cmajOPEN

Research

Association of physician financial incentives with primary care enrolment of adults with serious mental illnesses in Ontario: a retrospective observational population-based study

Imaan Bayoumi MD MSc, Marlo Whitehead MSc, Wenbin Li MSc, Paul Kurdyak MD PhD, Richard H. Glazier MD MPH

Abstract

Background: Financial incentives may improve primary care access for adults with schizophrenia or bipolar disorder (serious mental illness [SMI]). We studied the association between receipt of the SMI financial premium paid to primary care physicians and rostering of adults with SMI in different patient enrolment models (PEMs), including enhanced fee-for-service and capitation-based models with and without interdisciplinary team-based care.

Methods: We conducted a retrospective cohort study involving Ontario adults (≥18 yr) with SMI in PEM practices, in fiscal years 2016/17 and 2017/18. Using negative binomial models, we examined relations between rostering and the primary care model and the contribution of the incentive. Similar models were developed for adults with type 1 or 2 diabetes mellitus and the general population.

Results: Among 9730 physicians in PEM practices, 4866 (50.0%) received a premium and 448 319 (88.4%) people with SMI in PEMs were rostered. Compared with enhanced fee for service, the likelihood of rostering people with SMI was 3.0% higher for patients in capitation with team-based care (adjusted relative risk [RR] 1.03, 95% confidence interval [CI] 1.02–1.04), with similar results for capitation without team-based care (adjusted RR 1.00 95% CI 0.99–1.01). Rostering for people with diabetes was similar in team-based care (adjusted RR 1.02, 95% CI 1.02–1.03) but higher in capitation without team-based care (adjusted RR 1.03, 95% CI 1.02–1.03) and slightly higher for the Ontario population (team-based care 1.04, 95% CI 1.04–1.05, capitation without team-based care 1.03, 95% CI 1.03–1.04).

Interpretation: Rostering of people with SMI was lower than for the general population. Additional policy measures are needed to address persisting inequities and to promote rostering of this underserved population with complex needs.

Mental illnesses are prevalent, affecting 10%–20% of adults per year[1,2] and up to 33% over their lifetime.[1] They are responsible for an estimated 22.9% of years lived with a disability[3] and a mortality gap estimated at 13–20 years,[4] of which 60% of deaths are attributable to chronic conditions including cardiovascular and respiratory disease.[4]

Primary care physicians are the most frequently consulted health care professionals by adults with schizophrenia and bipolar disorder, collectively referred to as serious mental illnesses (SMI).[5] However, adults with SMI are less likely to have an ongoing site of primary care[6] and experience both difficulty accessing primary care[6,7] and lower quality of care.[8,9] Patient-reported barriers to accessing care occur at the patient level (socioeconomic and mental health or medication related), provider level (perceived stigma and lack of willingness to address mental health concerns) and the health system level (difficulty finding a family physician, inadequate time during appointments to meet their health needs and poor collaboration with other health care providers).[7]

Since 2000, Ontario has implemented a broad suite of voluntary reforms in the delivery and payment of primary care, aimed at improving access, quality of care and retention of primary care physicians.[10] More than 75% of primary care physicians shifted from exclusive fee-for-service to new primary care models involving patient enrolment.[10] Patient enrolment is voluntary; physicians can choose to provide care

Competing interests: Imaan Bayoumi reports the Centre for Studies in Primary Care Research Initiation Grant from Queen's University funded this work. Imaan Bayoumi received funded grants from the Canadian Institutes of Health Research and a funded grant and salary award from PSI Foundation, unrelated to this work, and has received an honorarium for work on the Core Group of the Rourke Baby Record, from the Government of Ontario. No other competing interests were declared.

This article has been peer reviewed.

Correspondence to: Imaan Bayoumi, bayoumi@queensu.ca

CMAJ Open **2023 January 10. DOI:10.9778/cmajo.20210190**

to some patients without rostering them (billing fee for service), and may be incented to do so if they anticipate that these patients may have more complex needs, requiring more frequent visits. Unrostered patients are not included in provincial quality improvement reporting to practices. Previous work has shown that fewer people with mental illnesses were enrolled in new models[11] and that people with SMI who were enrolled in capitation models accessed fewer health services than those enrolled in enhanced fee-for-service models.[12]

Incentives to enrol patients with SMI were included in the reforms in 2003.[13] We examined the effect of the SMI premium on primary care rostering in different primary care patient enrolment models (PEMs). We hypothesized that people with SMI would have lower rates of rostering than those with another complex chronic disease (diabetes mellitus) and the general population of Ontario. We also hypothesized that premium payment would be associated with the increased likelihood of rostering adults with SMI.

