

Effect of the COVID-19 pandemic on mental health visits in primary care: an interrupted time series analysis from nine INTRePID countries



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Summary

Background The COVID-19 pandemic impacted mental health disorders, affecting both individuals with pre-existing conditions and those with no prior history. However, there is limited evidence regarding the pandemic's impact on mental health visits to primary care physicians. The *International Consortium of Primary Care Big Data Researchers* (INTRePID) explored primary care visit trends related to mental health conditions in Argentina, Australia, Canada, China, Norway, Peru, Singapore, Sweden, and the USA.

Methods We conducted an interrupted time series analysis in nine countries to examine changes in rates of monthly mental health visits to primary care settings from January 1st, 2018, to December 31st, 2021. Sub-group analysis considered service type (in-person/virtual) and six categories of mental health conditions (anxiety/depression, bipolar/schizophrenia/other psychotic disorders, sleep disorders, dementia, ADHD/eating disorders, and substance use disorder).

Findings Mental health visit rates increased after the onset of the pandemic in most countries. In Argentina, Canada, China, Norway, Peru, and Singapore, this increase was immediate ranged from an incidence rate ratio of 1.118 [95% CI 1.053–1.187] to 2.240 [95% CI 2.057–2.439] when comparing the first month of pandemic with the pre-pandemic trend. Increases in the following months varied across countries. Anxiety/depression was the leading reason for mental health visits in most countries. Virtual visits were reported in Australia, Canada, Norway, Peru, Sweden, and the USA, accounting for up to 40% of the total mental health visits.

Interpretation Findings suggest an overall increase in mental health visits, driven largely by anxiety/depression. During the COVID-19 pandemic, many of the studied countries adopted virtual care in particular for mental health visits. Primary care plays a crucial role in addressing mental ill-health in times of crisis.

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Keywords: Primary care; Big data; Mental health; Global health

Research in context

Evidence before this study

We searched PubMed and Cochrane Library databases for papers published from January 1, 2020, to September 21, 2023, examining the influence of COVID-19 on mental health-related primary care visits. Our search terms included ("COVID-19" or "SARS-CoV-2") AND ("Mental health," "Psychiatric Disorders," or "Mental illness") AND ("Primary Care" OR "Family Medicine"), without language restrictions. While prior meta-analysis had explored the impact of the pandemic on mental health symptoms, a notable gap exists in understanding the utilization of mental health services, particularly in primary care settings. Existing studies present conflicting evidence, with some reporting an increase in mental health symptoms with the pandemic's onset, while others suggest non-significant changes.

Added value of this study

Our research identifies an initial surge in mental health visits in most countries globally, followed by a varying return to previous trends. Distinct patterns emerged, notably differing between European nations, Australia, and other regions, likely influenced by historical patterns of access. This increase in mental health services underscores anxiety and depression as the primary drivers of primary care attendance.

Implications of all the available evidence

Our data highlights the critical role of primary care in addressing increased mental health demands, encompassing both in-person and virtual care. These findings can provide valuable guidance for healthcare practitioners and policymakers in crisis response.

Introduction

Mental health conditions represent one of the most frequent causes of morbidity and an increasing global burden for societies. Even before the emergence of the COVID-19 pandemic, these conditions posed significant challenges to health-care systems worldwide.¹ The rising prevalence of mental health consultations underscores the urgency for comprehensive and adaptable approaches within healthcare systems.

Primary care physicians are no strangers to the challenge of addressing an increasing number of mental health-related concerns. This increase can be attributed to the dedication of primary care physicians to adopting a patient-centered care approach, as well as the limited availability of mental health specialists that many countries face.^{2,3} In addition to providing early detection and management of mental health concerns, primary care serves as an efficient and cost-effective strategy to guarantee access to mental health services.³

As outlined in a collaborative report by the World Health Organization (WHO) and the World Organization of Family Doctors (WONCA), incorporating mental health services into primary care holds the promise of diminishing inequalities in accessing mental health treatment and ensuring support for individuals in need of mental health care. Worldwide, while 75% of WHO member states have reported having policies or plans for integrating mental health

into primary care, only 12% report achieving functional integration. This falls significantly short of the global target of 80% set in the Comprehensive Mental Health Action Plan.⁴

Challenges persist in integrating mental health services into primary care. Stigma remains a significant obstacle to accessing mental health care in some Asian countries as China and Singapore, where patients often choose private mental health practitioners over their family physicians.^{5,6} In addition, in countries like Argentina, Peru, or the United States with very fragmented health systems patients do not need a referral by a family physician to access mental health specialists.⁷⁻⁹ In contrast in countries with an integrated health system such as Canada, Norway, Sweden, and Australia primary care physicians serve as the initial point of contact for mental health services and more commonly manage a broad scope of mental health issues.¹⁰⁻¹³

The emergence of the COVID-19 crisis, along with lockdowns and various self-isolation protocols, significantly exacerbated mental health challenges.¹⁴ Many systematic reviews and meta-analyses have investigated the influence of the pandemic in exacerbating or causing mental health distress across different populations. However, the evidence on this matter is still subject to much debate. While some studies showed an increase in symptoms such as anxiety, depression, and sleep disorders^{15,16}; others found minimal to non-significant changes.¹⁷ Among other limitations, authors reported

poor quality of some of the studies, short study periods being analysed, and heterogeneity between the included studies.^{18,19}

Health-care systems worldwide faced the challenge of adapting to the increasing demand for services, with some reports suggesting that the provision of psychiatric care was globally compromised.²⁰ In this context, primary care played a substantial role in promoting mental health care and treating prevalent mental health conditions.²¹ Several publications highlighted the significant contribution of primary care practitioners in addressing mental health problems during the pandemic.^{22,23} Understanding how the pandemic has influenced the use of primary care services for mental health concerns is crucial for shaping effective strategies to provide timely and adequate care.

The *International Consortium of Primary Care Big Data Researchers* (INTRePID) (www.intrepidprimarycare.org), is a dynamic coalition comprising family physicians and primary care researchers with a shared mission of conducting international comparative research in primary care. This collaborative effort currently involves experts from different countries, fostering a diverse and comprehensive perspective on global primary care practices. By leveraging primary care data from diverse sources, INTRePID aims to establish a standardised framework for conducting comprehensive research across various international primary care settings. Currently, INTRePID collects primary care data from countries spanning five of the seven continents of the world and is continuously engaging additional countries to participate.

