otsuka Canada, and Sunovion; and book royalties from Oxford University Press. outside the submitted work. All other authors report no conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Standards

ICES is a prescribed entity under Section 45 of Ontario's Personal Health Information Protection Act (PHIPA), which enables analysis and compilation of personal health information related to the management, evaluation, and monitoring of the health system without consent for such purposes. The portions of this protocol that involve health administrative data do not require review by a Research Ethics Board.

Data Access

The dataset from this study will be held securely in coded form at ICES and the ICES analyst will have full access to study data. While data sharing agreements prohibit ICES from making the dataset publicly available, access can be granted to those who meet pre-specified criteria for confidential access. The full dataset creation plan is available from the authors upon request.

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REFERENCES

Anderson, K. K., Archie, S., Booth, R. G., Cheng, C., Lizotte, D., MacDougall, A. G., Norman, R. M. G., Ryan, B. L., Terry, A. L., & Rodrigues, R. (2018). Understanding the role of the family physician in early psychosis intervention. *BJPsych Open*, *4*(6), 447–453. https://doi.org/10.1192/bjo.2018.67

Anderson, K. K., Flora, N., Archie, S., Morgan, C., & Mckenzie, K. J. (2014). A meta-analysis of ethnic differences in pathways to care at the first episode of psychosis. *Acta Psychiatrica Scandinavica*, *130*(4), 257–268. https://doi.org/10.1111/acps.12254

Anderson, K. K., Flora, N., Ferrari, M., Tuck, A., Archie, S., Kidd, S., Tang, T., Kirmayer, L. J., & McKenzie, K. J. (2015). Pathways to first-episode care for psychosis in African-, Caribbean-, and European-origin groups in Ontario. *Canadian Journal of Psychiatry*, *60*(5), 223–231. https://doi.org/10.1177/070674371506000504

Anderson, K. K., Fuhrer, R., & Malla, A. K. (2010). The pathways to mental health care of first-episode psychosis patients: A systematic review. *Psychological Medicine*, *40*(10), 1585–1597. https://doi.org/10.1017/S0033291710000371

Anderson, K. K., Fuhrer, R., & Malla, A. K. (2013). “There are too many steps before you get to where you need to be”: Help-seeking by patients with first-episode psychosis. *Journal of Mental Health*, *22*(4), 384–395. https://doi.org/10.3109/09638237.2012.705922

Anderson, K. K., Fuhrer, R., Schmitz, N., & Malla, A. K. (2013). Determinants of negative pathways to care and their impact on service disengagement in first-episode psychosis. *Social Psychiatry and Psychiatric Epidemiology*, *48*(1), 125–

136. https://doi.org/10.1007/s00127-012-0571-0

Anderson, K. K., Fuhrer, R., Wynant, W., Abrahamowicz, M., Buckeridge, D. L., & Malla, A. K. (2013). Patterns of health services use prior to a first diagnosis of psychosis: The importance of primary care. *Social Psychiatry and Psychiatric Epidemiology*, *48*(9), 1389–1398. https://doi.org/10.1007/s00127-013-0665-3

Anderson, K. K., & Kurdyak, P. (2017). Factors associated with timely physician follow-up after a first diagnosis of psychotic disorder. *Canadian Journal of Psychiatry*, *62*(4), 268–277. https://doi.org/10.1177/0706743716673322

Anderson, K. K., McKenzie, K. J., & Kurdyak, P. (2017). Examining the impact of migrant status on ethnic differences in mental health service use preceding a first diagnosis of schizophrenia. *Social Psychiatry and Psychiatric Epidemiology*, *52*(8), 949–961. https://doi.org/10.1007/s00127-017-1403-z

Anderson, K. K., Norman, R. M. G., MacDougall, A. G., Edwards, J., Palaniyappan, L., Lau, C., & Kurdyak, P. (2018). Disparities in access to early psychosis intervention services: Comparison of service users and nonusers in health administrative data. *Canadian Journal of Psychiatry*, *63*(6), 395–403. https://doi.org/10.1177/0706743718762101

Austin, P. C. (2009). Using the standardized difference to compare the prevalence of a binary variable between two groups in observational research. *Communications in Statistics: Simulation and Computation*, *38*(6), 1228–1234. https://doi.org/10.1080/03610910902859574

Austin, P. C., Van Walraven, C., Wodchis, W. P., Newman, A., & Anderson, G. M. (2011). Using the Johns Hopkins Aggregated Diagnosis Groups (ADGs) to predict

mortality in a general adult population Cohort in Ontario, Canada. *Medical Care*, *49*(10), 932–939. https://doi.org/10.1097/MLR.0b013e318215d5e2

Benchimol, E. I., Smeeth, L., Guttmann, A., Harron, K., Moher, D., Peteresen, I., Sørensen, H. T., von Elm, E., & Langan, S. M. (2015). The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement. *PLoS Medicine*, *12*(10). https://doi.org/10.1371/journal.pmed.1001885

Carter, B., Wootten, J., Archie, S., Terry, A. L., & Anderson, K. K. (2022). Sex and gender differences in symptoms of early psychosis: a systematic review and meta-analysis. *Archives of Women's Mental Health*, *25*(4), 679–691. https://doi.org/10.1007/s00737-022-01247-3

Chen, Y., Farooq, S., Edwards, J., Chew-Graham, C. A., Shiers, D., Frisher, M., Hayward, R., Sumathipala, A., & Jordan, K. P. (2019). Patterns of symptoms before a diagnosis of first episode psychosis: A latent class analysis of UK primary care electronic health records. *BMC Medicine*, *17*(1). https://doi.org/10.1186/s12916-019-1462-y

Chong, S. A., Mythily, S., & Verma, S. (2005). Reducing the duration of untreated psychosis and changing help-seeking behaviour in Singapore. *Social Psychiatry and Psychiatric Epidemiology*, *40*(8), 619–621. https://doi.org/10.1007/s00127-005-0948-4

Corbisiero, S., Riecher-Rössler, A., Buchli-Kammermann, J., & Stieglitz, R. D. (2017). Symptom overlap and screening for symptoms of attention-deficit/hyperactivity disorder and psychosis risk in help-seeking psychiatric patients. *Frontiers in Psychiatry*, *8*(OCT). https://doi.org/10.3389/fpsyt.2017.00206

El-Adl, M., Burke, J., & Little, K. (2009). First-episode psychosis: Primary care experience and implications for service development. *Psychiatric Bulletin*, *33*(5), 165–168. https://doi.org/10.1192/pb.bp.108.019646

Ferrari, M., Flora, N., Anderson, K. K., Tuck, A., Archie, S., Kidd, S., & McKenzie, K. J. (2015). The African, Caribbean and European (ACE) Pathways to Care study: A qualitative exploration of similarities and differences between African-origin, Caribbean-origin and European-origin groups in pathways to care for psychosis. *BMJ Open*, *5*(1). https://doi.org/10.1136/bmjopen-2014-006562

Gavin, B., Cullen, W., Foley, S., Mcwilliams, S., Turner, N., O'Callaghan, E., & Bury, G. (2008). Integrating primary care and early intervention in psychosis services: A general practitioner perspective. *Early Intervention in Psychiatry*, *2*(2), 103–107. https://doi.org/10.1111/j.1751-7893.2008.00065.x

Gavin, B., Cullen, W., O'Donoghue, B., Ascencio-Lane, J. C., Bury, G., & O'Callaghan, E. (2006). First episode schizophrenia in general practice: A national survey. In *Irish Journal of Psychological Medicine* (Vol. 23, Issue 1, pp. 6–9). https://doi.org/10.1017/S079096670000937X

Healthforce Ontario. (2015). *Family Practice Compensation Models; Speciality Practice Models*.