Methods

We conducted a retrospective observational cohort study using population-level administrative data provided by ICES. We examined the effect of the primary care SMI special premium incentives available to physicians practising in PEMs. The PEMs include the enhanced fee-for-service model (remunerated by fee-for-service payments with some bonuses for preventive care) and blended capitation models with and without integration of interdisciplinary team-based care (remunerated by capitation payments based on age and sex for in-basket services, and additional bonuses for comprehensive and preventive care). The primary care SMI special premium is an annual payment paid to physicians practising in PEMs for providing comprehensive primary care to a minimum of 5 enrolled patients with diagnoses of bipolar disorder or schizophrenia.[14] There are 2 levels of payment: $1000 for the minimum first 5 enrolled patients and $1000 for an additional 5 or more enrolled patients (maximum $2000 annually).

We reported data in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines.[15]

Study participants

Study participants included all adult (≥ 18 yr) Ontario residents eligible for publicly funded health insurance who were attributed (either rostered or virtually rostered) to primary care physicians practising in PEMs (Appendix 1, available at www.cmajopen.ca/content/11/1/E1/suppl/DC1). We created a cohort of people with schizophrenia or bipolar disorder and additional cohorts for people with type 1 or 2 diabetes mellitus and the general population of adults in Ontario (≥ 18 yr) for comparative purposes. Study inclusion dates were from Apr. 1, 2016, to Mar. 31, 2018. We identified people with schizophrenia (defined as a psychotic disorder characterized by disturbances in thinking, emotional responsiveness and behaviour)[16] or bipolar disorder (defined as a group of brain disorders that cause extreme fluctuation in a person's mood, energy and ability to function)[16] if they had at least 1 outpatient visit at any time before the study period with a family physician or psychiatrist, or an emergency department visit or an inpatient hospital admission billing the diagnostic codes schizophrenia-schizoaffective disorder (*International Classification of Diseases* [ICD]-9: 295; ICD-10: F20, F25) or bipolar disorder (ICD-9: 296; ICD-10: F31). We identified people with diabetes using a validated administrative case definition.[17] Exclusion criteria included children (< 18 yr), adults lacking a valid Ontario health card and who were therefore ineligible for Ontario health insurance and adults who died during the study period.

Primary care physicians were defined as those whose specialty was listed as general practitioner or family physician in the Corporate Provider Database.

Patients were attributed to a physician if they were formally enrolled (rostered) or had attended a minimum of 3 visits with the same primary care provider during the study period (virtually rostered). Previous work has virtually rostered patients to the physician who billed the largest dollar amount for primary care services in the preceding 2 years.[18] We used a higher threshold of 3 visits with the same physician over the 2-year study period for virtual rostering in light of the high needs of this population, which is consistent with the approach previously used as a proxy measure for having a regular primary care physician for people with a chronic condition.[19]

For comparative purposes, we identified adult Ontario residents with type 1 or type 2 diabetes mellitus using the Ontario Diabetes Database, an ICES-derived cohort,[17] who had a diabetes-related primary care visit in the 3 years before the study period (between Apr. 1, 2013, and Mar. 31, 2016) and an adult general population comparison sample.

Data sources

Several data sets were linked using unique encoded identifiers and analyzed at ICES (Appendix 2, available at www.cmajopen.ca/content/11/1/E1/suppl/DC1).[20] To identify and describe the cohort, we used the Registered Persons Database (a registry of all Ontario residents eligible for the Ontario Health Insurance Plan [OHIP]); the National Ambulatory Care Reporting System (a registry of emergency department visits); the Discharge Abstracts Database (a registry of inpatient hospital admissions); and the Ontario Mental Health Reporting System (a registry of mental health care contacts including hospital admissions). We derived age, sex, rurality and recent migration status from the Registered Persons Database. We measured rurality using postal codes and the Rurality Index for Ontario, with categories of urban (score 0–9), suburban (score 10–39) and rural (score ≥ 40).[21] We derived neighbourhood income quintile using postal codes linked to the census dissemination area. We identified recent migrants to Ontario as people who received an Ontario health card for the first time within the previous 10 years (about 75% of this group would be expected to be recent immigrants and the remainder would be expected to have migrated from other Canadian provinces).[22] We used the Johns Hopkins Adjusted