In a previous study, our research group found that the onset of the pandemic was associated with an increase in total visits to primary care physicians in four of nine participating countries.²⁴ In the present study, we explored specific patterns of mental health service visits to determine the impact of the COVID-19 pandemic on such visits to primary care settings in nine INTRePID countries.

Methods

Study design

We performed an interrupted time series analysis to investigate shifts in monthly primary care visits related to mental health across nine countries from January 1st, 2018 (approximately two years before the onset of COVID-19) to December 31st, 2021 (roughly two years after the pandemic began).

Choice of primary measure

The primary outcome measure was monthly mental health visit rates (per 1000 visits), aggregated by service modality (in-person vs virtual) and six mental health categories (anxiety/depression, bipolar/schizophrenia/other psychotic disorders, sleep disorders, dementia, conditions that predominately affect youth (attention deficit hyperactive disorder (ADHD)/eating disorders),

substance use disorders). The categories were established following consensus among INTRePID researchers, considering the various coding systems and their limitations. Visit rates have been used in previous studies to model mental health trends during the COVID-19 pandemic and they hold substantial clinical significance as indicators for potential unmet mental health needs.²⁵ For this study, monthly rates were calculated by dividing the number of mental health-related visits by the total reported visits in that month.

Data from nine countries —Argentina, Australia, Canada, China, Norway, Peru, Singapore, Sweden, and the USA— were procured via INTRePID. These datasets, either sourced from local or regional sources, national health registries or directly requested from respective Ministries of Health, encompass monthly visits to primary care physicians or primary care clinics and capture patients across all ages. The scope of data provided for this study displayed heterogeneity, with scales spanning from national to specific regional datasets, as described in [Table S1](#) and the INTRePID website.²⁶

Coding systems of visits varied across countries including, SNOMED-CT, ICD-10, ICD-10 AM, ICD-10 CM, ICPC-2, and OHIP (ICD 8–9 hybrid coding system). A detailed description of the diagnostic codes included in each category is available in the [Supplementary Material \(Tables S2–S7\)](#).

Pandemic onset and study periods

Data were extracted from 2018 to 2021 (48-month study period), except for Peru which offered data starting from 2019.

Recognising the diverse beginnings of the pandemic across countries, we defined the beginning of the pandemic to be the date the World Health Organization's declaration of a global pandemic on March 11, 2020. Due to our use of monthly data and the timing of this declaration in the middle of the month, we excluded March from our analysis, treating it as a washout period. In the case of China, where a public health emergency state was declared on January 23, 2020, we considered February 2020 as the first month of the pandemic.

For the descriptive analysis, we categorised the pandemic into two periods to highlight the evolving dynamics over its initial two years. During the first year, there was a consistent implementation of strict lockdown measures, accentuating the global challenges exacerbated by the absence of an accessible vaccine.²⁷ The first pandemic year (Pandemic period 1) was defined as April 1, 2020–February 28, 2021, except for China, where it extended from February 1, 2020, to January 31, 2021.

As we progressed into the second year, though variations persisted among countries, a general tendency toward easing lockdown measures emerged. Concurrently, the introduction of vaccination marked a crucial

juncture in the global response to the pandemic. The second pandemic phase spanned from March 1, 2021, to December 31, 2021, except for China, which encompassed the period from February 1, 2021, to December 31, 2021.

Ethical aspects

This study was approved by the Research Ethics Committee of the University of Toronto (N40129) and North York General Hospital (N20-0044). All data collected were handled in accordance with country-specific regulations. Data used in this study were aggregated and did not contain any personally identifiable information.

Patient engagement

Members from the Patient and Clinician Engagement (PaCE) group, an international patient advisory committee within the North American Primary Care Research Group (NAPCRG), reviewed our manuscript to ensure the content was of public interest and understandable to a lay audience.

Statistical analysis

Descriptive analysis

The descriptive analysis included presenting the median monthly visit volume, the proportion of total visits for both total mental health visits and each specific mental health category during the first and second year of the pandemic. This proportion was calculated over the total number of primary care visits. Additionally, we presented the monthly visit rates categorised by service type (in-person and virtual).

Segmented regression model for interrupted time series analysis

We used a segmented regression, to capture the prospective impacts of the COVID-19 pandemic, as detailed elsewhere.²⁸ We theorised that its onset would correlate with an immediate rise (level change) and, as time progressed, we also anticipated potential variations (either increases or decreases) in the trend of these visits. To address potential data over-dispersion, we employed a generalised linear mixed model (GLMM) with penalised quasi-likelihood (PQL) estimation with an autoregressive structure of order 1. The suitability of the functional form was confirmed by inspecting the relationship between time and normalised residuals.

Finally, we presented time series plots highlighting the interruption, along with both pre- and post-intervention trends. A more detailed description of the statistical methodology is available in Section 3 of the [Supplementary Material](#) (Section C). All analytical processes were conducted in R version 4.3.0.

Role of the funding source

The funding source had no role in the study design, data collection, data analysis, data interpretation, or writing

of the report. All authors confirm that they had full access to all the study data and accept responsibility for the decision to submit for publication.

Results

Our study included over 11.4 million primary care patient mental health visits reported across the nine INTRePID countries with distinct patterns emerging during the COVID-19 pandemic. [Table 1](#) provides an overview of the total volume of mental health visits and the rate of mental health visits as a proportion of total visits across all countries.

Before the pandemic, the proportion of primary care visits that were attributed to mental health problems varied widely, ranging from 0.4% in Singapore to 17.4% in the USA ([Table 1](#)). Notably, all countries observed an increase in the proportion of mental health visits at some point during the pandemic. For instance, Canada, Peru, Singapore, and Sweden experienced an increase in this mental health visit proportion during both years of the pandemic. Argentina, Australia, and Norway only experienced minimal increases during the first year of the pandemic. Conversely, the USA had a slight decrease in the first year and a slight increase in the second year, while China exhibited the opposite pattern, experiencing an increase in the first year and a decrease in the second year ([Table 1](#)).