Joa, I., Johannessen, J. O., Auestad, B., Friis, S., McGlashan, T., Melle, I., Opjordsmoen, S., Simonsen, E., Vaglum, P., & Larsen, T. K. (2008). The key to reducing duration of untreated first psychosis: Information campaigns. *Schizophrenia Bulletin*, *34*(3), 466–472. https://doi.org/10.1093/schbul/sbm095

Joa, I., Johannessen, J. O., Auestad, B., Friis, S., Opjordsmoen, S., Simonsen, E.,

Vaglum, P., McGlashan, T., & Larsen, T. K. (2007). Effects on referral patterns of reducing intensive informational campaigns about first-episode psychosis. *Early Intervention in Psychiatry*, *1*(4), 340–345. https://doi.org/10.1111/j.1751-7893.2007.00047.x

Kates, N., McPherson-Doe, C., & George, L. (2011). Integrating mental health services within primary care settings: The Hamilton Family Health Team. In *Journal of Ambulatory Care Management* (Vol. 34, Issue 2, pp. 174–182). J Ambul Care Manage. https://doi.org/10.1097/JAC.0b013e31820f6435

Kennedy, L., Johnson, K. A., Cheng, J., & Woodberry, K. A. (2020). A Public Health Perspective on Screening for Psychosis Within General Practice Clinics. *Frontiers in Psychiatry*, *10*. https://doi.org/10.3389/fpsyt.2019.01025

Krstev, H., Carbone, S., Harrigan, S. M., Curry, C., Elkins, K., & McGorry, P. D. (2004). Early intervention in first-episode psychosis - The impact of a community development campaign. *Social Psychiatry and Psychiatric Epidemiology*, *39*(9), 711–719. https://doi.org/10.1007/s00127-004-0798-5

Kurdyak, P., Lin, E., Green, D., & Vigod, S. (2015). Validation of a population-based algorithm to detect chronic psychotic illness. *Canadian Journal of Psychiatry*, *60*(8), 362–368. https://doi.org/10.1177/070674371506000805

Kurdyak, P., Stukel, T. A., Goldbloom, D., Kopp, A., Zagorski, B. M., & Mulsant, B. H. (2014). Universal coverage without universal access: A study of psychiatrist supply and practice patterns in ontario. *Open Medicine*, *8*(3).

Le Galudec, M., Cornily, G., Garlantézec, R., Stéphan, F., Alavi, Z., & Walter, M. (2014). Evaluation of GPs diagnostic knowledge and treatment practice in detection and

treatment of early schizophrenia: A French postal survey in Brittany. *Social Psychiatry and Psychiatric Epidemiology*, *49*(1), 69–77. https://doi.org/10.1007/s00127-013-0686-y

Leahy, D., Schaffalitzky, E., Saunders, J., Armstrong, C., Meagher, D., Ryan, P., Dooley, B., McNicholas, F., McGorry, P., & Cullen, W. (2018). Role of the general practitioner in providing early intervention for youth mental health: a mixed methods investigation. *Early Intervention in Psychiatry*, *12*(2), 202–216. https://doi.org/10.1111/eip.12303

Lee, L., & Weston, W. (2012). The aging physician. *Canadian Family Physician Medecin de Famille Canadien*, *58*(1), 17–178.

Lester, H. E., Birchwood, M., Freemantle, N., Michail, M., & Tait, L. (2009). REDIRECT: Cluster randomised controlled trial of GP training in first-episode psychosis. *British Journal of General Practice*, *59*(563), 403–408. https://doi.org/10.3399/bjgp09X420851

Lester, H. E., Tritter, J. Q., & Sorohan, H. (2005). Patients' and health professionals' views on primary care for people with serious mental illness: Focus group study. *British Medical Journal*, *330*(7500), 1122–1126. https://doi.org/10.1136/bmj.38440.418426.8F

Liddy, C., Singh, J., Kelly, R., Dahrouge, S., Taljaard, M., & Younger, J. (2014). What is the impact of primary care model type on specialist referral rates? A cross-sectional study. *BMC Family Practice*, *15*(1). https://doi.org/10.1186/1471-2296-15-22

Lloyd-Evans, B., Crosby, M., Stockton, S., Pilling, S., Hobbs, L., Hinton, M., & Johnson, S. (2011). Initiatives to shorten duration of untreated psychosis: Systematic review.

In *British Journal of Psychiatry* (Vol. 198, Issue 4, pp. 256–263). https://doi.org/10.1192/bjp.bp.109.075622

Lucyk, K., Tang, K., & Quan, H. (2017). Barriers to data quality resulting from the process of coding health information to administrative data: A qualitative study. *BMC Health Services Research*, *17*(1). https://doi.org/10.1186/s12913-017-2697-y

Marshall, M., & Rathbone, J. (2011). Early intervention for psychosis. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.cd004718.pub3

Matheson, F. I., Dunn, J. R., Smith, K. L. W., Moineddin, R., & Glazier, R. H. (2012). Development of the Canadian Marginalization index: A new tool for the study of inequality. *Canadian Journal of Public Health*, *103*(S2), S12–S16. https://doi.org/10.1007/bf03403823

McLeod, L., Buckley, G., & Sweetman, A. (2016). Ontario primary care models: a descriptive study. *CMAJ Open*, *4*(4), E679–E688. https://doi.org/10.9778/cmajo.20160069

Müller, M. J., Szegedi, A., Wetzel, H., & Benkert, O. (2001). Depressive factors and their relationships with other symptom domains in schizophrenia, schizoaffective disorder, and psychotic depression. *Schizophrenia Bulletin*, *27*(1), 19–28. https://doi.org/10.1093/oxfordjournals.schbul.a006856

Nkire, N., Sardinha, S., Nwosu, B., Mcdonough, C. M., De Coteau, P. A., Duffy, I., Waddington, J. L., & Russell, V. (2015). Evaluation of knowledge and attitudes among primary care physicians in Cavan-Monaghan as “gatekeepers-in-waiting” for the introduction of Carepath for Overcoming Psychosis Early (COPE). *Early*

Intervention in Psychiatry, *9*(2), 141–150. https://doi.org/10.1111/eip.12069

Norman, R. M. G., Malla, A. K., Verdi, M. B., Hassall, L. D., & Fazekas, C. (2004). Understanding delay in treatment for first-episode psychosis. *Psychological Medicine*, *34*(2), 255–266. https://doi.org/10.1017/S0033291703001119

Ogdie, A. R., Reilly, J. B., Pang, W. G., Keddem, S., Barg, F. K., Von Feldt, J. M., & Myers, J. S. (2012). Seen through their eyes: Residents' reflections on the cognitive and contextual components of diagnostic errors in medicine. *Academic Medicine*, *87*(10), 1361–1367. https://doi.org/10.1097/ACM.0b013e31826742c9

Oliver, D., Davies, C., Crossland, G., Lim, S., Gifford, G., McGuire, P., & Fusar-Poli, P. (2018). Can we reduce the duration of untreated psychosis? A systematic review and meta-analysis of controlled interventional studies. *Schizophrenia Bulletin*, *44*(6), 1362–1372. https://doi.org/10.1093/schbul/sbx166

Oud, M. J. T., Schuling, J., Slooff, C. J., Groenier, K. H., Dekker, J. H., & Meyboom-De Jong, B. (2009). Care for patients with severe mental illness: The general practitioner's role perspective. *BMC Family Practice*, *10*, 29. https://doi.org/10.1186/1471-2296-10-29

Oud, M. J. T., Schuling, J., Slooff, C. J., & Jong, B. M. De. (2007). How do general practitioners experience providing care for their psychotic patients? *BMC Family Practice*, *8*, 37. https://doi.org/10.1186/1471-2296-8-37

Perez, J., Jin, H., Russo, D. A., Stochl, J., Painter, M., Shelley, G., Jackson, E., Crane, C., Graffy, J. P., Croudace, T. J., Byford, S., & Jones, P. B. (2015). Clinical effectiveness and cost-effectiveness of tailored intensive liaison between primary and secondary care to identify individuals at risk of a first psychotic illness (the