Clinical Groups System, Version 10, to capture comorbidity according to Aggregated Diagnosis Groups.[23] We derived health service utilization from the OHIP, the National Ambulatory Care Reporting System, the Discharge Abstracts Database and the Ontario Mental Health Reporting System databases,[20] including primary care attachment,[24] number of core primary care visits[25] and number of psychiatric visits. Health service utilization and comorbidity were also examined over the 3 years before the study period (Apr. 1, 2013–Mar. 20, 2016), referred to as the look-back period, for additional contextual data. Core primary care visits were defined by billing codes for which 80% or more of all billings were submitted by primary care physicians, and those for which total primary care billings for the code represented at least 0.1% of all billings by primary care physicians.[25]

We identified primary care physicians and utilization using the Corporate Provider Database (a registry of all providers and provider groups eligible to bill OHIP for their services), the Client Agency Program Enrolment database (which lists all patients enrolled with a primary care physician within a primary care group) and Primary Care Population Database (an ICES derived cohort which includes data on primary care rostering, models of care and health system utilization for Ontario residents eligible for health services). We derived physician characteristics (age, sex, panel size, years since medical school graduation) from the Corporate Provider Database. We derived payment of SMI premiums from the architected payments data set, which includes physician payments that do not pertain to individual patient level services, such as premiums and bonuses, that are summed across a physician's entire practice.

Variables

Outcome

The dependent variable was the percentage of adults with SMI, diabetes mellitus and in the general population who were rostered, defined at the physician level, during the study period. The percent rostered was calculated as the proportion of the number rostered, divided by the total rostered and virtually rostered.

Exposure

The primary independent variable was primary care physician model of care (enhanced fee for service, team-based care and capitation without team-based care). To assess the relative contribution of the SMI premium to rostering, we created models with and without SMI premiums to assess change in model estimates.

Covariates

Covariates were selected theoretically based on literature on factors associated with access to care and opportunities for rostering to address potential confounding and included patient age, sex, income quintile, newly arrived in Ontario, rurality, Aggregated Diagnosis Groups, health system utilization within 3 years before study dates (primary care attachment, mean number of primary care visits, psychiatric hospital admissions), primary care visits during the study period, continuity of care and physician age, sex, rurality of practice, location of training, panel size and amount of SMI premium paid.[11,12]

Statistical analysis

We compared the demographic characteristics of people with SMI, with those with diabetes mellitus and with the adult population in Ontario, including those who were rostered and virtually rostered using consistent approaches to rostering among all 3 populations. Next, we compared the characteristics of physicians receiving SMI premium payments with those who did not receive these payments during the study period. For the outcome of number of patients rostered, patient data were aggregated at the physician level and the unit of observation was the primary care physician.

We determined that the outcome (number of patients rostered) was overdispersed, and, therefore, developed negative binomial models to model the counts of the number of rostered patients, with an offset for the log of the number of patients in the practice. Using complete cases, we modelled the relations between the number of rostered patients in the practice (by condition or the Ontario population) and the model of primary care. To examine the relative contribution of SMI premium payment status, we added this variable into each model to assess change in model estimates. Physicians with fewer than 100 patients in total (rostered or virtually rostered) were excluded. The means for continuous variables and the frequencies in each category represented for categorical variables were calculated. We adjusted for a number of patient and physician characteristics as prespecified covariates. Patient characteristics were aggregated at the physician level. Patient characteristics included in the model were age, sex, rurality, recent migration, neighbourhood income, comorbidity using Aggregated Diagnosis Groups, continuity of care and health care utilization in the look-back period (primary care attachment,[24] number of primary care visits and number of psychiatric hospital admissions). Continuity of care was determined at the practice level for patients with at least 3 primary care visits during the study period and was defined as the proportion of primary care visits with the patient's own provider. Physician-related covariates were physician age, sex, rurality, panel size, model of care and primary care visits during the study period. We repeated the analyses weighting the observations by the sum of rostered and virtually rostered patients, both with and without panel size included as a covariate in the model, to address concerns about physicians with different practice sizes having the same weight in the analysis. Finally, we did a weighted analysis including panel size but excluding SMI premium in the model. Analyses were completed using SAS version 9.4 (SAS Institute).