Visit modality

In [Fig. 1](#), we show the monthly mental health visit rates stratified by visit modality, distinguishing between in-person and virtual visits. Before the onset of the pandemic, all countries relied primarily on in-person visits, constituting nearly 100% of all mental health visits. However, during the pandemic, six countries, Australia, Canada, Norway, Peru, Sweden, and the USA expanded their services to include or expand virtual care. In these countries, the percentage of mental health visits conducted virtually ranged between 21.1% and 87.5% during the first pandemic year. The continuation of this trend in the second year exhibited varying degrees of variability in each of the countries. Particularly striking was the adoption in Canada where virtual mental health visits exceeded 80% of all mental health visits in the initial year and surpassed 70% in the subsequent year. [Table S10](#) offers a summary of the percentage of in-person and virtual visits for each category and for total mental health visits. [Figure S1](#) shows the distribution of virtual and in-person visits for the different categories in countries that have embraced virtual care.

Mental health categories

[Figs. 2](#) and [3](#) highlight the monthly mental health visit distribution by category before and during the pandemic. [Fig. 4](#) summarises pandemic-induced changes in visit rates across categories. Anxiety and

Mental health visits by country								
Country	Total study period (2018–2021)		Pre-pandemic period		Pandemic period 1		Pandemic period 2	
	Total mental health visit volume	Proportion of total visits	Median (IQR) monthly visits	Proportion of total visits	Median (IQR) monthly visits	Proportion of total visits	Median (IQR) monthly visits	Proportion of total visits
Argentina	131,074	2.95%	3003 (456.0)	2.95%	2159 (493.0)	3.04%	2874 (256.8)	2.92%
Australia	287,744	4.36%	5431 (661.0)	4.33%	6620 (997.0)	4.48%	6788 (318.0)	4.30%
Canada	403,554	11.68%	7229 (717.0)	10.18%	9536 (681.0)	13.62%	10,303 (1423.5)	13.17%
China	20,840	6.55%	506 (450.0)	6.52%	604 (219.5)	10.75%	217 (40.5)	3.10%
Norway	5,194,214	8.79%	101,107 (13,430.5)	8.65%	114,156 (14,173.0)	9.32%	117,502 (15,467.5)	8.67%
Peru	5,081,413	3.80%	94,467 (23,340.2)	2.16%	150,275 (41,423.0)	5.43%	220,089 (40,211.7)	5.29%
Singapore	20,939	0.47%	384 (68.5)	0.37%	462 (99.0)	0.59%	581 (36.0)	0.69%
Sweden	180,501	12.11%	3427 (740.2)	10.99%	3675 (622.0)	13.02%	4622 (558.2)	14.14%
United States	143,239	17.49%	3250 (576.2)	17.36%	2839 (523.0)	16.63%	3288 (161.5)	18.71%

Pre-Pandemic Period = January 1, 2018–February 28, 2020, except China where = January 1, 2018–January 31, 2020, and Peru where = January 1, 2019–February 28, 2020. Pandemic Period 1 = April 1, 2020–February 28, 2021, except China where = February 1, 2020–January 31, 2021. Pandemic Period 2 = March 1, 2021–December 31, 2021, except China where = February 1, 2021–December 31, 2021.

Table 1: Mental health visits by country and by period.

depression notably drove the surge in mental health visits in most countries, excluding Australia and China. The other categories did not display uniform trends across the examined countries. Conversely, certain categories, like substance use disorders, saw reduced representation in some countries. For an in-depth breakdown, consult the [Supplementary Material \(Table S9\)](#).

Interrupted time series analysis

[Table 2](#) and [Fig. 5](#) provide a summary of the interrupted time series results for mental health visit rates across all countries. These findings compared the periods preceding and following the onset of the pandemic to reveal whether mental health visit rates experienced an increase or decrease. Mental health visit rates increased at some point during the pandemic in all countries. In

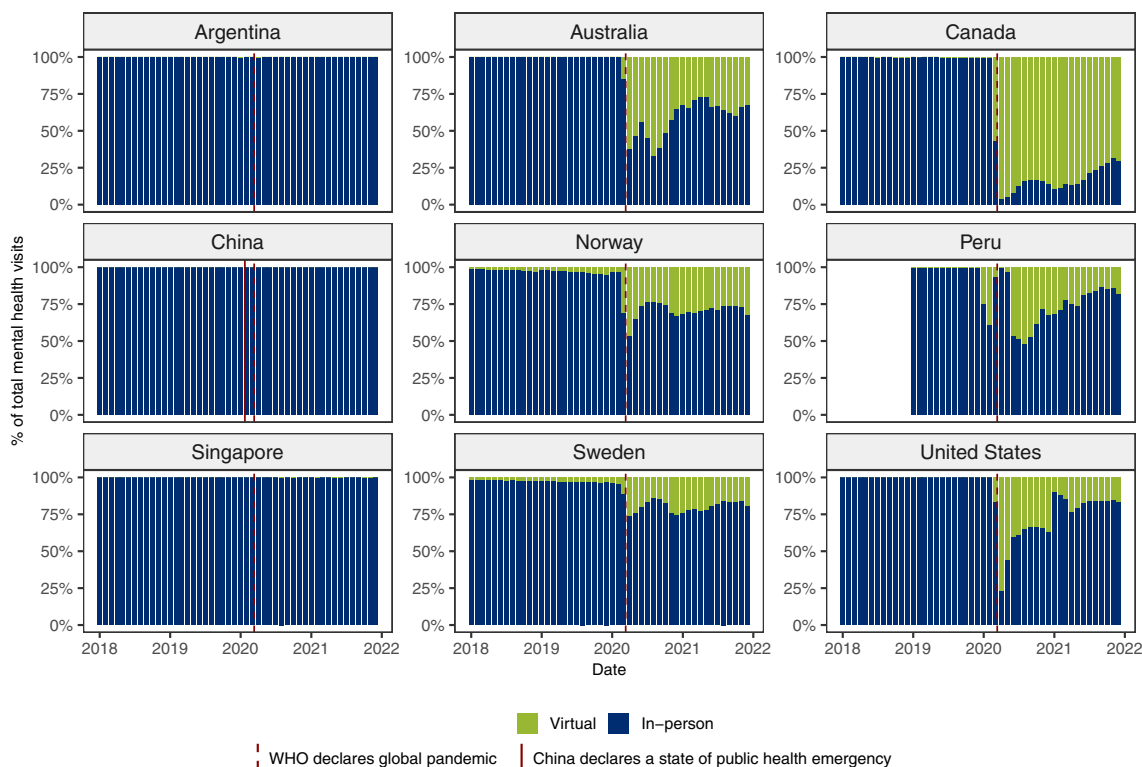


Fig. 1: Mental health visits by modality of care in INTREPID countries in 2018–2021. Blue bars represent in-person visits. Green bars represent virtual visits.