LEGs study): A cluster-randomised controlled trial. *The Lancet Psychiatry*, *2*(11), 984–993. https://doi.org/10.1016/S2215-0366(15)00157-1

Power, P., Iacoponi, E., Reynolds, N., Fisher, H., Russell, M., Garety, P., McGuire, P. K., & Craig, T. (2007). The Lambeth Early Onset Crisis Assessment Team Study: General practitioner education and access to an early detection team in first-episode psychosis. *British Journal of Psychiatry*, *191*(SUPPL. 51). https://doi.org/10.1192/bjp.191.51.s133

Renwick, L., Gavin, B., McGlade, N., Lacey, P., Goggins, R., Jackson, D., Turner, N., Foley, S., McWilliams, S., Behan, C., Lawlor, E., Cullen, W., & O'Callaghan, E. (2008). Early intervention service for psychosis: Views from primary care. *Early Intervention in Psychiatry*, *2*(4), 285–290. https://doi.org/10.1111/j.1751-7893.2008.00090.x

Richie, M., & Josephson, S. A. (2018). Quantifying Heuristic Bias: Anchoring, Availability, and Representativeness. *Teaching and Learning in Medicine*, *30*(1), 67–75. https://doi.org/10.1080/10401334.2017.1332631

Rodrigues, R., Beswick, A., & Anderson, K. K. (2020). Psychiatric hospitalization following psychosis onset: A retrospective cohort study using health administrative data. *Early Intervention in Psychiatry*, *14*(2), 235–240. https://doi.org/10.1111/eip.12893

Salisbury, C., Sampson, F., Ridd, M., & Montgomery, A. A. (2009). How should continuity of care in primary health care be assessed? *The British Journal of General Practice : The Journal of the Royal College of General Practitioners*, *59*(561), e134-41. https://doi.org/10.3399/bjgp09X420257

Schoer, N., Rodrigues, R., Reid, J., Ryan, B. L., Lizotte, D. J., Booth, R., MacDougall, A. G., Kurdyak, P., & Anderson, K. K. (2021). Patterns of primary care use prior to a first diagnosis of nonaffective psychotic disorder in Ontario, Canada. *Canadian Journal of Psychiatry*, *66*(4), 406–417. https://doi.org/10.1177/0706743720961732

Schultz, S. E., & Glazier, R. H. (2017). Identification of physicians providing comprehensive primary care in Ontario: a retrospective analysis using linked administrative data. *CMAJ Open*, *5*(4), E856–E863. https://doi.org/10.9778/cmajo.20170083

Simon, A. E., Jegerlehner, S., Müller, T., Cattapan-Ludewig, K., Frey, P., Grossenbacher, M., Seifritz, E., & Umbricht, D. (2010). Prodromal schizophrenia in primary care: A randomised sensitisation study. *British Journal of General Practice*, *60*(578). https://doi.org/10.3399/bjgp10X515377

Simon, A. E., Lauber, C., Ludewig, K., Braun-Scharm, H., & Umbricht, D. S. (2005). General practitioners and schizophrenia: Results from a Swiss survey. In *British Journal of Psychiatry* (Vol. 187, Issue SEPT., pp. 274–281). https://doi.org/10.1192/bjp.187.3.274

Simon, A. E., Lester, H. E., Tait, L., Stip, E., Roy, P., Conrad, G., Hunt, J., Epstein, I., Larsen, T. K., Amminger, P., Holub, D., Wenigová, B., Turner, M., Berger, G. E., O'Donnell, C., & Umbricht, D. (2009). The International Study on General Practitioners and Early Psychosis (IGPS). *Schizophrenia Research*, *108*(1–3), 182–190. https://doi.org/10.1016/j.schres.2008.11.004

Simon, G. E., Stewart, C., Hunkeler, E. M., Yarborough, B. J., Lynch, F., Coleman, K. J., Beck, A., Operskalski, B. H., Penfold, R. B., & Carrell, D. S. (2018). Care

pathways before first diagnosis of a psychotic disorder in adolescents and young adults. *American Journal of Psychiatry*, *175*(5), 434–442. https://doi.org/10.1176/appi.ajp.2017.17080844

Slade, M., Gask, L., Leese, M., Mccrone, P., Montana, C., Powell, R., Stewart, M., & Chew-Graham, C. (2008). Failure to improve appropriateness of referrals to adult community mental health services-lessons from a multi-site cluster randomized controlled trial. *Family Practice*, *25*(3), 181–190. https://doi.org/10.1093/fampra/cmn025

Steele, M., Zayed, R., Davidson, B., Stretch, N., Nadeau, L., Fleisher, W., Doey, T., Spenser, H. R., Abidi, S., Auclair, G., Callanan, T. S., Duncan, D., Ferguson, G., Flynn, R., Hope-Ross, L., Khalid-Khan, S., Lazier, L., Liashko, V., Lipton, H., … St. John, K. (2012). Referral patterns and training needs in psychiatry among primary care physicians in Canadian rural/remote areas. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, *21*(2), 111–123.

Sullivan, S. A., Hamilton, W., Tilling, K., Redaniel, T., Moran, P., & Lewis, G. (2018). Association of Primary Care Consultation Patterns With Early Signs and Symptoms of Psychosis. *JAMA Network Open*, *1*(7), e185174. https://doi.org/10.1001/jamanetworkopen.2018.5174

Sved-Williams, A., & Poulton, J. (2010). Primary care mental health consultation-liaison: A connecting system for private psychiatrists and general practitioners. *Australasian Psychiatry*, *18*(2), 125–129. https://doi.org/10.3109/10398560903469783

Tang, K. L., Lucyk, K., & Quan, H. (2017). Coder perspectives on physician-related

barriers to producing high-quality administrative data: a qualitative study. *CMAJ Open*, *5*(3), E617–E622. https://doi.org/10.9778/cmajo.20170036

Thomson, M. S., Chaze, F., George, U., & Guruge, S. (2015). Improving Immigrant Populations' Access to Mental Health Services in Canada: A Review of Barriers and Recommendations. *Journal of Immigrant and Minority Health*, *17*(6), 1895–1905. https://doi.org/10.1007/s10903-015-0175-3

Triscott, J. A. C., Szafran, O., Waugh, E. H., Torti, J. M. I., & Barton, M. (2016). Cultural transition of international medical graduate residents into family practice in Canada. *International Journal of Medical Education*, *7*, 132–141. https://doi.org/10.5116/ijme.570d.6f2c

Turrina, C., Valsecchi, P., Bonomi, S., Corsini, P., Cacciani, P., Medea, G., Brignoli, O., & Sacchetti, E. (2006). Variables associated with general practitioners' knowledge about and diagnostic skills for schizophrenia. *Primary Care Companion to the Journal of Clinical Psychiatry*, *8*(4), 192–197. https://doi.org/10.4088/PCC.v08n0401

Turrina, C., Valsecchi, P., Mosca, A., Parrinello, G., Tabaglio, E., Brignoli, O., & Sacchetti, E. (2008). Immediate and 8-month impact of a medical educational course for general practitioners on knowledge about Schizophrenia and its treatment: Results of a 3-phase study from Brescia, Italy. *Primary Care Companion to the Journal of Clinical Psychiatry*, *10*(6), 457–461. https://doi.org/10.4088/PCC.v10n0606

Vasiliadis, H. M., Lesage, A., Adair, C., & Boyer, R. (2005). Service use for mental health reasons: Cross-provincial differences in rates, determinants, and equity of

access. *Canadian Journal of Psychiatry*, *50*(10), 614–619. https://doi.org/10.1177/070674370505001007

Verdoux, H., Cougnard, A., Grolleau, S., Besson, R., & Delcroix, F. (2005). How do general practitioners manage subjects with early schizophrenia and collaborate with mental health professionals?: A postal survey in South-Western France. *Social Psychiatry and Psychiatric Epidemiology*, *40*(11), 892–898. https://doi.org/10.1007/s00127-005-0975-1

Zantinge, E. M., Verhaak, P. F. M., & Bensing, J. M. (2005). The workload of GPs: Patients with psychological and somatic problems compared. *Family Practice*, *22*(3), 293–297. https://doi.org/10.1093/fampra/cmh732

Zayed, R., Hon, B. D., Nadeau, L., Callanan, T. S., Fleisher, W., Hope-Ross, L., Espinet, S., Spenser, H. R., Lipton, H., Srivastava, A., Lazier, L., Doey, T., Khalid-Khan, S., McKerlie, A., Stretch, N., Flynn, R., Abidi, S., St.John, K., Auclair, G., … Steele, M. (2015). Canadian rural/remote primary care physicians perspectives on child/adolescent mental health care service delivery. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, *25*(1), 24–34.