Ethics approval

The study was approved by the Queen's University Health Sciences Research Ethics Board. ICES is an independent,

nonprofit 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.

Results

We identified 592 431 adults in Ontario with an SMI (212 369 with schizophrenia and 380 062 with bipolar disorder) between Apr. 1, 2016, and Mar. 30, 2018, representing 5.7% of the general population in Ontario (Table 1). People with schizophrenia and bipolar disorder were more likely to live in lower income neighbourhoods (particularly those with schizophrenia) and in urban centres, and less likely to be recent immigrants to Ontario, than the general population. People with SMI were less likely to be attributed to a primary care provider (n = 559 505, 94.4% v. n = 990 193, 98.4%), and less likely to have accessed any primary care and to have lower continuity of care, in contrast to people with diabetes mellitus.

Among the 13 606 Ontario family physicians identified, 9730 (71.5%) practised in PEMs and would have been eligible to receive the SMI premium, and 4866 (50.0%) received a premium during the study period based on having at least 5 SMI patients on their roster (Table 2). Only 90 physicians were in a PEM and had at least 5 SMI patients in their roster but did not receive the premium. Compared with physicians practising in PEMs who were ineligible for the premium by having too few patients, those who received the highest premium payments were more likely to be male, had larger patient panel size and were more likely to work in capitation models (with and without team-based care). The patient panels of physicians practising in PEMs who were ineligible for the premiums did not differ by age and sex from the patient panels of physicians who received the premium or those who were not practising in PEMs, but included higher proportions of patients who were recent immigrants or living in urban settings (Table 3). Compared with practices of physicians practising in PEMs patients of physicians who were not practising in PEMs, were more likely to live in low-income neighbourhoods, be new immigrants, have higher morbidity and have more primary care visits. In total, $12 750 400 was paid in SMI premiums during the study period.

Among the 592 431 Ontario adults with SMI, 507 158 (85.6%) received primary care in PEMs, compared with 916 506 (91.0%) people with diabetes and 8 954 863 (85.6%) of the Ontario general population. Among the 507 158 people with SMI receiving primary care through PEMs, 88.4% were formally rostered, compared with 854 668 (93.3%) people with diabetes and 8 135 246 (90.8%) of the Ontario general population (Table 4). The proportion of adults with SMI rostered was consistently lower than those for either people with diabetes or in the Ontario general population across all patient and physician characteristics and all models of care. For people with SMI, rostering ranged from 145 252 (85.2%) for enhanced fee-for-service models, 147 487 (91.0%) for capitation models with team-based care and 149 674 (88.7%) for capitation models without team-based care, which were all less than rates observed for diabetes (90.6%–95.2%) and the Ontario general population (86.1%–94.1%) (Table 4).

Adjusted negative binomial models of the number of patients rostered, using panel size as an offset, determined that compared with enhanced fee for service, the likelihood of physicians rostering people with SMI was higher for those in capitation models with team-based care (adjusted relative risk [RR] 1.03 confidence interval [CI] 1.02–1.04) but not for capitation models without team-based care (adjusted RR 1.00 95% CI 0.99–1.01) (Table 5). In similar modelling for the population with diabetes, we found that the likelihood of rostering of patients with diabetes compared with enhanced fee for service was higher for capitation models with team-based care (adjusted RR 1.02, 95% CI 1.02–1.03) and for capitation models without team-based care (adjusted RR 1.02, 95% CI 1.02–1.03). Parameter estimates for similar modelling for the Ontario general population were capitation with team-based care (adjusted RR 1.04, 95% CI 1.04–1.05) and capitation without team-based care (adjusted RR 1.03, 95% CI 1.03–1.04). Probability testing for each of these models was conducted, testing against the null that there is no difference across enrolment models and was significant for all 3 models ($p < 0.001$). When the SMI premium was included in the model, the parameter estimates were unchanged.