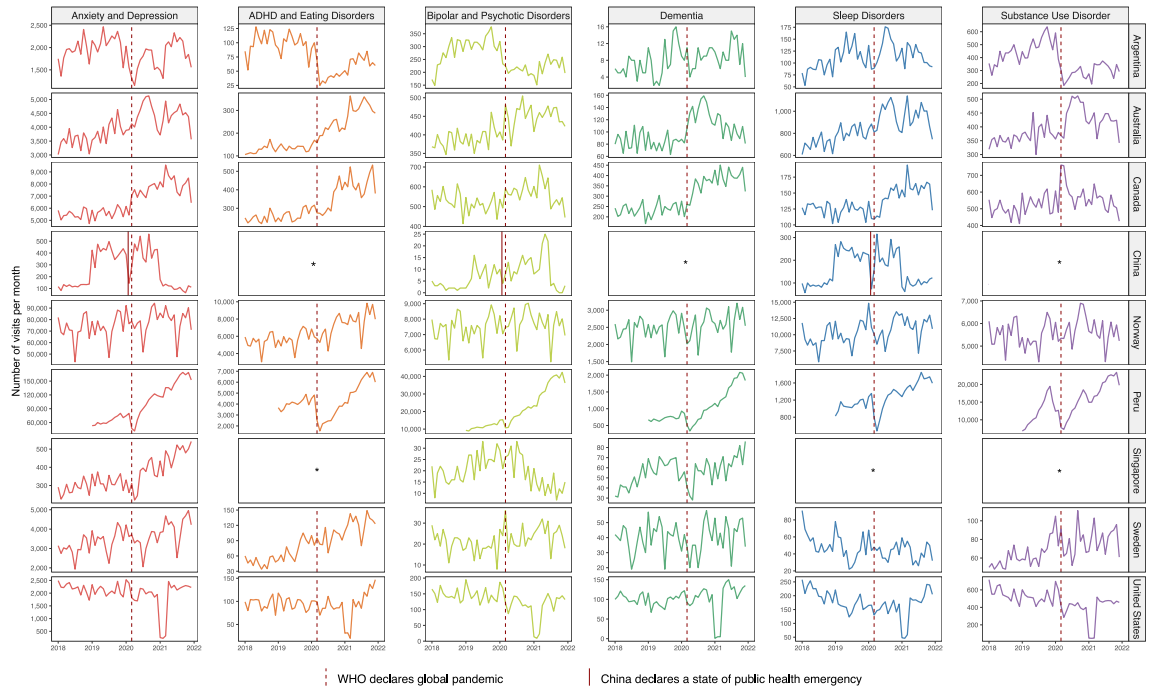


Fig. 2: Monthly mental health visits trends by category and country. Fields marked with an asterisk indicate non-plotted graphs due to low counts per unit of time (<10 counts per month).

Argentina, Canada, China, Norway, Peru, and Singapore, the rise in the first month (referred to as the “level of change”) was statistically significant. These increases ranged from a 1.118-fold increase (95%

confidence interval [CI]: 1.053–1.187) in Norway to a 2.240-fold increase (95% CI: 2.057–2.439) in Peru.

In contrast to the initial increases, the sustained effects of the pandemic in the subsequent months

