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RESEARCH

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Healthcare costs associated with receipt of effective mental healthcare coverage in individuals with moderate or severe symptoms of anxiety and depression

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Abstract

Background Effective mental healthcare coverage (EMHC) is an important health system performance indicator of a population's mental healthcare needs. This study aims to assess the factors and healthcare costs associated with the receipt of EMHC for anxiety and depression.

Methods This study draws on data from participants from Alberta's Tomorrow Project with moderate or severe symptoms of anxiety and depression during the first wave of the COVID-19 pandemic (2020) with available medico-administrative and complete data [$n = 720$]. EMHC was assessed during the eighteen months as of March 1, 2020, and defined as adequate pharmacotherapy (i.e., antidepressant dispensed, with ≥ 80% proportion of days covered and 4 follow-up medical visits) and/or adequate psychotherapy (≥ 8 physician consultations for psychotherapy) depending on the severity of symptoms. Logistic regression analysis was used to study EMHC as a function of study variables. Regressions with augmented inverse probability weighting were used to estimate the total healthcare costs attributable to receipt of EMHC during the first 18-month period of the pandemic, controlling for confounders. Mean adjusted differences with 95% bias-corrected bootstrap confidence intervals (CIs) are presented.

Results The proportion receiving EMHC was 26.7%. Individuals with worse self-rated mental health after the pandemic than before were less likely to receive EMHC. Those with a lifetime diagnosis of depression and anxiety were more likely to receive EMHC. The overall mean adjusted total healthcare costs attributable to receipt of EMHC during the pandemic was $2601 [– $247, $5694]. The mean adjusted outpatient costs attributable to EMHC was significantly higher and reached $1613 [$873, $2577].

Conclusion The study's findings highlight the existence of health inequalities and potential unmet mental health needs in individuals with worsening mental health during the pandemic. The receipt of EMHC during the pandemic was not significantly associated with increased total healthcare costs. These findings underscore the need for mental health policies that are aimed at improving timely access to EMHC to address population unmet mental health service needs.

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Introduction

The global burden of anxiety and depression further deteriorated during the pandemic, with increases in absolute cases and disability-adjusted life years worldwide [1]. The increase in mental health services needs has been a global concern, with significant changes in the delivery, access, and referrals to mental health services [2]. A rare population study focusing on initiation and barriers to mental health service use during the pandemic revealed that more than one in five individuals reported barriers in accessing mental health services [3]. In Canada, several health-service covid-related restrictions were imposed during the pandemic. As of the end of March 2020, all non-urgent and elective surgeries and laboratory testing were asked to stop, physician billing codes for services delivered virtually were added, and telepractice was recommended for non-urgent psychological services [4]. Among the provinces announcing additional financial support and spending on mental health and substance use disorders, the province of Alberta reported the highest per capita spending within the first year of the pandemic [5].

The societal costs associated with mental and substance-related disorders in Canada have been projected at $291 billion [6, 7]. Cost-effective treatments for anxiety and depression, such as pharmacotherapy with appropriate follow-up and/or psychotherapy are available [8–10]. However, there are significant gaps in quality effective treatment coverage for common mental disorders, with less than one in two individuals receiving adequate treatment [11–16]. Effective mental health service coverage is an important indicator for monitoring the performance of a universal health system [17, 18] in responding to the mental health needs of its population [19]. Factors associated with receipt of effective treatment or adequate mental healthcare for depression and anxiety include adult age, education, having a family physician, supplementary insurance coverage, comorbid mental disorders, and clinical severity [13–15]. In low- and middle-income countries, factors associated with the receipt of effective treatment coverage include higher education, adulthood, and private insurance [20]. Despite the importance of effective mental health service coverage, there is a scarcity of studies that have examined the costs associated with it. The few studies available have shown increased societal costs associated with receipt of guideline concordant treatment for depression and anxiety in adults [21] and older adults [22]. It has also been reported that mental disorders cost more in the long run when left untreated [23, 24], which therefore underscores the importance of improving access to mental health treatment that meets the population's mental health needs.

The current study therefore aimed to assess the factors and healthcare costs associated with receipt of effective mental healthcare coverage according to clinical guidelines in individuals with moderate or severe symptoms of anxiety and depression during the pandemic in Canada. Reporting on socio-demographic, economic, health status and healthcare costs associated with the receipt of effective mental healthcare coverage will inform the allocation of resources needed to improve the performance of the health system in providing equitable mental healthcare [25].