Zou, G. (2004). A Modified Poisson Regression Approach to Prospective Studies with Binary Data. *American Journal of Epidemiology*, *159*(7), 702–706. https://doi.org/10.1093/aje/kwh090

TABLES

Table 1

Characteristics of patients with a first diagnosis of psychotic disorder and prior help-seeking contacts in primary care, by level of care at diagnosis

Variables			Primary Care n (%) n=13,906	Secondary/Tertiary Care n (%) n=9,563	Standardized Difference
Sociodemographic Characteristics					
Age		14-19	3,222 (23.2%)	2,670 (27.9%)	0.11*
		20-24	3,811 (27.4%)	2,837 (29.7%)	0.05
		25-29	3,250 (23.4%)	2,032 (21.2%)	0.05
		30-35	3,623 (26.1%)	2,024 (21.2%)	0.12*
Sex		Male	8,231 (59.2%)	5,773 (60.4%)	0.02
		Female	5,675 (40.8%)	3,790 (39.6%)	0.02
Residence		Urban	12,532 (90.1%)	8,890 (93.0%)	0.10*
		Rural	1,366 (9.8%)	671 (7.0%)	0.10*
Immigrant status		Immigrant	1,765 (12.7%)	1,339 (14.0%)	0.04
		Refugee	566 (4.1%)	377 (3.9%)	0.01
		Non-immigrant	11,575 (83.2%)	7,847 (82.1%)	0.03
Marginalization	Dependency	1 (Low)	7,241 (52.1%)	5,356 (56.0%)	0.08
		2	4,086 (29.4%)	2,864 (29.9%)	0.01
		3	1,397 (10.0%)	760 (7.9%)	0.07
		4	778 (5.6%)	403 (4.2%)	0.06
		5 (High)	305 (2.2%)	125 (1.3%)	0.07
	Deprivation	1 (Low)	1,510 (10.9%)	1,068 (11.2%)	0.01
		2	2,203 (15.8%)	1,475 (15.4%)	0.01
		3	2,020 (14.5%)	1,266 (13.2%)	0.04
		4	5,031 (36.2%)	3,450 (36.1%)	0
		5 (High)	3,043 (21.9%)	2,249 (23.5%)	0.04
	Residential instability	1 (Low)	1,890 (13.6%)	1,373 (14.4%)	0.02
		2	1,360 (9.8%)	1,082 (11.3%)	0.05
		3	1,197 (8.6%)	686 (7.2%)	0.05
		4	2,411 (17.3%)	1,966 (20.6%)	0.08
		5 (High)	6,949 (50.0%)	4,401 (46.0%)	0.08
	Ethnic concentration	1 (Low)	122 (0.9%)	51 (0.5%)	0.04
		2	334 (2.4%)	176 (1.8%)	0.04
		3	800 (5.8%)	456 (4.8%)	0.04
		4	1,383 (9.9%)	681 (7.1%)	0.10*
		5 (High)	11,267 (81.0%)	8,199 (85.7%)	0.13*

Clinical Characteristics				
Number of Aggregated Diagnosis Groups	Low (≤5)	6,003 (43.2%)	3,625 (37.9%)	0.11*
	Medium (6-9)	4,824 (34.7%)	3,610 (37.7%)	0.06
	High (≥10)	3,079 (22.1%)	2,328 (24.3%)	0.05
Chronic medical condition	No	9,460 (68.0%)	6,447 (67.4%)	0.01
	Yes	4,446 (32.0%)	3,116 (32.6%)	0.01
Chronic psychosocial condition	No	2,363 (17.0%)	353 (3.7%)	0.45*
	Yes	11,543 (83.0%)	9,210 (96.3%)	0.45*
Psychosocial Expanded Diagnostic Clusters	Substance use	3,104 (22.3%)	2,588 (27.1%)	0.11*
	Anxiety	10,300 (74.1%)	8,649 (90.4%)	0.44*
	Depression	5,874 (42.2%)	5,116 (53.5%)	0.23*
	Attention deficit disorders	609 (4.4%)	448 (4.7%)	0.01
	Personality disorders	1,590 (11.4%)	1,290 (13.5%)	0.06
	Behavioural problems	1,301 (9.4%)	1,132 (11.8%)	0.08
	Family/social problems	1,508 (10.8%)	1,412 (14.8%)	0.12*
	Psychologic signs/symptoms	1,822 (13.1%)	1,919 (20.1%)	0.19*
Service Use Characteristics				
Help-seeking contacts in primary care	1	6,627 (47.7%)	4,433 (46.4%)	0.03
	2	2,892 (20.8%)	2,022 (21.1%)	0.01
	3	1,598 (11.5%)	1,072 (11.2%)	0.01
	≥4	2,789 (20.1%)	2,036 (21.3%)	0.03
Help-seeking contacts with diagnosing/terminal physician	0	2,520 (18.1%)	0 (0.0%)	0.67*
	1	7,314 (52.6%)	5,888 (61.6%)	0.18*
	2	1,904 (13.7%)	1,612 (16.9%)	0.09
	≥3	2,168 (15.6%)	2,243 (21.6%)	0.15*
Continuity of care with diagnosing/terminal physician	Low (<50%)	3,418 (24.6%)	763 (8.0%)	0.46*
	Moderate (50-79%)	1,254 (9.0%)	1,127 (11.8%)	0.09
	High (≥80%)	9,234 (66.4%)	7,673 (80.2%)	0.32*
Terminal visit with regular physician	No	8,386 (60.3%)	5,503 (57.5%)	0.06
	Yes	5,520 (39.7%)	4,060 (42.5%)	0.06

Note. IQR = interquartile range; * = meaningful standardized difference

Table 2

Characteristics of primary care physicians who saw patients with early psychosis during help-seeking contacts, by level of care at diagnosis

Variables		Primary Care n (%)	Secondary/Tertiary Care n (%)	Standardized Difference
Age	Median (IQR)	50 (41-58)	50 (42-58)	0.06
Sex	Male	10,240 (73.6%)	6,472 (67.7%)	0.13*
	Female	3,666 (26.4%)	3,091 (32.3%)	0.13*
Specialty	Family physician	12,117 (87.1%)	8,473 (88.6%)	0.04
	Pediatrician	154 (1.1%)	219 (2.3%)	0.09
	Other	1,635 (11.8%)	871 (9.1%)	0.09
Years since graduation	<10	2,050 (14.7%)	1,133 (11.8%)	0.09
	10-20	3,778 (27.2%)	2,599 (27.2%)	0
	21-30	3,892 (28.0%)	2,947 (30.8%)	0.06
	>30	4,186 (30.1%)	2,884 (30.2%)	0
International medical graduate	No	11,424 (82.2%)	7,451 (77.9%)	0.11*
	Yes	2,427 (17.5%)	2,090 (21.9%)	0.11*
Practice panel size	Median (IQR)	1,391 (895-1,951)	1,406 (885-1,963)	0
Practice location	Urban	12,903 (92.8%)	9,129 (95.5%)	0.11*
	Rural	1,003 (7.2%)	434 (4.5%)	0.11*
Practice model	Solo practitioner	5,207 (37.4%)	3,962 (41.4%)	0.08
	Team-based, physician only	1,490 (10.7%)	979 (10.2%)	0.02
	Team-based, multidisciplinary	7,209 (51.8%)	4,622 (48.3%)	0.07
Practice comprehensiveness	Comprehensive	10,214 (73.5%)	7,455 (78.0%)	0.11*
	Focused, non-mental health	1,121 (8.1%)	406 (4.2%)	0.16*
	Focused, mental health	190 (1.4%)	176 (1.8%)	0.04
	Specialist	1,426 (10.3%)	925 (9.7%)	0.02
	Other	955 (6.9%)	601 (6.3%)	0.02