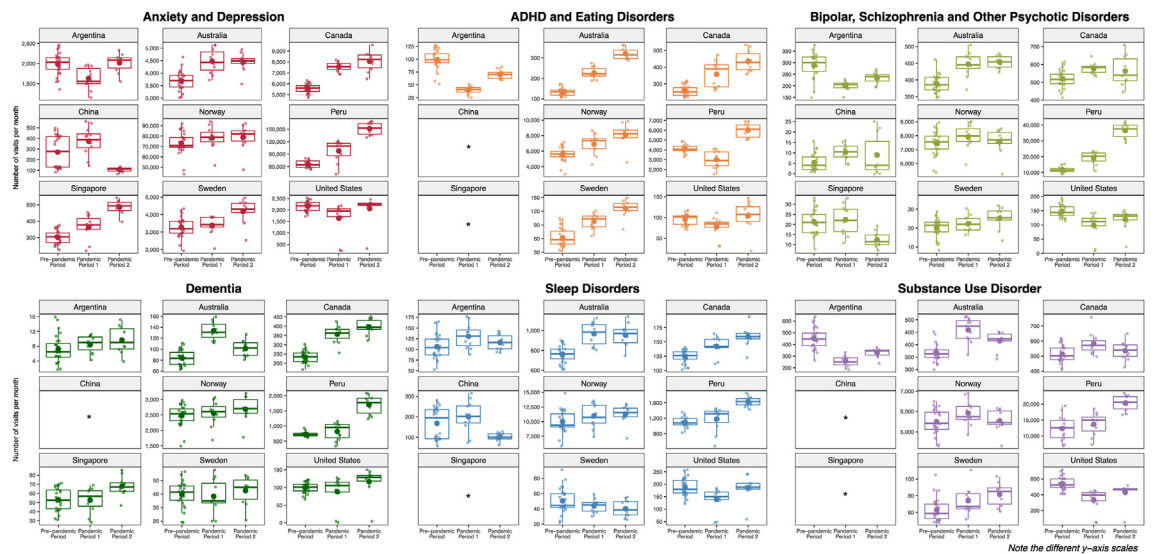
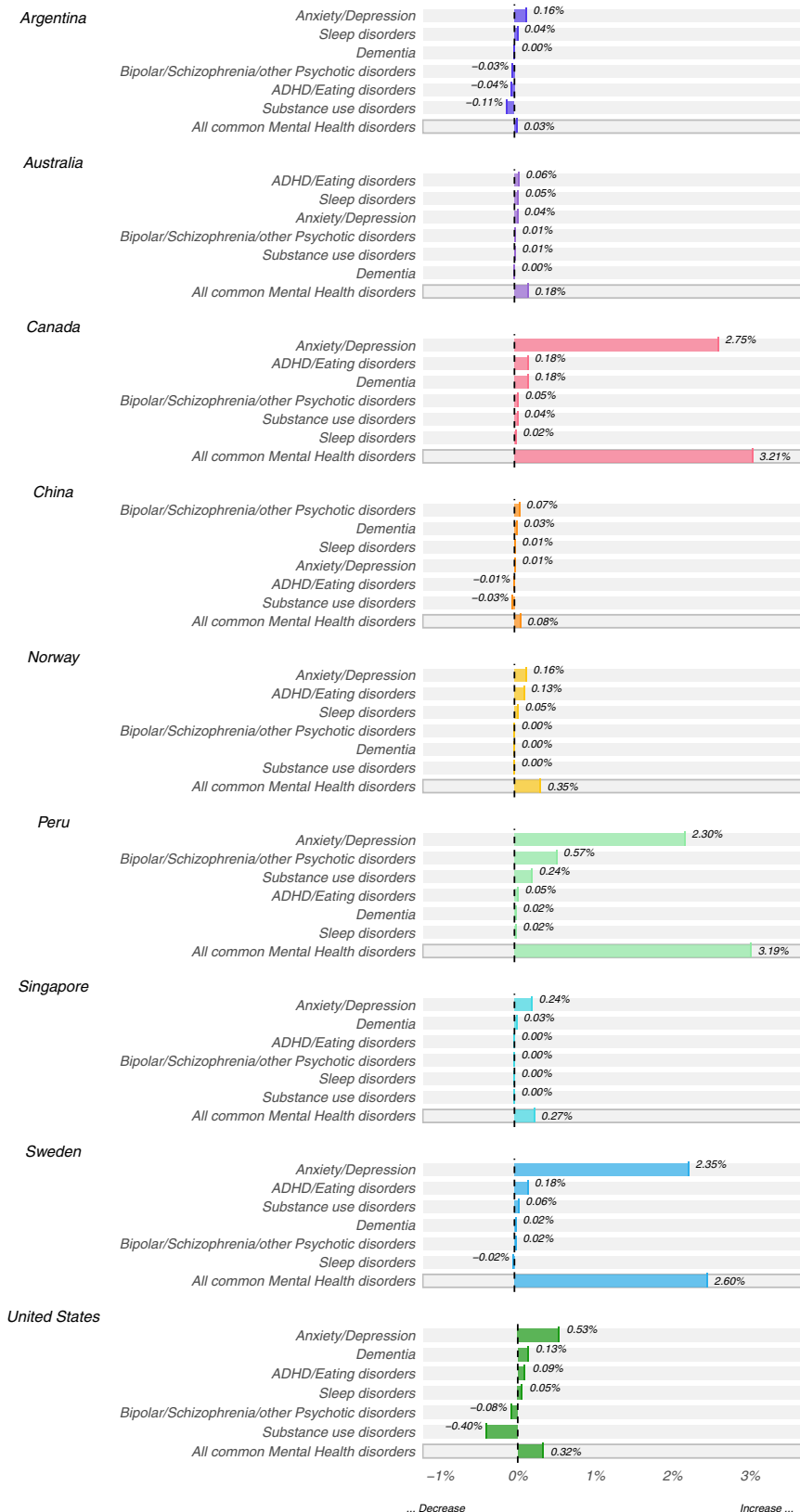


Fig. 3: Distribution of mental health visits by category in pre-pandemic and pandemic periods. Pandemic Period 1 represents the first pandemic year from April 1, 2020, to February 28, 2021, except for China, where it extended from February 1, 2020, to January 31, 2021. Pandemic Period 2 spanned from March 1, 2021, to December 31, 2021, except for China, which encompassed the period from February 1, 2021, to December 31, 2021. Fields marked with an asterisk indicate non-plotted graphs due to low counts per unit of time (<10 counts per month).



Country	Effect measure	Incidence rate ratio (IRR)	(95% Confidence interval)	p-value
Argentina	Level change	1.123	(1.013–1.244)	p = 0.040
	Trend change	1.001	(0.993–1.009)	p = 0.763
Australia	Level change	1.075	(0.995–1.161)	p = 0.090
	Trend change	0.998	(0.992–1.004)	p = 0.505
Canada	Level change	1.251	(1.166–1.343)	p < 0.001
	Trend change	0.993	(0.987–0.999)	p = 0.035
China	Level change	2.115	(1.723–2.596)	p < 0.001
	Trend change	0.951	(0.933–0.969)	p < 0.001
Norway	Level change	1.118	(1.053–1.187)	p = 0.001
	Trend change	0.990	(0.985–0.995)	p < 0.001
Peru	Level change	2.240	(2.057–2.439)	p < 0.001
	Trend change	0.978	(0.968–0.987)	p < 0.001
Singapore	Level change	1.270	(1.167–1.382)	p < 0.001
	Trend change	1.007	(1.001–1.013)	p = 0.026
Sweden	Level change	1.054	(1.001–1.109)	p = 0.065
	Trend change	1.001	(0.997–1.004)	p = 0.775
United States	Level change	0.973	(0.925–1.022)	p = 0.310
	Trend change	1.005	(1.001–1.008)	p = 0.024

Level change represents the immediate effect of the first month of the pandemic. Trend change represents the sustained effect of the pandemic on the following months. Significant changes are denoted with a bold font referring to p-values <0.05.

Table 2: Summaries of interrupted time series regression analyses of the impact of the COVID-19 pandemic on mental health visits rate.

exhibited significant variability among countries. Singapore and the USA were the only countries that showed a consistent monthly increase in mental health visits, 1.005-fold (95% CI: 1.001–1.008) and 1.007-fold (95% CI: 1.001–1.013), respectively. Canada and Peru experienced a decline in mental health visits in the subsequent months, reducing the previous excess (0.993-fold (95% CI: 0.987–0.999) and 0.978-fold (95% CI: 0.968–0.987), respectively) but without returning to their expected pre-pandemic levels.