Methods

Study participants

This study draws on data from Alberta residents who participated in Alberta's Tomorrow Project, a longitudinal cohort study of adults that aims to support research in cancer and chronic disease. Participants were recruited from 2000 to 2015 and have been invited to complete periodic follow-up surveys to provide health and lifestyle information since enrollment [26–28]. Most participants (99%) also consented to linking their survey data with administrative health databases. The present study includes participants who completed a questionnaire in May and December 2020 (COVID-19-focused follow-up survey) and who had given consent and personal health number to link their ATP cohort data to medico-administrative databases. The study participants included those reporting moderate or severe symptoms of anxiety or depression during the pandemic (2020). The presence of moderate or severe symptoms of anxiety or depression was based on a cutoff score ≥ 10 in the 7-item Generalized Anxiety Disorder Scale (GAD-7) (score range 0–21) for anxiety and Patient Health Questionnaire (PHQ-8) (score range 0–24) for depression [29, 30]. Seven hundred and twenty participants with moderate or severe symptoms of anxiety or depression had complete survey data and available medico-administrative data.

Study variables

Information on health services used and related costs was available from Alberta Health administrative data from September 1, 2018, to August 31, 2021, which includes routinely collected information on resident healthcare services used, diagnoses, medications dispensed, physician fees paid out, and ambulatory and inpatient costs. The data sources used in this study included the Provincial Registry, Vital Statistics, National Ambulatory Care Reporting System (NACRS) database for emergency department and day surgery encounters, Discharge Abstract Database (DAD) for inpatient hospital stays, Practitioner Claims, and Pharmaceutical Information Network (PIN) on drug dispensations community

pharmacies and number of days supplied. Postal codes from the Provincial Registry in 2021 were used to document area-level social and material Pampalon deprivation indices (based on the 2016 census). Reasons for encounters were classified using ICD-9 (practitioner claims data) and ICD-10 codes (NACRS and DAD) as mental health reasons (290.x–319.x, F00.x–F99.x, X60–X84, Y10–-Y19, Y28) and all other reasons (any codes not included as mental health). Psychotropic medications dispensed in the community were classified according to the following Anatomic Therapeutic Chemical (ATC) codes: N05B*, anxiolytics; N06A*, antidepressants; N05A*, antipsychotics; N05C*, hypnotics and sedatives. More information on Alberta Health's administrative databases can be found at: https://www.alberta.ca/health-research.

Effective mental health treatment coverage

The prevalence of health service use (i.e., treatment coverage) is the proportion of participants with moderate or severe symptoms of anxiety or depression who had, during the eighteen months as of March 1, 2020, any mental health encounter during an outpatient consultation, emergency department or inpatient admission, or psychotropic drug delivered. Health service use was then categorized as effective mental healthcare coverage (EMHC) aligned with previous published studies and criteria on quality mental healthcare [31–33] and similarly categorized as adequate pharmacotherapy defined as either (1) the delivery in community pharmacies of an antidepressant for the duration of ≥80% proportion of days covered during the follow-up period (# days supplied / 548 days) [33–35] and 4 follow-up visits with any physician; or adequate psychotherapy defined as (2) the presence of ≥8 psychotherapy claims for in-person individual, virtual individual, group or family therapy encounters with any physician (psychiatrist or other). Individuals with severe anxiety or depression (cutoff score ≥15 in either the GAD-7 or PHQ-8) needed to have received both adequate pharmacotherapy and psychotherapy to be categorized as receiving EMHC.

Measurement of health service utilization and valuation of healthcare costs

The cost analysis was carried out from the health system perspective, and total healthcare costs, presented in Canadian dollars (CAD), are based on healthcare costs incurred for inpatient stays, ambulatory visits, drug service use, physician fees paid out for consultations, and this during the eighteen months preceding and following March 1, 2020. The measurement and valuation of costs were based on Canadian published reports [36]. Given the high comorbidity between mental and physical disorders, healthcare costs were based on overall health service utilization independent of whether there was a mental or physical diagnosis registered with the encounter. Health service utilization and related costs were identified from Alberta Health administrative databases.