Note. IQR = interquartile range; * = meaningful standardized difference

Table 3
Patient and physician factors associated with first diagnosis of psychotic disorder in primary care

Variables		Unadjusted RR (95% CI)	Adjusted RR• (95% CI)
Patient Factors			
Age (ref: 14-19)	20-24	1.05 (1.02-1.08)	1.04 (1.01-1.07)
	25-29	1.13 (1.10-1.16)	1.13 (1.10-1.16)
	30-35	1.17 (1.14-1.21)	1.17 (1.14-1.21)
Sex (ref: Female)	Male	0.98 (0.96-1.00)	0.96 (0.94-0.98)
Immigrant status (ref: Non-immigrant)	Immigrant	0.95 (0.92-0.99)	0.93 (0.90-0.96)
	Refugee	1.01 (0.96-1.06)	1.00 (0.95-1.05)
Ethnic concentration (ref: 1)	2	0.93 (0.83-1.04)	0.96 (0.85-1.07)
	3	0.90 (0.81-1.00)	0.95 (0.86-1.05)
	4	0.95 (0.86-1.05)	0.99 (0.89-1.09)
	5	0.82 (0.75-0.90)	0.89 (0.81-0.98)
Aggregated Diagnosis Groups (ref: Low)	Medium	0.92 (0.90-0.94)	0.99 (0.97-1.01)
	High	0.91 (0.89-0.94)	0.96 (0.93-0.99)
Psychosocial condition (ref: No)	Yes	0.64 (0.63-0.65)	0.58 (0.56-0.59)
Substance use (ref: No)	Yes	0.89 (0.87-0.92)	0.91 (0.89-0.94)
Help-seeking contacts (ref: 1)	2	0.98 (0.96-1.01)	1.11 (1.08-1.15)
	3	1.00 (0.97-1.03)	0.99 (0.95-1.03)
	>3	0.97 (0.94-0.99)	0.94 (0.91-0.98)
Continuity of care (ref: High)	Moderate	0.96 (0.93-1.00)	1.09 (1.04-1.14)
	Low	1.50 (1.47-1.52)	1.83 (1.78-1.89)
Terminal visit with regular physician (ref: No)	Yes	0.95 (0.93-0.98)	1.03 (1.00-1.05)
Physician Factors			
Male (ref: Female)	Male	1.13 (1.10-1.16)	1.06 (1.04-1.09)
Practice location (ref: Urban)	Rural	1.19 (1.15-1.24)	1.14 (1.10-1.19)
Years since graduation (ref: <10)	10-20	0.92 (0.89-0.95)	0.98 (0.94-1.00)
	21-30	0.88 (0.86-0.91)	0.95 (0.92-0.98)
	>30	0.92 (0.89-0.95)	0.99 (0.96-1.03)
International medical graduate (ref: No)	Yes	0.89 (0.86-0.91)	0.93 (0.91-0.96)
Specialty (ref: Family physician)	Pediatrician	0.70 (0.62-0.79)	0.92 (0.80-1.05)
	Other	1.11 (1.08-1.14)	1.02 (0.96-1.09)
Practice model (ref: Solo)	Team-based, physician only	1.07 (1.05-1.10)	1.23 (1.20-1.27)
	Team-based, multidisciplinary	1.06 (1.03-1.10)	1.18 (1.14-1.23)

Practice comprehensiveness (ref: Comprehensive)	Focused, non-mental health	1.27 (1.23-1.31)	1.07 (1.03-1.11)
	Focused, mental health	0.90 (0.81-0.99)	0.98 (0.88-1.08)
	Specialist	1.05 (1.01-1.09)	0.93 (0.87-1.00)
	Other	1.06 (1.02-1.11)	1.06 (1.02-1.11)

Note. CI = confidence interval; RR = risk ratio; ref = reference group; * = model adjusted for all listed patient and physician factors

SUPPLEMENTARY MATERIAL

APPENDIX A

RECORD Checklist

Section	Item #	STROBE items	RECORD items	Location
Title and Abstract				
Title Abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. RECORD 1.2: If applicable, the geographic region and timeframe within which the study took place should be reported in the title or abstract. RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	Title Page Abstract
Introduction				
Background Rationale	2	Explain the scientific background and rationale for the investigation being reported	…	Background
Objectives	3	State specific objectives, including any pre-specified hypotheses	…	Background
Methods				
Study Design	4	Present key elements of study design early in the paper	…	Methods: Study Design
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	…	Methods: Study Setting, Cohort Definition
Participants	6	(a) Cohort study - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up Case-control study - Give the eligibility criteria, and the sources and methods of case ascertainment and control	RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided.	Methods: Cohort Definition Appendix B

Section	Item #	STROBE items	RECORD items	Location
		selection. Give the rationale for the choice of cases and controls Cross-sectional study - Give the eligibility criteria, and the sources and methods of selection of participants (b) Cohort study - For matched studies, give matching criteria and number of exposed and unexposed Case-control study - For matched studies, give matching criteria and the number of controls per case	RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided. RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	Methods: Variable Definitions Appendix B
Data Sources	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group.	…	Methods: Data Sources Appendix B
Bias	9	Describe any efforts to address potential sources of bias	…	Discussion: Limitations
Study Size	10	Explain how the study size was arrived at	…	Methods: Cohort Definition
Quantitative Variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.	…	Methods: Variable Definitions, Statistical Analysis
Statistical Methods	12	(a) Describe all statistical methods, including those used to control for confounding	…	Methods: Data Sources, Statistical Analysis

Section	Item #	STROBE items	RECORD items	Location
		(b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) Cohort study - If applicable, explain how loss to follow-up was addressed Case-control study - If applicable, explain how matching of cases and controls was addressed Cross-sectional study - If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses		
Data Access Data Cleaning	…	…	RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population. RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	Methods: Data Sources Declarations: Data Access
Linkages	…	…	RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	Methods: Data Sources Appendix B
Results				
Participants	13	(a) Report the numbers of individuals at each stage of the study (e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram	RECORD 13.1: Describe in detail the selection of the persons included in the study (i.e., study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	Results: Proportion of Diagnoses in Primary Care

Section	Item #	STROBE items	RECORD items	Location
Descriptive Data	14	(a) Give characteristics of study participants (e.g., demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) Cohort study - summarise follow-up time (e.g., average and total amount)	…	Results: Tables 1-2
Outcome Data	15	Cohort study - Report numbers of outcome events or summary measures over time Case-control study - Report numbers in each exposure category, or summary measures of exposure Cross-sectional study - Report numbers of outcome events or summary measures	…	Results: Proportion of Diagnoses in Primary Care, Tables 1-2
Main Results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included. (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	…	Results: Factors Associated with Diagnosis in Primary Care, Table 3
Other analyses	17	Report other analyses done (e.g., analyses of subgroups and interactions, and sensitivity analyses)	…	N/A
Discussion				
Key Results	18	Summarise key results with reference to study objectives	…	Discussion
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias	RECORD 19.1: Discuss the implications of using data that were not	Discussion: Limitations

Section	Item #	STROBE items	RECORD items	Location
		or imprecision. Discuss both direction and magnitude of any potential bias	created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	…	Discussion
Generalisability	21	Discuss the external validity of the study results	…	Discussion
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	…	Declarations: Financial Support
Accessibility	…	…	RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	Declarations: Data Access Appendix B

Benchimol, E. I., Smeeth, L., Guttmann, A., Harron, K., Moher, D., Peteresen, I., Sørensen ,H. T., von Elm, E., Langan, S. M., the RECORD Working Committee (2015). The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement. *PLoS Medicine*, 12(10), e1001885. [Protected under Creative Commons Attribution license.]