China and Norway also experienced a drop in mental health visit rates in the months following the onset of the pandemic, with respective reductions of 0.951-fold (95% CI: 0.933–0.969) and 0.990-fold (95% CI: 0.985–0.995) per month. Significantly, these declines were substantial enough to fall below the pre-pandemic projections during the second year of the pandemic. In contrast, the effects observed in Argentina, Australia, and Sweden were less pronounced and not statistically significant. The interrupted time series plot per country for each mental health category can be found in [Supplementary Material \(Figure S2\)](#).

Discussion

The robustness of primary healthcare systems was crucial in tackling mental health concerns during this period, especially considering the limited resources

available.^{20,29} While prior research has examined the reported burden of mental health concerns by country, information regarding the proportion of mental health visits at the primary care level, is sometimes an overlooked facet of mental health services and offers a distinctive perspective.^{1,30} Our findings provide a comprehensive analysis of mental health service use in primary care across nine countries (Argentina, Australia, Canada, China, Norway, Peru, Singapore, Sweden, and the USA) during the COVID-19 pandemic. While our study revealed an overall increase in mental health visits, it is important to recognise the nuanced variations that characterise these trends.

Before the pandemic, we found a substantial degree of heterogeneity in the proportion of primary care visits dedicated to addressing mental health issues in these countries. For instance, countries such as the USA (17.36%), Sweden (10.99%) and Canada (10.18%) had a relatively high proportion of mental health visits within their primary care services, indicating a strong focus on mental health within their primary care systems. However, countries like Singapore (0.37%), Peru (2.16%), and Argentina (2.95%) had considerably lower proportions, reflecting potential gaps in the integration of mental health services within primary care. Despite initiatives designed to reduce this gap such as the WHO Mental Health Gap Action Programme (mhGAP)

Fig. 4: Changes in mental health visit rates relative to the total number of visits during the pandemic compared to pre-pandemic by categories. Pandemic period was defined from April 1, 2020, to December 31, 2021, except for China, where it was from February 1, 2020, to December 31, 2021. Rates have been calculated relative to the total number of visits.

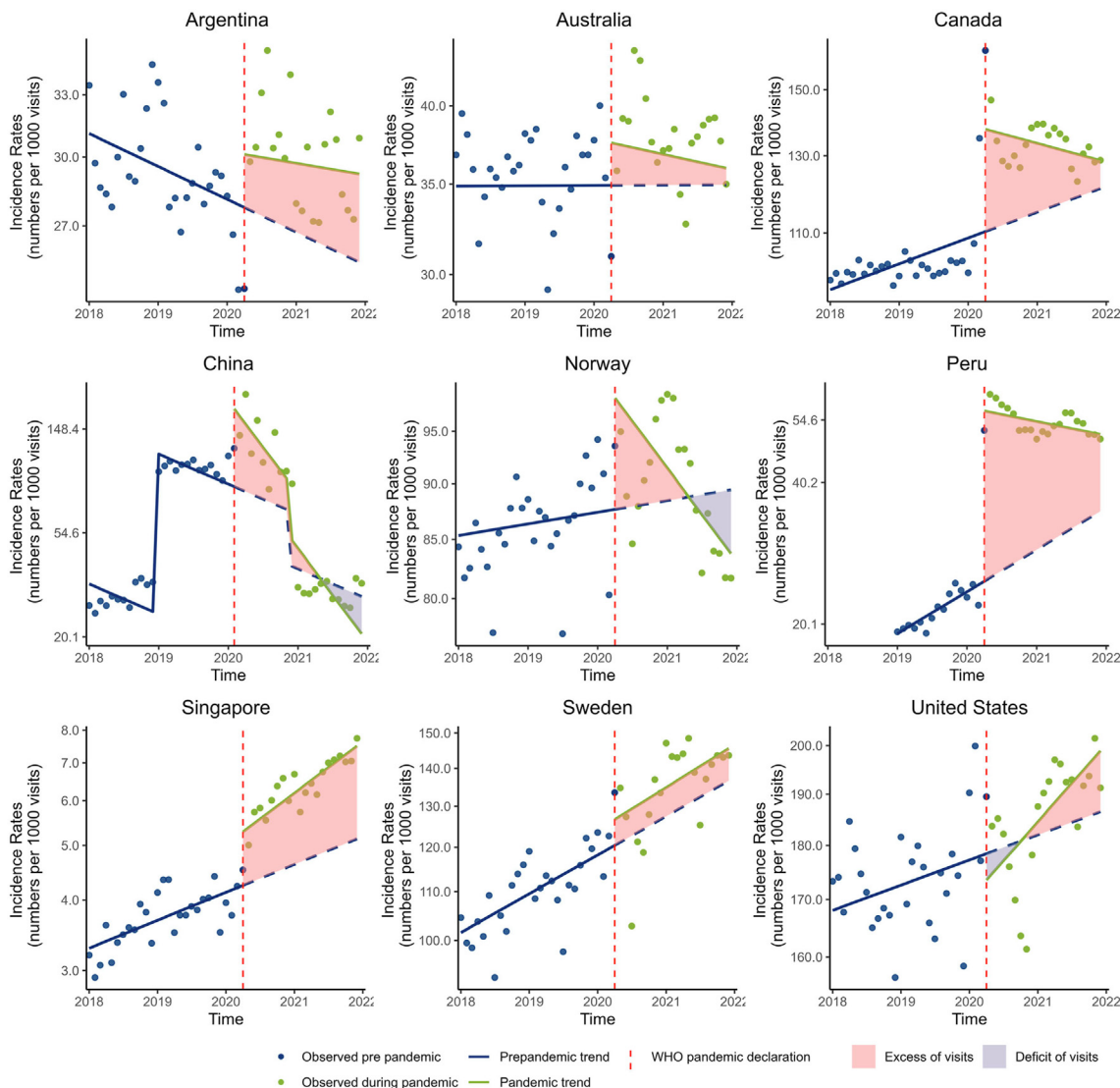


Fig. 5: Interrupted time series graphs showing impact of COVID-19 pandemic on monthly mental health visit rates per country. The solid and dashed blue lines represent the trend in monthly visit rates before the pandemic and the expected rates if there had been no pandemic, respectively. The solid green line represents the pandemic trend of monthly visit rates. The excess and deficit of visits are shown using red and purple shading, respectively.