The cost of a hospital stay in the eighteen months prior to and following the pandemic was based on DAD's total Resource Intensity Weight (RIW) for the inpatient stay [37] multiplied by the cost of a standard hospital stay for Alberta as reported at the time of the study by the Canadian Institutes for Health Information (CIHI) for the 2019–2020 ($8011) and 2020–2021 ($9284) fiscal years, respectively [38]. The cost of a day surgery and emergency department visit was based on NACRS' Comprehensive Ambulatory Care Classification System (CACS)-RIW also multiplied by the cost of a standard hospital stay for Alberta reported by CIHI for the 2019–2020 (pre-pandemic) and 2020–2021 (pandemic) fiscal years [38].

Based on previously published literature, the estimated cost of an outpatient visit in the community was $130 (2014), and the cost of an ambulatory visit with a psychiatrist in an outpatient specialized clinic was $315 (2011) and [22, 39, 40]. In general, 76% of encounters with a psychiatrist are in specialized clinics and 24% in the community [41]. These estimates from previous years (2011 and 2014) were adjusted for Alberta's health care inflation rate according to the consumer price index reported on March 2020 (146.4%, year 2002 = 100) and March 2021 (146.7%, year 2002 = 100) [42]. Given the similar inflation rates in 2020 and 2021, these were rounded up, and a 10.0% and 7.7% inflation rate were used to bring 2011 and 2014 values to 2021. The cost per outpatient visit to a psychiatrist and other physician was $356 and $164. Physician billing claims captured in the claims database for encounters in community, ambulatory, emergency department, and hospital settings were based on physician fees paid out. The system also generated amounts for shadow billing claims where no amount was billed. Medication dispensed were identified in the PIN, and costs for each drug dispensed were estimated for each dispensation by multiplying the quantity dispensed by the most current base price according to Alberta Blue Cross (https://www.ab.bluecross.ca/provider/type/pharmacy/price-files.php.)

Study covariates

The study covariates included age (<65 years; ≥65 years), sex (male; female), race/ethnicity (self-identifying as White, yes, no), work status (full-time employed; part-time employed/self-employed; retired; unable to work because of sickness or disability; or other such as unemployed; looking after home; doing unpaid work or volunteering; student; not reported), household income in

the year prior to the pandemic before taxes (≤$24,999; $25,000–$49,999; $50,000–$74,999; $75,000–$99,999; $100,000–$149,999; ≥$150,000; or prefer not to respond, doesn't know/missing); self-reported decrease in income during the pandemic (yes/no), Pampalon social and material deprivation index quintiles (least deprived to most deprived) [43], change in self-rated mental health from prior to the pandemic towards the worse (yes; no), the presence of a lifetime physician diagnosis of major depression or anxiety, and the number of lifetime physician diagnoses of the following twelve physical conditions: cancer; diabetes; cardiovascular disorder; respiratory system conditions; gastrointestinal diseases; liver or pancreatic conditions; renal disease; kidney conditions; neurological conditions; bone and joint conditions; immune system conditions and transplant.

Statistical analyses

Chi-square statistics were used to test differences in group comparisons regarding study variables. For the first objective, a multivariable logistic regression analysis was used to study the factors associated with receipt of EMHC. Adjusted odds ratios and corresponding 95% confidence intervals (CI) are presented.

For the second objective, the mean total healthcare costs and by type of health service use category are presented according to receipt of EMHC. Generalized linear models with a gamma distribution and log link were used to estimate the mean unadjusted difference (95% CI) in healthcare costs incurred during the pandemic between those receiving and not receiving EMHC. Furthermore, to reduce the potential selection bias and confounding associated with the non-random nature of receiving EMHC, an augmented inverse probability weighting method was used to estimate the healthcare costs attributable to the receipt of EMHC during the pandemic [44]. Analyses were conducted in SAS [45]. The propensity score model included all study covariates [46]. Variables that showed a standardized difference of 10% or greater were further adjusted in the model [47]. These variables were past diagnoses of anxiety or depression and reporting a decrease in income during the pandemic. The outcome model, total healthcare costs during the pandemic, was therefore further adjusted for these covariates and the healthcare costs incurred in the period preceding the pandemic (before March 1, 2020). Additional analyses assessed the costs incurred by type of health service utilization during the pandemic period: inpatient and emergency department admissions, outpatient visits, physician billing claims paid out, and medications. The mean healthcare costs attributable to receiving EMHC are presented with their corresponding 95% bias-corrected bootstrap CI.