APPENDIX B

List of datasets

Dataset	Description	Date Range
General Use Datasets		
Health Services		
DAD	Discharge Abstract Database	1988-2017
NACRS	National Ambulatory Care Reporting System	1991-2017
OHIP	Ontario Health Insurance Plan Claims Database	2000-2017
OMHRS	Ontario Mental Health Reporting System	2005-2017
Population		
RPDB	Registered Persons Database	1990-2017
Care Providers		
CPDB	Corporate Provider Database	1965-2018
IPDB	ICES Physician Database	1999-2015
Geography		
LHIN	Local Health Integration Network	2009
PCCF	Postal Code Conversion File	2009-2013
Other		
ASTHMA	Ontario Asthma Dataset	2016
CAPE	Client Agency Program Enrolment	1999-2017
HIV	Ontario HIV Database	2016
HYPER	Ontario Hypertension Dataset	2016
MOMBABY	Linked Delivering Mother and Newborns	2016
OCCC	Ontario Crohn's and Colitis Cohort Dataset	2016
ODD	Ontario Diabetes Dataset	2016
ONMARG	Ontario Marginalization Index	2006, 2011
OMID	Ontario Myocardial Infarction Dataset	2016
ORAD	Ontario Rheumatoid Arthritis Database	2016
Controlled Use		
CIC	IRCC Permanent Residents Database	1991-2015
Other		
PCPOP	Primary Care Population	2004-2008, 2010, 2012, 2014

List of variables

Variable	Description
Cohort Creation	
fep_case	<u>Inclusion Criteria:</u> Incident case of non-affective psychosis (schizophrenia, schizoaffective disorder, schizophreniform disorder, or psychosis not otherwise specified (NOS)), defined as patients who meet at least one of the following criteria: 1. DAD: • Primary discharge diagnosis (DXCODE or DX10CODE) of non-affective psychosis with a valid IKN • Restrict to the first date per patient • Use the discharge date (DDATE) as the index date 2. OMHRS: • Most responsible discharge diagnosis (DSM4CODE_DISCH1 or DSM5CODE_DISCH1) of non-affective psychosis with a valid IKN • Restrict to the first date per patient • Use the discharge date (DDATE) as the index date 3. Ambulatory: • All OHIP billings during the accrual period with a diagnostic code (DXCODE) for non-affective psychosis with a valid IKN • All emergency department visits in NACRS with a diagnostic code (DX10CODE) for non-affective psychosis with a valid IKN • Exclude if there is no evidence of two OHIP physician billing claims or two emergency department visits with a diagnostic code for for non-affective psychosis occurring in any 12-month period • Restrict to the first date per patient ○ Use SERVDATE in OHIP or REGDATE in NACRS from the first ever claim as the index date ○ If both fall on the same date, preferentially select the OHIP observation Restrict to the first episode: 1. In cases where a IKN appears in more than one cohort, use the date of the first event as the index date. 2. If the first date is the same for more than one cohort, preferentially select Ambulatory > OMHRS > DAD <u>Exclusion Criteria:</u> 1. Invalid/missing data in age and sex variables 2. Non-Ontario resident 3. Age < 14 or > 35 4. Presence of an aforementioned diagnostic code at any point prior to index date
priorhelp_count	For fep_case, count the number of mental health and addictions (MHA)-related prior help-seeking attempts in primary care Identify OHIP billings as follows: • LOCATION=O/H/L and SPEC=00 (Family physician) or SPEC=26 (Pediatrician) in combination with MHA DXCODES, excluding G FEECODES [substr(FEECODE,1,1) ne ‘G’] • For patients where age ≤ 24, also include the following criteria:

Variable	Description
	○ Pediatrician [SPEC=26] and undefined location (LOCATION =U) and MHA diagnosis code [DXCODE] and FEECODE=K122 or K123 or K704 A mental health visit defined as follows: • VISIT=MHA claim/patient/physnum/servdate • A physician may submit several MHA-related claims for a patient on the same day. To avoid multiple-counting, only the first MHA claim for a given patient on a given day billed by a given provider is kept. A patient who visited more than one provider on the same day would be flagged as having the same number of visits as unique providers seen.
priorhelp_flag	Flag youth with FEP (case=1) who had prior help-seeking attempts in primary care, defined as at least one visit to a family physician or pediatrician for a mental health reason within 6 months prior to the index date (i.e., at least 1 visit identified in the priorhelp_count variable): • 0 = no prior help-seeking in primary care (priorhelp_count = 0) • 1 = at least one help-seeking attempt in primary care (priorhelp_count ≥ 1)
priorhelp_fp	Identify all GP/FPs in Ontario from April 1, 2005 to March 31, 2015 (fiscal years 2005 to 2014, inclusive) using OHIP billings: • GP/FPs: SPEC=00, LOCATION=O/H/L Flag physicians who had an encounter with a FEP case for a help-seeking visit for a mental health reason in the 6-months prior to and including the index date (using the definition in priorhelp_count): • 1 = GP/FP encountered an FEP case on a mental health help-seeking visit • 0 = GP/FP did not encounter an FEP case on a mental health help-seeking visit
priorhelp_ped	Identify all pediatricians practicing primary care in Ontario from April 1, 2005 to March 31, 2015 (fiscal years 2005 to 2014, inclusive) using OHIP billings: • SPEC=26, LOCATION=O/H/L with at least 10 billings per year for preventative primary care services Flag physicians who had an encounter with a FEP case for a help-seeking visit for a mental health reason in the 6-months prior to and including the index date (using the definition in priorhelp_count): • 1 = Pediatrician encountered an FEP case on a mental health help-seeking visit • 0 = Pediatrician did not encounter an FEP case on a mental health help-seeking visit
terminal_date	Date of last primary care visit for a mental health reason (i.e., terminal visit) prior to or on the index date, defined as any OHIP billing meeting the following criteria: • LOCATION=O/H/L and SPEC=00 (Family physician) or SPEC=26 (Pediatrician) in combination with MHA DXCODES, excluding G FEECODES [substr(FEECODE,1,1) ne 'G'] • For patients where age ≤ 24, also include the following criteria: ○ Pediatrician [SPEC=26] and undefined location (LOCATION =U) and MHA diagnosis code [DXCODE] and FEECODE=K122 or K123 or K704
Patient Characteristics	
sex	Sex from RPDB at index date
age	Age at index date, calculated based on date of birth from RPDB