intervention guide,³¹ ongoing challenges persist, including issues like fragmentation in healthcare delivery, stigma, and insufficient medical education on mental health conditions.³²

In connection with the preceding, in the case of Argentina, the healthcare system is highly fragmented.⁷ Being the nation with the most therapists per capita and a notable count of psychiatrists, coupled with a system facilitating direct specialist access without referrals, the incorporation of mental health into primary care remains incomplete.³³ Furthermore, in 2019, the Peruvian Ministry of Health increased the quantity of community-focused mental health facilities, each

equipped with a diverse team comprising psychiatrists, psychologists, nurses, pharmacists, and social workers.³⁴ Meanwhile, in many cultures, the fear of being stigmatised and traditional beliefs still act as barriers, preventing individuals from seeking help for mental health concerns.^{3,35,36}

Globally, the shift towards virtual mental health visits during the pandemic, as depicted in Fig. 1, represents a significant adaptation in healthcare delivery.³⁷ However, Argentina, China, and Singapore deviated from this trend, maintaining a continuity of face-to-face visits.

Virtual visits may have facilitated an increase in mental health visits in some countries for some

conditions (Figure S1). However, discerning the extent to which this increase is attributable to virtual care adoption poses a challenge. Variations in the adoption of virtual care across countries, make it difficult to assess whether the rise in mental health visits is primarily due to changes in overall visit rate changes or specifically to the adoption of virtual care. When disaggregating virtual mental health visits by categories, our findings indicated that anxiety and depression exhibited the highest rates in most of the countries. An explanation for this could be that the rising number of new visits for anxiety consultations may have been addressed through virtual care. Conversely, conditions such as dementia, bipolar disorder, psychotic disorders, and substance use disorders exhibited a lower likelihood of transitioning to virtual care, suggesting that patients with persistent mental health conditions continued to receive in-person care (Figure S1 and Table S10).

In this regard, numerous research studies have emphasised the crucial role of telemedicine amid the pandemic, serving as an effective means to provide care for patients with mental health disorders, including schizophrenia, dementia in older adults, bipolar disorder, and depression.^{38–41} The ease of virtual consultations ensured ongoing care while reducing the chances of viral spread. Yet, looking ahead to the post-pandemic era, questions about the enduring efficacy and feasibility of telemedicine emerge, underscoring the need for additional research in this area.⁴²

Irrespective of visit modality, when analysing the different trends in mental health visits by category, anxiety and depression emerged as the most prevalent reasons for primary care visits across most countries congruent with previous studies.⁴³ This increase found in the majority of countries underscores the pervasive psychological distress inflicted by the pandemic on populations worldwide, transcending geographical and cultural boundaries. A similar overall change was seen in a UK study over a shorter timeframe. Focusing on a subset of mental health concerns (depression, anxiety, overdose, and excess alcohol consumption) it was found a post-lockdown surge in these conditions, especially in seeking urgent services through calls and visits to the Emergency Department. It was plausible that similar shifts in mental health needs may have been observed across different primary care providers.⁴⁴

Our analysis also revealed different variations in the other mental health categories. In Canada, China, Singapore, and the USA dementia-related visits constituted the second-highest increased proportion during the pandemic. This finding might reflect the unique challenges faced by older populations during the pandemic, thus emphasising the importance of tailored mental health care for vulnerable groups. Australia, Canada, Norway, and Sweden placed visits related to ADHD and eating disorders among the top contributors to increased mental health visits, suggesting a focused

approach to addressing these disorders within their primary care systems. The relationship between COVID-19 and ADHD and eating disorders could be explained by issues related to school lockdowns, home-schooling, and social isolation.^{45,46}

Our interrupted time series analysis further revealed the specific impact of the pandemic on mental health visit rates across the studied countries. Importantly, we demonstrated the immediacy of the pandemic influence, with most countries experiencing an immediate rapid increase in mental health visit rates following the onset. This initial surge could be attributed to the heightened stressors, anxiety, and uncertainty induced by the pandemic and underscores the acute need for mental health care services during crises of this magnitude.²⁵

However, as we further examined the sustained effects of COVID-19, it became evident that the pandemic did not lead to a continuous rise in mental health visits across all countries. Remarkably, the USA and Singapore stood out as the only nations maintaining a consistent monthly increase throughout the pandemic. China and Norway presented a unique challenge, with mental health visit rates dropping below the pre-pandemic projections during the second year of the pandemic. This unsettling trend points to a deficit in visits compared to the anticipated pre-pandemic values, raising concerns about access to mental health care in primary care during an extended pandemic.

In the case of China, the decline in mental health visits during the second year of the pandemic was attributed to a significant policy change experienced in the region. In response to COVID-19 travel restrictions, the Hong Kong SAR Government implemented the Special Support Scheme in December 2020. This scheme aimed to assist Hong Kong residents with chronic conditions living in Guangdong province who could not return for clinic appointments. The policy prioritised the provision of services, led by family medicine physicians, focusing on chronic conditions like hypertension, diabetes, and coronary artery disease, while deprioritising mental health visits in primary care.⁴⁷ We also found a noticeable increase in mental health visits in 2019. One explanation for this could be that in 2018, family physicians underwent training in the management of mental health conditions. This training likely heightened awareness, potentially leading to an increase in diagnoses and reporting in the subsequent years. Norway, on the other hand, experienced a shift in care delivery from primary care settings to specialised centres, particularly among children.⁴⁸

Variations in mental health service use in primary care among countries during the COVID-19 pandemic can be attributed to historical configurations of mental health care delivery. For instance, in Singapore, patients typically do not consult their primary care physician for various mental health conditions, preferring to seek

medical services for such conditions in private clinics.⁴⁹ In Argentina, as we previously mentioned, primary care mental health is more often delivered in specialised mental health clinics such that the data presented here underreports the occurrence of mental health visits in the population.⁵⁰

While this study shows notable strengths, there are several limitations: First, the data sources used in this study were drawn from variable data sources within each country, encompassing national-level data in countries such as Norway and Peru, regional data in Australia, Argentina, Canada, Singapore, Sweden and the USA, and local-level data in China. Therefore, we acknowledge that the results may not accurately represent national experiences in primary care practice for those countries that supplied regional or local data (See [Table S1](#) for additional details on data sources categorised by country).