Results

In the current study sample of individuals with moderate or severe symptoms of anxiety and depression, the proportion of individuals receiving adequate pharmacotherapy with medical follow-up was 29.2% ($n=210$) and adequate psychotherapy (at least 8 sessions) was 14.3% ($n=103$) (Table 1). The overall prevalence of EMHC was 26.7% ($n=192$). Participants with severe symptoms of anxiety or depression were more likely to receive adequate psychotherapy, and both adequate pharmacotherapy and psychotherapy, than those with moderate symptoms. Participants with severe symptoms were less likely to receive EMHC, defined as adequate pharmacotherapy and psychotherapy than those with moderate symptoms.

Table 1 Type of mental health service use by severity of symptoms of anxiety and/or depression

	Overall *N* = 720	Participants with moderate symptoms of anxiety or depression *N* = 502	Participants with severe symptoms of either anxiety or depression *N* = 218	*P*-value
Any mental health service use[a]	359 (49.9%)	245 (48.8%)	114 (52.3%)	0.39
Adequate pharmacotherapy[b]	210 (29.2%)	140 (27.9%)	70 (32.1%)	0.25
Adequate psychotherapy [c]	103 (14.3%)	63 (12.5%)	40 (18.3%)	0.04
Both adequate pharmacotherapy and adequate psychotherapy	63 (8.8%)	37 (7.4%)	26 (11.9%)	< 0.05
Effective mental healthcare coverage (adequate pharmacotherapy and/or psychotherapy)[d]	192 (26.7%)	166 (33.1%)	26 (11.9%)	< 0.0001

[a] Any mental health service use: any outpatient, inpatient, emergency department visit, or psychotropic drug use for mental health reasons

[b] Adequate pharmacotherapy: Antidepressant use with ≥ 80% of proportion of days covered and 4 follow-up medical visits during study period

[c] Adequate psychotherapy: ≥8 physician consultations with psychotherapy claim

[d] Effective mental healthcare coverage: adequate pharmacotherapy or psychotherapy for moderate symptoms of anxiety or depression and both adequate pharmacotherapy and psychotherapy for severe symptoms of anxiety or depression

The characteristics of the study sample according to receipt of EMHC are presented in Table 2. The results show differences in the proportion of individuals receiving as compared to not receiving EMHC regarding reported social deprivation index, current self-rated mental health as compared to prior to the pandemic, lifetime physician diagnosis of major depression or anxiety, and the number of physical chronic conditions. When adjusting for sociodemographic, economic and health status factors, the multivariable analyses (Table 3) show that individuals reporting a worsening of current mental health from before the pandemic were less likely to receive EMHC (aOR 0.40; 95% CI: 0.27–0.59). Those reporting a lifetime physician diagnosis of depression or anxiety during their lifetime (aOR 9.98; 95% CI: 5.80–17.15) were more likely to receive EMHC. The unadjusted mean healthcare costs incurred during the study period are presented in Table 4. The results show significant differences in the total 18-month mean healthcare costs incurred between those receiving and not receiving EMHC during the pandemic. Those receiving EMHC incurred, on average, higher total healthcare costs during the first eighteen months of the pandemic, reaching $5957 (95% CI: $4633, $7578). Individuals receiving EMHC during the pandemic also incurred higher costs related to physician consultations ($1536; 95% CI: $1185, $1967), emergency department and hospital admissions ($580; 95% CI: $261, $1078), outpatient visits $2387 ($1934, $2920) and medication use ($1455; 95% CI: $1073, $1952). The results obtained from the regression augmented inverse probability weighting analyses are presented in Table 5. The adjusted average 18-month total healthcare costs attributable to receipt of EMHC during the pandemic reached $2601 (95% CI: -$247, $5694). These results do not show a significant difference in healthcare costs (overlapping confidence intervals). When looking at the categories of healthcare costs, those receiving EMHC had, on average, higher healthcare costs related to outpatient visits during the pandemic ($1613, 95% CI: $873, $2577). No significant difference was observed in healthcare costs attributable to receipt of EMHC for physician claims, emergency department and hospital admissions and medications.

Discussion

The current study extends the existing literature by examining in individuals reporting moderate or severe symptoms of anxiety and depression, the socio-demographic, economic and health status factors associated with the receipt of EMHC, as well as the associated healthcare costs during the first eighteen months of the pandemic. The study findings are based on individual health surveys linked to health administrative data, reducing the potential recall bias regarding health service use and allowing the control of potential confounders, which overcomes the limitations of earlier studies retrospectively assessing self-reported healthcare use in individuals with common mental disorders.