Interpretation

Thirteen years after introduction of reforms into the payment and structure of primary care, including a financial incentive to promote enrolment of people with SMI, we found evidence of lower enrolment into new models for people with SMI compared with the Ontario general population. Including the SMI premium payment did not substantially change parameter estimates of the relation between enrolment model and rostering, suggesting that the SMI premium payment was not associated with rostering of SMI patients into PEM models.

People with SMI have complex needs, and it is encouraging to observe that overall rostering was quite high. Nevertheless, inequitable access to new models (shown by lower enrolment than for the Ontario general population) was still observed. In Ontario, provincial quality improvement systems, including incentives and practice-level reporting, for preventive care (such as cancer screening and vaccination) apply only to rostered patients. Lower rostering of people with SMI may then translate into lower quality of preventive care and contribute to adverse outcomes in a high-needs population with elevated risks of chronic disease, including cancer.[8,26] Furthermore, the incentive structure itself may limit its effect. Once a provider has enrolled 10 patients with SMI, there is no additional incentive to enrol additional patients. Modified capitation as implemented in Ontario includes adjustments for age and sex, but not for case mix, thereby embedding disincentives for enrolment of patients with complex needs. It is noteworthy that the intention to incorporate case-mix adjustment was outlined in the recent Physician Services Agreement, with specific details pending.[27]

Table 1: Characteristics of patients with serious mental illness, diabetes mellitus and the Ontario adult population in fiscal years 2016/17–2017/18

Variable	No. (%)*			
	Schizophrenia *n* = 212 369 (2.0)	Bipolar disorder *n* = 380 062 (3.6)	Diabetes mellitus *n* = 1 006 692 (9.6)	Ontario adult population *n* = 10 461 874 (100)
Age, yr				
18–44	93 280 (43.9)	161 255 (42.4)	93 775 (9.3)	4 589 401 (43.9)
45–64	84 567 (39.8)	155 639 (41.0)	431 846 (42.9)	3 803 639 (36.4)
65–74	21 315 (10.0)	41 890 (11.0)	274 731 (27.3)	1 211 001 (11.6)
≥ 75	13 207 (6.2)	21 278 (5.6)	206 340 (20.5)	857 833 (8.2)