Secondly, variations in coding practices across countries could introduce potential biases when creating a comprehensive categorisation of mental health visits. In certain coding systems, a single code might be assigned to multiple diagnoses (refer to [Table S2–S7](#)). To account for this, we combined multiple diagnoses within certain mental health categories, such as Anxiety and Depression. Furthermore, codes may not necessarily represent accurate diagnoses, as the quality of diagnoses is contingent on the accuracy of coding procedures. Moreover, in some countries, the way reasons for visits are recorded in medical records may have led to an underreporting of mental health consultations. To address this limitation, extensive collaborative efforts were undertaken with participating countries to validate the registered codes in their respective information systems.

Third, our study does not delve into examining relationships between mental health visit rates and other factors, such as population demographics or socioeconomic variables as this information was not available to us. Prior research has indicated that mental health visit rates during the pandemic can vary significantly across specific demographic groups, such as age and ethnicity.³⁰

Lastly, we were unable to correlate the potential impacts of the capacity for primary care physicians to see patients with mental health disorders as we are aware that potentially in some or all of the studied countries, there may have been staff shortages or limited access to care due to COVID-19.

This study assessed the direct impact of the pandemic on mental health visit rates within each country and compared pre-pandemic vs pandemic changes across countries. Future research should delve into identifying specific factors associated with changes in visit rates, allowing for targeted public health interventions. Continued vigilance and close monitoring of the population's mental health visit rates should remain a priority.

To our knowledge, this is the first trans-national study with a global footprint that analyses mental

health primary care service use across nine countries during the COVID-19 pandemic period of 2020 and 2021. The early stages of the pandemic ushered in a rise in mental health visits in most countries, with anxiety and depression being the main reasons for seeking care.

The widespread adoption of virtual mental health care further emphasises the adaptability and resilience of primary care systems during this crisis. There is a critical need for sustained and flexible mental health services, encompassing both traditional and virtual modalities, to address the evolving and complex mental health challenges that have been exacerbated by the pandemic.

Contributors

JS-V contributed to conceptualization, data curation in Peru, investigation, methodology, formal analysis, verification, writing-original draft, and writing-review & editing. CL contributed to conceptualization, data curation in Canada, formal analysis, investigation, methodology, project administration, verification, writing-original draft, and writing-review & editing. JMW and GG contributed to data curation in the United States, investigation, and verification of the data from United States and writing-review & editing. SdeL contributed to investigation, and writing-review & editing. RSK contributed to data curation in Sweden, investigation, and verification of the data from Sweden and writing-review & editing. ZJL and LHG contributed to data curation in Singapore, investigation, and verification of the data from Singapore and writing-review & editing. PS-B and MSC-F contributed to data curation in Peru, investigation, and verification of the data from Peru and writing-review & editing. K-AW, SF, and VB contributed to data curation in Norway, investigation, and verification of the data from Norway and writing-review & editing. WC-WW and APPN contributed into data curation in China, investigation, and verification of the data from China and writing-review & editing. AO contributed to conceptualization, data curation in Canada, investigation, methodology, and writing-review & editing. J-AM-N, and CMH contributed to data curation in Australia, investigation, and verification of the data from Australia and writing-review & editing. PZ and LS contributed to data curation in Argentina, investigation, and verification of the data from Argentina and writing-review & editing. AH contributed to investigation, methodology, writing-original draft, and writing-review & editing. KT contributed to conceptualization, data curation, funding acquisition, investigation, methodology, project administration, supervision, verification, writing-original draft, and writing-review & editing. All authors confirm that they had full access to all the study data and accept responsibility for the decision to submit for publication.

Data sharing statement

Data availability is governed by local data-sharing regulations, which differ across countries. Personal-level data is not accessible to the public. Ethical guidelines for utilizing UTOPIAN data prohibit its public release. Those wishing to obtain electronic medical record (EMR) data from the UTOPIAN Data Safe Haven can submit applications at: <https://www.dfc.utoronto.ca/getting-utopian-support>. Analytical codes for data analysis can be provided upon request.

Declaration of interests

CL and AO receive a salary for research associate positions at the University of Toronto.

JMW holds the position of Vice President Medical Affairs and is employed by the DARTNet Institute. SdeL serves as the director of the Royal College of General Practitioners (RCGP) Research and Surveillance Centre (RSC) the primary care sentinel network and he receives funding from the UK Health Security Agency for this position. Seqirus and Roche provided a bursary for speaking. AstraZeneca provided a bursary to attend a European conference. Additionally, AstraZeneca, Sanofi, and Seqirus provided funding for Advisory Board membership.

RSK has received payment from Qulturum Jönköping County for lectures and support from Region Uppsala to attend WONCA Sydney 2023. MSC-F is an Associate Professor at the Universidad Peruana Cayetano Heredia, and the Director of the Primary Health Care Research Center. Her salary is sourced from teaching, contracts and grants awarded to the university. She has received a grant from the National Council of Science and Technology of Peru. KT receives a Chair in Family and Community Medicine Research in Primary Care at UHN. She has received grants from the following organizations in the past 3 years: The Canadian Institutes of Health Research, Rathlyn Foundation Primary Care EMR Research and Discovery Fund, College of Family Physicians of Canada/Foundation for Advancing Family Medicine/CMA Foundation Heart and Stroke Foundation of Ontario, Department of Defense United States of America, St. Michael's Hospital Foundation, Ontario Health Data Platform First Movers Fund, Queen's University CSCP Research Initiation Grant, Diabetes Canada, Heart and Stroke Foundation and Brain Canada Heart-Brain IMPACT Award, CANSSI ICES Data Access Grant, North York General Hospital Exploration Fund, CFPC Janus Grant. Support for attending meetings is provided by the Rathlyn Foundation Primary Care EMR Research and Discovery Fund. None of the other authors have reported any other potential conflicts of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.eclinm.2024.102533>.

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