The findings of the current study showed that one in four individuals (26.7%) with moderate or severe symptoms of anxiety and depression had received EMHC. These findings concord with previous research also reporting a 34.8% and 17.9% proportion of individuals with mild/moderate and severe major depression receiving an adequate combination of pharmacotherapy and psychotherapy [11].

Individuals in the current study were more likely to receive adequate pharmacotherapy than adequate psychotherapy which has been similarly reported in previous Canadian studies in adults [48] and older adults [15]. These findings may partly be explained by the fact that in Canada most residents are covered for and therefore treated with pharmacotherapy as a first treatment choice. At the same time, access to psychotherapy can be hindered by long wait lists in the public health system and out of pocket costs for consultations in the private sector [49–51].

Regarding the factors associated with EMHC, the findings of the current study showed that clinical factors such as a lifetime diagnosis of depression or anxiety were associated with an increased likelihood of receiving EMHC. The findings also suggest the presence of potential health inequities, where individuals reporting a worsening of self-rated mental health during the pandemic were less likely to receive EMHC. The findings did not show the presence of socio-economic and demographic inequities in receipt of EMHC. This finding was expected as earlier research also reported no association between self-reported mental health service use and factors such as sex, self-identifying as White, type of employment, and decrease in income during the pandemic in Alberta [52].

The current study also reported on the healthcare costs attributable to receiving EMHC during the pandemic in individuals with moderate or severe symptoms of anxiety and depression. During the pandemic in Canada, protocols and guidance on virtual care and telemedicine were published [4]. In Alberta, in addition to in-person physician and specialist care, virtual mental health services and consultations were offered to the population [53], as additional physician billing codes were added for these services [54]. Although the unadjusted total mean healthcare costs attributable to receipt of EMHC was significant ($5957), after adjusting for important confounders, the adjusted total mean healthcare costs attributable to EMHC was not significant ($2601). One may consider that the healthcare cost attributable to the receipt of

Table 2 Characteristics of study participants according to receipt of effective mental healthcare coverage

	Receipt of effective mental healthcare coverage		P-value [a]
	No *N* = 528 (73.3%)	Yes *N* = 192 (26.7%)	
Age group			0.58
≤ 64 years	433 (82.0%)	154 (80.2%)	
≥ 65 years	95 (18.0%)	38 (19.8%)	
Sex			0.81
Male	106 (19.4%)	37 (19.3%)	
Female	422 (79.9%)	155 (80.7%)	
Race/ethnicity			0.47
Self-identifying as White	502 (95.1%)	185 (96.4%)	
Not self-identifying as White	26 (4.9%)	7 (3.6%)	
Total household income in year prior to pandemic			0.16
< $24,999	25 (4.7%)	17 (8.9%)	
$25,000 - $49,999	52 (9.8%)	15 (7.8%)	
$50,000 - $74,999	67 (12.7%)	32 (16.7%)	
$75,000 - $99,999	78 (14.8%)	24 (12.5%)	
$100,000 - $149,999	103 (19.5%)	43 (22.4%)	
≥ $150,000	125 (23.7%)	36 (18.7%)	
Prefer not to answer	78 (14.8%)	25 (13.0%)	
Decrease in income during pandemic			0.31
Yes	193 (41.1%)	93 (37.2%)	
No	277 (58.9%)	157 (62.8%)	
Work status			0.76
Full-time employed	272 (51.5%)	96 (50.0%)	
Part-time employed/self-employed	84 (15.9%)	29 (15.1%)	
Retired	123 (23.3%)	44 (22.9%)	
Unable to work because of sickness or disability	27 (5.1%)	15 (7.8%)	
Other (unemployed; looking after home; doing unpaid work or volunteering; student; not reported)	22 (4.2%)	8 (4.2%)	
Material deprivation index (quintiles)			0.76
Quintile 1 = least deprived	132 (25.0%)	49 (25.5%)	
Quintile 2	111 (21.0%)	36 (18.7%)	
Quintile 3	114 (21.6%)	36 (18.7%)	
Quintile 4	82 (15.5%)	31 (16.2%)	
Quintile 5 = most deprived	67 (12.7%)	28 (14.6%)	
Missing	22 (4.2%)	12 (6.3%)	
Social deprivation index (quintiles)			0.04
Quintile 1 = least deprived	82 (15.5%)	28 (14.6%)	
Quintile 2	85 (16.1%)	30 (15.6%)	
Quintile 3	110 (20.8%)	24 (12.5%)	
Quintile 4	124 (23.5%)	43 (22.4%)	
Quintile 5 = most deprived	105 (19.9%)	55 (28.6%)	
Missing	22 (4.2%)	12 (6.3%)	
Worse current self-rated emotional/mental health as compared to before March 2020			< 0.0001
Yes	364 (68.9%)	90 (46.9%)	
No	164 (31.1%)	102 (53.1%)	
Lifetime physician diagnosis of major depression or anxiety			< 0.0001
Yes	166 (31.4%)	132 (68.8%)	
No	253 (48.0%)	20 (10.4%)	
Did not answer	109 (20.6%)	40 (20.8%)	
Number of physical conditions (mean, standard deviation)	1.47 (1.34)	2.03 (1.54)	< 0.0001