Mean ± SD	47.58 ± 16.74	47.91 ± 16.53	62.91 ± 13.68	48.03 ± 17.98
Income quintile, patient				
Female	98 626 (46.4)	235 623 (62.0)	467 484 (46.4)	5 397 953 (51.6)
Q1 (low)	73 707 (34.7)	92 670 (24.4)	237 113 (23.6)	2 030 502 (19.4)
Q2	47 013 (22.1)	81 074 (21.3)	222 131 (22.1)	2 082 736 (19.9)
Q3	36 487 (17.2)	72 861 (19.2)	207 886 (20.7)	2 102 894 (20.1)
Q4	28 362 (13.4)	65 775 (17.3)	180 353 (17.9)	2 077 038 (19.9)
Q5 (high)	25 635 (12.1)	66 286 (17.4)	157 157 (15.6)	2 126 537 (20.3)
New arrival to Ontario†				
No	206 128 (97.1)	369 832 (97.3)	957 290 (95.1)	9 723 602 (92.9)
Yes	6241 (2.9)	10 230 (2.7)	49 402 (4.9)	738 272 (7.1)
RIO score group, patient				
Missing	1914 (0.9)	2507 (0.7)	10 821 (1.1)	105 539 (1.0)
Rural	14 123 (6.7)	24 417 (6.4)	74 753 (7.4)	770 884 (7.4)
Suburban	36 615 (17.2)	76 131 (20.0)	186 413 (18.5)	2 020 218 (19.3)
Urban	159 717 (75.2)	277 007 (72.9)	734 705 (73.0)	7 565 233 (72.3)
Total core primary care visits in study period				
0	30 794 (14.5)	33 178 (8.7)	37 080 (3.7)	1 626 541 (15.5)
1	15 123 (7.1)	20 998 (5.5)	27 528 (2.7)	954 361 (9.1)
2	14 445 (6.8)	23 002 (6.1)	36 122 (3.6)	960 777 (9.2)
3–5	39 221 (18.5)	73 871 (19.4)	155 561 (15.5)	2 444 397 (23.4)
6–10	47 922 (22.6)	100 963 (26.6)	327 580 (32.5)	2 449 347 (23.4)
≥ 11	64 864 (30.5)	128 050 (33.7)	422 821 (42.0)	2 026 451 (19.4)
Mean ± SD	9.30 ± 11.65	9.70 ± 10.22	11.32 ± 9.55	6.50 ± 7.59
Continuity of care for patients with > 2 primary care visits				
0–40	35 922 (23.6)	62 539 (20.6)	110 932 (12.2)	1 386 998 (20.0)
41–80	47 043 (30.9)	102 157 (33.7)	228 197 (25.2)	2 208 455 (31.9)
≥ 81	69 042 (45.4)	138 188 (45.6)	566 833 (62.6)	3 324 742 (48.0)
Sum of ADGs in look-back period‡				
0	7 728 (3.6)	9442 (2.5)	NA	695 482 (6.6)
1–5	57 548 (27.1)	83 433 (22.0)	256 557 (25.5)	4 092 896 (39.1)
6–10	81 085 (38.2)	158 263 (41.6)	439 434 (43.7)	3 992 407 (38.2)
≥ 11	66 008 (31.1)	128 924 (33.9)	310 701 (30.9)	1 681 089 (16.1)
Sum of psychosocial ADGs in look-back period‡				
0	38 749 (18.2)	89 647 (23.6)	622 203 (61.8)	6 951 222 (66.4)
1	62 587 (29.5)	141 303 (37.2)	297 974 (29.6)	2 773 087 (26.5)
2	78 617 (37.0)	113 992 (30.0)	73 167 (7.3)	619 047 (5.9)
3	32 416 (15.3)	35 120 (9.2)	13 348 (1.3)	118 518 (1.1)
Psychiatry visits during the study period, mean ± SD	3.68 ± 9.53	2.62 ± 9.01	0.34 ± 3.06	0.32 ± 3.26