Variable	Description
age_cat	Categorize age as follows: • 1 = 14-19 • 2 = 20-24 • 3 = 25-29 • 4 = 30-35
rural	RURAL from %GETDEMO at index date, categorized as follows: • 0 = non-rural • 1 = rural
immigrant	IMMIGRATION_CATEGORY from CIC_IRCC, categorized as follows: • 0 = non-immigrant (i.e., not included in CIC_IRCC database) • 1 = immigrant (IMMIGRATION_CATEGORY = all values not listed below for refugee definition) • 2 = refugee (IMMIGRATION_CATEGORY = classified according to refugee definition)
dependency	DEPENDENCY_Q_CSD from ONMARG, categorized as follows: • 1 = least marginalized • 5 = most marginalized
deprivation	DEPRIVATION_Q_CSD from ONMARG, categorized as follows: • 1 = least marginalized • 5 = most marginalized
instability	INSTABILITY_Q_CSD from ONMARG, categorized as follows: • 1 = least marginalized • 5 = most marginalized
ethniccon	ETHNICCON_Q_CSD from ONMARG, categorized as follows: • 1 = least marginalized • 5 = most marginalized
adg1-34	ADG1-ADG34 dummy variables from %GETACG measured from 2 years prior to index date.
adg_total	Number of ADGs for each patient (0 to 32)
adg_cat	Categorize the total number of ADGs, calculated as follows: • 1 = low (adg_total < 5) • 2 = medium (adg_total = 6-9) • 3 = high (adg_total ≥ 10)
adg_chronic_medical	Flag any chronic medical condition from %GETACG, classified as follows: • 0 = no chronic medical conditions • 1 = at least one chronic medical condition (CADG = 5 [chronic medical: unstable], 6 [chronic medical: stable], 9 [chronic specialty: unstable])
adg_chronic_psych	Flag any recurrent or persistent psychosocial condition, classified as follows: • 0 = no chronic psychosocial conditions

Variable	Description
	• 1 = at least one chronic psychosocial condition (ADG = 24 [psychosocial: recurrent or persistent, stable] or 25 [psychosocial: recurrent or persistent, unstable])
edc_total	Number of EDCs for each patient (0 to 264)
edc_anx	Flag people with the “Anxiety” EDC (1) from %GETACG (edc_code=PSY01)
edc_subuse	Flag people with the “Substance use” EDC (1) from %GETACG (edc_code=PSY02)
edc_behav	Flag people with the “Behavior problems” EDC (1) from %GETACG (edc_code=PSY04)
edc_add	Flag people with the “Attention deficit disorder” EDC (1) from %GETACG (edc_code= PSY05)
edc_soc	Flag people with the “Family and social problems” EDC (1) from %GETACG (edc_code= PSY06)
edc_pd	Flag people with the “Personality disorders” EDC (1) from %GETACG (edc_code=PSY08)
edc_dep	Flag people with the “Depression” EDC (1) from %GETACG (edc_code=PSY09)
edc_psych	Flag people with the “Psychologic signs and symptoms” EDC (1) from %GETACG (edc_code=PSY10)
Physician Characteristics	
fp_dx_phys	PHYSNUM for the FP that the patient saw on the terminal_date (i.e., the PHYSNUM associated with the OHIP billing identified in terminal_date)
fp_dx_group	GRPNUM associated with each PHYSNUM in fp_dx_phys • Identify GRPNUM for each physician within CAPE on the index date • In cases where physicians have > 1 GRPNUM, use the GRPNUM for which the physician has the most number of rostered patients
fp_dx_solo	Flag physicians in a solo practice: • Physicians in CAPE with no rostered patients OR • Physicians in CAPE where PROGTYPE=CCM OR • Physicians not in CAPE
fp_age	Age of family physician assigned in fp_dx_phys variable on the terminal_date, calculated using BDATE from %GETIPDB
fp_sex	Sex of assigned FP in fp_dx_phys from %GETIPDB
fp_rural	RURAL from %GETIPDB (1 = rural, 0 = non-rural) on terminal_date for fp_dx_phys
fp_years	Number of years the assigned FP in fp_dx_phys has been practicing on the terminal_date, calculated using GRADYEAR from %GETIPDB
fp_years_cat	Categorize the number of years since graduation from fp_years as follows: • 1 = < 10 years • 2 = 10-20 years • 3 = 21-30 years 4 = > 30 years
fp_panel	Number of patients rostered to each FP in fp_dx_phys on the terminal_date, calculated using CAPE (i.e., count the unique IKNs assigned to each PHYSNUM)
fp_panel_cat	Categorize fp_panel as follows: • 1 = < 1200 patients

Variable	Description
	• 2 = 1200 to 1799 patients • 3 = 1800 to 2399 patients • 4 = 2400 to 2999 patients • 5 = 3000 to 3599 patients • 6 = ≥ 3600 patients
fp_type_dx	Type of primary care provider that the person was assigned to in the fp_dx_phys variable with %GETIPDB: • 1 = family physician (MAINSPECIALTY=GP/FP) • 2 = pediatrician (MAINSPECIALTY=PEDIATRICS) • 3 = other (family physician/emergency medicine [MAINSPECIALTY=F.P./EMERGENCY MEDICINE] and community medicine [MAINSPECIALTY=COMMUNITY MED./PUBLIC HEALTH])
progtype_dx	Type of primary care model of assigned FP in the fp_dx_phys variable on the terminal_date: • 1 = Family Health Team (fee for service; PCPOP: PROGTYPE2/PROGTYPE3= FHT; CAPE: PROGTYPE=CHG, CSA, HSO, PCG, PCN, SMO, STJ) • 2 = Primarily fee for service (PCPOP: PROGTYPE2/PROGTYPE3=CCM, FHG; CAPE: PROGTYPE= CCM, FHG) • 3 = Primarily capitation (PCPOP: PROGTYPE2=CAP, PROGTYPE2=FHN, FHO; CAPE: PROGTYPE=FHN, FHO) • 4 = Physician not in PEM (PCPOP: PROGTYPE2/PROGTYPE3=NOG) • 5 = Other (enrolled in primary care model, but PROGTYPE2/PROGTYPE3 in PCPOP or PROGTYPE in CAPE is none of the above)
progtype_dx1	Recategorize progtype_dx (primary care model of assigned FP in fp_dx_phys) as follows: • 1 = Physician not in PEM/solo practitioner (PCPOP: PROGTYPE2/PROGTYPE3=CCM, NOG; CAPE: PROGTYPE= CCM; physician not in CAPE) • 2 = Multidisciplinary team-based model (PCPOP: PROGTYPE2/PROGTYPE3= FHT; CAPE: PROGTYPE=CHG, CSA, HSO, PCG, PCN, SMO, STJ) • 3 = FP team-based patient enrollment model (PCPOP: PROGTYPE2/PROGTYPE3=FHG, CAP, FHN, FHO, OGP, GHC, RAN, HIV; CAPE: PROGTYPE=FHG, FHN, FHO, RAN, GHC; pem=0 and fp_dx_solo=0)
fp_img	Physician from fp_dx_phys is an international medical graduate (IMG; physician is a graduate of a medical school outside of Canada, US, UK Ireland, Australia, New Zealand) from %GETIPDB: • 0 = No (IMG = 0) • 1 = Yes (IMG = 1)
pcpool	PCPOOL from %GETIPDB on the terminal_date (flag indicating whether a physician from fp_dx_phys variable is in primary care practice, as defined by specialty and billing pattern): • 0 = No • 1 = Yes
pem	PEM from %GETIPDB on the terminal_date (flag indicating whether physician in fp_dx_phys variable has full-time affiliation with a patient enrolment model primary care group):