[a] P-value based on Chi-square statistics

Table 3 Multivariable analysis of factors associated with receipt of effective mental healthcare coverage

	Receipt of effective mental healthcare coverage Adjusted OR (95% CI)		
Age group: ≤64 years versus ≥ 65 years	0.703	0.362	1.366
Sex: Male versus Female	0.886	0.547	1.437
Self-identifying as White: Yes versus No	0.931	0.348	2.493
Income in year prior to pandemic: <$24,999	1.059	0.443	2.532
$25,000–$49,999	0.570	0.258	1.262
$50,000–$74,999	0.897	0.471	1.709
$75,000–$99,999	0.651	0.337	1.257
$100,000–$149,999	Reference		
≥ $150,000	0.885	0.489	1.603
Prefer not to answer	0.807	0.416	1.569
Decrease in income during pandemic Yes versus no	0.848	0.566	1.270
Work status: Full-time employed	Reference		
Part-time employed/self-employed	0.884	0.498	1.570
Retired	0.798	0.410	1.552
Unable to work because of sickness or disability	0.854	0.387	1.884
Other (unemployed; looking after home; doing unpaid work or volunteering; student; not reported)	1.110	0.406	3.031
Material deprivation index: Quintile 1 = least deprived	Reference		
Quintile 2	1.199	0.674	2.132
Quintile 3	0.861	0.481	1.541
Quintile 4	0.977	0.527	1.809
Quintile 5 = most deprived	1.266	0.663	2.419
Social deprivation index: Quintile 1 = least deprived	Reference		
Quintile 2	0.832	0.422	1.639
Quintile 3	0.482	0.240	0.969
Quintile 4	0.892	0.467	1.704
Quintile 5 = most deprived	1.098	0.581	2.076
Missing	1.435	0.534	3.854
Worse current self-rated emotional/mental health as compared to before March 2020 Yes versus No	0.400	0.273	0.586
Lifetime physician diagnosis of major depression or anxiety: No	Reference		
Yes	9.977	5.803	17.151
Not answered	4.742	2.592	8.673
Number of physical conditions	1.124	0.983	1.285

EMHC ranges between the unadjusted and adjusted estimates. When looking at the types of healthcare costs, the findings showed higher outpatient costs associated with EMHC, which was expected as the definition of receipt of EMHC includes outpatient follow-up and mental health consultations, including psychotherapy. Similarly to our findings, receipt of minimally adequate care for anxiety and depression was associated with a significant difference in outpatient healthcare costs but not medication and overall total healthcare costs in adults [21].

The results of the current study should be interpreted with the following considerations. First, the presence of moderate and severe symptoms of anxiety and depression were self-reported and may have led to a sample that is not representative of individuals with these symptoms. Second, the healthcare costs considered in the current study included hospital and emergency department and medication costs, physician fees, and costs for outpatient visits related to physician contacts. As the current study focused on adequate pharmacotherapy with physician follow-up and psychotherapy, consultations specifically with other mental health professionals (e.g., psychologists and social workers) in the public health sector are not considered. This may have led to a

Table 4 Mean unadjusted healthcare costs according to receipt of effective mental healthcare coverage