Note: ADGs = Aggregated Diagnosis Groups, NA = not applicable, SD = standard deviation, RIO = Rurality Index of Ontario.
*Unless otherwise indicated.
†New arrival in Ontario: receiving an Ontario health card for the first time in the preceding 10 years.
‡Look-back period: Apr. 1, 2013–Mar. 30, 2016.

Table 2: Characteristics of family physicians eligible for serious mental illness premium in fiscal years 2016/17–2017/18

Variable	Physicians receiving SMI premium, no. (%)*				Physicians not receiving SMI premium, no. (%)*			
	$3001–$4000, *n* = 1767	$2001–$3000, *n* = 723	$1001–$2000, *n* = 1310	≤ $1000, *n* = 1066	Eligible (had ≥ 5 patients with SMI), *n* = 90	Ineligible (< 5 patients with SMI) in an eligible model, *n* = 4774	Non-PEM physicians, *n* = 3876	Total, no. (%),* *n* = 13 606
Age, yr								
Mean ± SD	51.07 ± 11.54	49.46 ± 12.20	48.90 ± 12.16	48.21 ± 12.82	49.02 ± 10.77	51.24 ± 12.71	49.28 ± 14.54	50.09 ± 13.06
Sex								
Missing or unknown	0 (0.0)	0 (0.0)	19 (1.5)	33 (3.1)	0 (0.0)	162 (3.4)	245 (6.3)	459 (3.4)
Female	699 (39.6)	343 (47.4)	647 (49.4)	547 (51.3)	43 (47.8)	2180 (45.7)	1567 (40.4)	6026 (44.3)
Male	1068 (60.4)	380 (52.6)	644 (49.2)	486 (45.6)	47 (52.2)	2432 (50.9)	2064 (53.3)	7121 (52.3)
Time since medical school graduation, yr, mean ± SD	24.23 ± 12.21	22.55 ± 12.83	22.02 ± 12.72	21.37 ± 13.45	22.41 ± 11.43	24.36 ± 13.25	22.16 ± 15.02	23.16 ± 13.61
Rurality								
Missing	0 (0.0)	≤ 5 (0.1)	29 (2.2)	40 (3.8)	0 (0.0)	182 (3.8)	282 (7.3)	534 (3.9)
Urban	1328 (75.2)	547 (75.7)	978 (74.7)	724 (67.9)	53 (58.9)	3494 (73.2)	2872 (74.1)	9996 (73.5)
Suburban	346 (19.6)	132 (18.3)	217 (16.6)	206 (19.3)	26 (28.9)	750 (15.7)	474 (12.2)	2151 (15.8)
Rural	93 (5.3)	43 (5.9)	86 (6.6)	96 (9.0)	11 (12.2)	348 (7.3)	248 (6.4)	925 (6.8)
Panel size,† mean ± SD	1854.20 ± 859.92	1694.31 ± 883.63	1615.77 ± 775.60	1532.64 ± 836.58	1488.84 ± 630.98	1528.04 ± 903.87	1182.97 ± 763.88	1596.97 ± 875.32
Enrolment model								
Blended capitation team-based care	649 (36.7)	264 (36.5)	487 (37.2)	341 (32.0)	42–46 (46.7– 51.1)	1015–1019 (21.3)	0 (0.0)	2802 (20.6)
Blended capitation no team-based care	696 (39.4)	277 (38.3)	446 (34.0)	298 (28.0)	43 (47.8)	947 (19.8)	0 (0.0)	2707 (19.9)
Enhanced fee for service	362 (20.5)	149 (20.6)	231 (17.6)	250 (23.5)	0 (0.0)	1834 (38.4)	0 (0.0)	2826 (20.8)
Other	60 (3.4)	33 (4.6)	146 (11.1)	177 (16.6)	≤ 5 (4.4)	974–978 (20.4–20.5)	3876 (100.0)	5271 (38.7)
No. of patients with schizophrenia, mean ± SD								
Total	32.72 ± 26.47	24.41 ± 17.46	19.68 ± 15.90	17.07 ± 14.56	16.87 ± 9.52	15.13 ± 13.90	6.18 ± 10.53	17.55 ± 18.49
Rostered	28.90 ± 23.88	20.86 ± 15.51	16.59 ± 13.99	14.15 ± 13.08	13.67 ± 8.23	12.11 ± 11.83	0.00 ± 0.06	13.76 ± 16.62
Virtually rostered	3.82 ± 6.13	3.55 ± 5.12	3.09 ± 5.14	2.92 ± 4.73	3.19 ± 3.00	3.02 ± 5.38	6.18 ± 10.53	3.80 ± 6.81
No. of patients with bipolar disorder, mean ± SD								
Total	55.04 ± 39.05	45.84 ± 30.23	37.92 ± 29.94	33.67 ± 27.65	37.78 ± 25.65	30.52 ± 30.82	7.38 ± 11.53	31.59 ± 32.67
Rostered	49.79 ± 36.69	40.47 ± 28.76	33.05 ± 27.99	28.81 ± 26.24	32.62 ± 24.16	25.89 ± 27.54	0.01 ± 0.11	26.19 ± 30.65
Virtually rostered	5.26 ± 6.91	5.38 ± 6.62	4.87 ± 6.56	4.85 ± 6.56	5.16 ± 4.07	4.63 ± 8.56	7.37 ± 11.53	5.40 ± 8.64

Note: PEM = patient enrolment model, SD = standard deviation, SMI = serious mental illness.
*Unless indicated otherwise.
†Panel size = rostered and virtually rostered patients in past 2 years.

Table 3: Characteristics of patients enrolled with family physician eligible for serious mental illness premium in fiscal years 2016/17–2017/18