Variable	Description
	• 0 = No • 1 = Yes
practype	Physician from fp_dx_phys practice type (PRACTYPE) from %GETIPDB on the terminal_date: • 1 = CCPC phys (physician is in comprehensive primary care practice)- 'comppc' • 2 = focused (physician is in focused practice, i.e., he or she had more than 50% of his/her payments or services within a relatively narrow area of practice)- 'focus' • 3 = specialist (physician is not in primary care practice)-'specialist' • 4 = other (physician's practice does not meet any other definitions. Usually indicates a mixed practice with < 50% office-based)-'other' OR < 44 days (physician worked < 44 days per year so is ineligible to be called"comprehensive")- '<44days'
practype2	Recode practype as follows: • 1 = CCPC phys (practype = 1) • 2 = focused practice – mental health (focusedprac_mh = 1) • 3 = focused practice – non-mental health (focusedprac_mh = 0) • 4 = specialist (practype = 3) • 5 = other (practype = 4 or 5)
focusedprac_mh	For physicians in fp_dx_phys categorized as focused practice (practype=2), identify whether their focused practice is in the area of mental health/addiction Use %GETOHIP to pull all billings for the physicians in focused practice for the 2 years prior to the terminal_date: • 1 = physician is a focused mental health-related practice - more than 50% of billings are from the mental health/addictions activity area • 0 = physician is not in a focused mental health-related practice - 50% or less of billings are from the mental health/addictions activity area
Service Use	
priorhelp_count_cat	Categorize priorhelp_count as follows: • 1 = 1 help-seeking visit • 2 = 2 help-seeking visits • 3 = 3 help-seeking visits • 4 = > 3 help-seeking visits
regular_fp	PHYSNUM of the FP assigned to each person in the PCPOP dataset (link people with a FP using the PCPOP dataset for the closest fiscal year where the index date for PCPOP occurs before index date) For the people who are not assigned a FP in the PCPOP dataset, check whether they are rostered to a FP in CAPE: • CAPE_STATUS = 10 [rostered, red-and-white card], 11 [rostered, photo health card], 12 [patient was preloaded from existing program area], 15 [patient resides in a long-term care facility]) • Confirm that CAPE eligibility overlapped on the index date (i.e., index date lies between STARTCAPE and ENDCAPE) • If so, include PHYSNUM from CAPE

Variable	Description
fp_dx_flag	Flag if the FP assigned in the fp_dx_phys variable is the same FP that the patient was assigned to in the regular_fp variable (i.e., see if PHYNUM matches) • 0 = terminal FP was not the patient's regular FP • 1 = terminal FP was the patient's regular FP
regfp_involvement	Identify cases where the regular_fp was involved in either diagnosis (fp_dx_phys) or prior help-seeking • 0 = no regular_fp involvement • 1 = regular_fp involved in diagnosis (fp_dx_phys=regular_fp) or in help-seeking (priorhelp_regfp_flag=1)
priorhelp_regfp_count	Count the number of prior help-seeking attempts in primary care that occurred with the physician that was assigned to the patient in the regular_fp variable
priorhelp_regfp_flag	Flag cases identified in the priorhelp_regfp_count variable where any of the help-seeking visits occurred with the physician that was assigned to the patient in the regular_fp variable • 0 = no help-seeking from regular FP (priorhelp_regfp_count=0) • 1 = at least one help-seeking attempt from regular FP (priorhelp_regfp_count ≥ 1)
priorhelp_location	Pull the location of visits for priorhelp_count (LOCATION variable in OHIP) Flag any cases in which all visits occurred only in either the emergency room (LOCATION=E) or the hospital (LOCATION=I)
priorhelp_fp_dx_phys	Count the number of visits in priorhelp_count where the PHYSNUM for the visit matches the PHYSNUM defined in fp_dx_phys
priorhelp_fp_dx_group	Count the number of visits in priorhelp_count where the GRPNUM for the visit matches the GRPNUM defined in fp_dx_group
priorhelp_samefp	For the visits identified in priorhelp_count, count the number of visits occurring with the same PHYSNUM
priorhelp_samefp_flag	Flag cases in priorhelp_samefp where all help-seeking attempts occurred with the same physician: • 1= all prior help-seeking attempts occurred with the same FP
continuity_fp	Proportion of visits during help-seeking occurring with the same physician assigned in fp_dx_phys derived as follows: • priorhelp_fp_dx_phys divided by priorhelp_count
continuity_fp_cat	Categorize continuity_fp as follows: • 1 = low (continuity _fp < 0.50) • 2 = moderate (continuity_fp = 0.50 to < 0.80) • 3 = high (continuity_fp ≥ 0.80)
continuity_group	Identify physicians practicing with the same GRPNUM on the index date in CPDB. Determine the proportion of visits during help-seeking occurring within the same physician group as the group assigned in fp_dx_group derived as follows: • priohelp_fp_dx_group divided by priorhelp_count • Exclude cases where fp_dx_solo=1
continuity_group_cat	Categorize continuity_group as follows: • 1 = low (continuity _group < 0.50) • 2 = moderate (continuity_group = 0.50 to < 0.80) • 3 = high (continuity_group ≥ 0.80)

Variable	Description
	• 4 = solo practitioner (fp_dx_solo=1)
continuity_fpgroup	Calculate the proportion of visits occurring with the same physician OR group: • Numerator: the number of visits during help-seeking occurring with the same physician assigned in fp_dx_phys OR a physician practicising in the same group as the group assigned in fp_dx_group • Denominator: total help-seeking visits (priorhelp_count)
continuity_fpgroup_cat	Categorize continuity within physician OR group (continuity_fpgroup) as follows: • 1 = low (continuity _fp < 0.50) • 2 = moderate (continuity_fp = 0.50 to < 0.80) • 3 = high (continuity_fp ≥ 0.80)
Outcome	
fp_dx	Cases diagnosed in primary care versus secondary/tertiary care • 1 = diagnosed in primary care (OHIP billing for index event was from a family physician [00] or pediatrician [26] • 2 = diagnosed in secondary/tertiary care (all other cases not identified above)
fp_dx_location	LOCATION in OHIP of the billing record associated with the terminal visit (i.e., last primary care visit in priorhelp_count on or before the index date) • LOCATION= 'E', 'H', 'I', 'L', 'O', 'P', 'U'
fp_dx_2care	Flag cases who were diagnosed by a FP in a secondary/tertiary care setting, defined as: • OHIP billing for index event was from a family physician (00) or pediatrician (26) AND the location was in the ER or hospital (LOCATION = E or I)

List of codes

Code	Description
Diagnostic Codes for Cohort Definition	
ICD-9, DSM4, DSM5, OHIP	
295	Schizophrenias
2950	Simple type schizophrenia
2951	Disorganized type schizophrenia
2952	Catatonic type schizophrenia
2953	Paranoid type schizophrenia
2954	Schizophreniform disorder
2955	Latent schizophrenia
2956	Schizophrenic disorder, residual type
2957	Schizoaffective disorder
2958	Other specified types of schizophrenia
2959	Unspecified schizophrenia
298	Other psychoses
2980	Depressive type psychosis
2981	Excitative type psychosis
2982	Reactive confusion
2983	Acute paranoid reaction
2984	Psychogenic paranoid psychosis
2988	Other and unspecified reactive psychosis
2989	Unspecified psychosis
ICD-10	
F20	Schizophrenia
F200	Paranoid schizophrenia
F201	Disorganized schizophrenia
F202	Catatonic schizophrenia
F203	Undifferentiated schizophrenia
F204	Post-schizophrenic depression
F205	Residual schizophrenia
F206	Simple schizophrenia
F208	Other schizophrenia
F209	Schizophrenia, unspecified
F25	Schizoaffective disorders
F250	Schizoaffective disorder, bipolar type

Code	Description
F251	Schizoaffective disorder, depressive type
F252	Schizoaffective disorder, mixed type
F258	Other schizoaffective disorders
F259	Schizoaffective disorder, unspecified
F29	Unspecified nonorganic psychosis
Other Mental Health & Addiction Diagnostic Codes	
296	Episodic mood disorders
297	Delusional disorders
300	Anxiety disorders
301	Personality disorders
302	Sexual disorders
303	Alcohol dependence
304	Drug dependence
306	Psychosomatic illness
309	Adjustment reaction
311	Depressive disorders
897	Economic problems
898	Marital difficulties
899	Parent-child problems
900	Problems with aged parents or in-laws
901	Family disruption/divorce
902	Education problems
904	Social maladjustment
905	Occupational problems
906	Legal problems
909	Other problems of social adjustment
Mental Health & Addiction Fee Codes	
K004A	Family psychotherapy – 2 or more members
K005A	Primary mental health care – individual – per unit
K007A	Individual psychotherapy
K013A	Counselling-one or more people
K025A	Group psychotherapy – 6-12 people
K099A	GP psychotherapy premium
K682A	Opioid agonist maintenance program