	Receipt of effective mental healthcare coverage		
	No ***N*** **= 528 (73.3%)**	**Yes** ***N*** **= 192 (26.7%)**	
	Mean healthcare costs and 95% CI [a]		**Mean difference (95% CI)**
Total healthcare costs in the pre-pandemic period [b]	$ 6495 ($ 5882, $ 7170)	$ 10 150 ($ 8613, $ 11 961)	$ 3655 ($ 2731, $ 4791)
Total healthcare costs during the pandemic [c]	$ 6729 ($ 6075, $ 7453)	$ 12 686 ($ 10 708, $ 15 031)	$ 5957 ($ 4633, $ 7578)
Physician fees paid out during the pandemic	$ 1977 ($ 1787, $ 2186)	$ 3513 ($ 2971, $ 4153)	$ 1536 ($ 1185, $ 1967)
Emergency department and inpatient costs during the pandemic	$ 1452 ($ 1180, $ 1786)	$ 2031 ($ 1440, $ 2864)	$ 580 ($ 261, $ 1078)
Outpatient clinic costs during the pandemic	$ 2281 ($ 2085, $ 2494)	$ 4667 ($ 4023, $ 5414)	$ 2387 ($ 1934, $ 2920)
Medication costs during the pandemic	$ 1024 ($ 890, $ 1179)	$ 2479 ($1963, $ 3131)	$ 1455 ($ 1073, $ 1952)

[a] Mean and 95% CIs based on generalized linear models with gamma distribution

[b] 18-months prior to March 1st, 2020

[c] 18-months following March 1st, 2020

Table 5 Mean adjusted healthcare costs attributable to receipt of effective mental healthcare coverage during the pandemic (EMHC)

Receipt of EMHC during the pandemic	**Mean adjusted total healthcare costs**		
	Mean* **($CAD)**	**95% CI (bias corrected bootstrap) [b]**	
Yes	$ 10 195	$ 7510	$13 327
No	$ 7593	$ 6502	$ 8876
Average treatment effect[a]	**Mean difference in healthcare costs attributable to receipt of effective mental healthcare coverage**		
Total healthcare costs	$ 2601	$ (247)	$ 5694
Difference in physician fees paid out	$ 679	$ (14)	$ 1472
Difference in emergency department and inpatient costs	$ (195)	$ (2004)	$ 1877
Difference in outpatient clinic costs	$ 1613	$ 873	$ 2577
Difference in medication costs	$ 534	$ (223)	$ 2017

[a] Average treatment effect: mean difference in 18-month total healthcare costs, and by type, between those who received and those who did not receive effective mental healthcare coverage during the pandemic.

[b] Based on 1000 bootstrap samples.

*Estimates in parentheses correspond to negative estimates

potential misclassification of individuals receiving adequate psychotherapy as not receiving EMHC leading to conservative findings on the prevalence of receipt of EMHC in the study sample. Third, the sample tended to be younger, female, self-identifying as White, employed, reporting higher income brackets, and reporting close to two chronic conditions therefore findings should be generalizable to individuals with moderate and severe symptoms of anxiety and depression with similar characteristics. The sample was also healthy, with an average number of chronic conditions of less than two. This may have led to more conservative findings regarding the

health system costs attributable to the receipt of EMHC. Finally, the conclusions of this study from one Canadian province may be generalizable to other similar public health systems in Canada and elsewhere.

In conclusion, this is one of the first studies to report on the factors and healthcare system costs attributable to the receipt of EMHC for individuals with moderate or severe symptoms of anxiety and depression during the pandemic. The study showed the presence of potential unmet health needs in individuals with worsening mental health during the pandemic. From a mental health policy perspective, improved timely access to cost-effective mental health interventions can address the potential unmet mental health service needs of individuals with common mental disorders such as anxiety and depression [55]. Finally, future longitudinal studies with more extended time frames should also focus on measuring changes in anxiety and depression symptom severity and other outcomes, such as quality of life, that can complement information on the long-term healthcare costs associated with EMHC.

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Author contributions
HMV and PR obtained funding. JV and GS secured access to data. HMV wrote the main manuscript text and carried out analyses. All authors reviewed the final manuscript.

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Availability of data and materials
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Participants gave consent to both health survey and administrative data linkage. This research received ethical approval from the Ethics Committee of the Centre intégré de santé et services sociaux de la Montérégie Centre (CISSS-MC) (board (#2021 – 563).

Competing interests
The authors declare no competing interests.

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