Variable	No. (%)*							
	$3001–$4000 *n* = 2 307 819	$2001–$3000 *n* = 825 873	$1001–$2000 *n* = 1 304 148	≤ $1000 *n* = 934 499	Eligible (had ≥ 5 SMI patients), no premium *n* = 88 890	Ineligible (< 5 SMI patients) in an eligible model *n* = 3 642 797	Non-PEM physicians *n* = 373 489	Total *n* = 9 477 515
Age at index, yr								
18–44	954 450 (41.4)	347 823 (42.1)	548 041 (42.0)	397 114 (42.5)	36 363 (40.9)	1 590 094 (43.7)	138 273 (37.0)	4 012 158 (42.3)
45–64	858 945 (37.2)	301 975 (36.6)	482 621 (37.0)	344 002 (36.8)	32 479 (36.5)	1 335 576 (36.7)	143 141 (38.3)	3 498 739 (36.9)
65–74	286 368 (12.4)	101 979 (12.3)	158 648 (12.2)	114 185 (12.2)	11 745 (13.2)	422 858 (11.6)	51 108 (13.7)	1 146 891 (12.1)
≥ 75	208 056 (9.0)	74 096 (9.0)	114 838 (8.8)	79 198 (8.5)	8303 (9.3)	294 269 (8.1)	40 967 (11.0)	819 727 (8.6)
Mean ± SD	49.03 ± 18.12	48.86 ± 18.09	48.76 ± 18.06	48.57 ± 17.99	49.34 ± 18.31	48.07 ± 17.86	50.98 ± 18.31	48.64 ± 18.02
Sex, female	1 191 074 (51.6)	436 917 (52.9)	705 173 (54.1)	506 256 (54.2)	47 322 (53.2)	1 934 913 (53.1)	197 062 (52.8)	5 018 717 (53.0)
Income quintile, patient								
Q1 (low)	462 482 (20.0)	154 425 (18.7)	236 646 (18.1)	161 755 (17.3)	15 002 (16.9)	659 526 (18.1)	92 058 (24.6)	1 781 894 (18.8)
Q2	466 334 (20.2)	165 135 (20.0)	255 402 (19.6)	178 764 (19.1)	15 900 (17.9)	716 594 (19.7)	80 561 (21.6)	1 878 690 (19.8)
Q3	459 216 (19.9)	167 933 (20.3)	261 031 (20.0)	190 827 (20.4)	17 480 (19.7)	750 051 (20.6)	74 611 (20.0)	1 921 149 (20.3)
Q4	441 416 (19.1)	162 172 (19.6)	265 909 (20.4)	197 063 (21.1)	18 485 (20.8)	763 377 (21.0)	66 202 (17.7)	1 914 624 (20.2)
Q5 (high)	473 584 (20.5)	174 595 (21.1)	282 464 (21.7)	204 195 (21.9)	21 852 (24.6)	745 371 (20.5)	59 063 (15.8)	1 961 124 (20.7)
Missing	4787 (0.2)	1613 (0.2)	2696 (0.2)	1895 (0.2)	171 (0.2)	7878 (0.2)	994 (0.3)	20 034 (0.2)
New arrival to Ontario								
No	2 203 310 (95.5)	778 408 (94.3)	1 225 055 (93.9)	873 121 (93.4)	85 063 (95.7)	3 341 258 (91.7)	345 593 (92.5)	8 851 808 (93.4)
Yes	104 509 (4.5)	47 465 (5.7)	79 093 (6.1)	61 378 (6.6)	3827 (4.3)	301 539 (8.3)	27 896 (7.5)	625 707 (6.6)
Rurality, patient								
Urban	1 645 034 (71.3)	597 805 (72.4)	936 030 (71.8)	653 124 (69.9)	49 727 (55.9)	2 710 734 (74.4)	289 903 (77.6)	6 882 357 (72.6)
Suburban	500 010 (21.7)	169 018 (20.5)	256 380 (19.7)	187 267 (20.0)	26 262 (29.5)	658 362 (18.1)	50 517 (13.5)	1 847 816 (19.5)
Rural	149 890 (6.5)	54 391 (6.6)	101 727 (7.8)	88 015 (9.4)	11 214 (12.6)	245 121 (6.7)	26 939 (7.2)	677 297 (7.1)
Missing	12 885 (0.6)	4659 (0.6)	10 011 (0.8)	6093 (0.7)	1687 (1.9)	28 580 (0.8)	6130 (1.6)	70 045 (0.7)
Sum of ADGs in look-back period†								
0	91 519 (4.0)	30 267 (3.7)	50 933 (3.9)	36 092 (3.9)	3601 (4.1)	145 728 (4.0)	6648 (1.8)	364 788 (3.8)
1–5	897 827 (38.9)	319 607 (38.7)	512 007 (39.3)	358 194 (38.3)	37 015 (41.6)	1 384 168 (38.0)	114 154 (30.6)	3 622 972 (38.2)
6–10	921 573 (39.9)	332 292 (40.2)	523 081 (40.1)	378 056 (40.5)	34 458 (38.8)	1 483 288 (40.7)	165 320 (44.3)	3 838 068 (40.5)
≥11	396 900 (17.2)	143 707 (17.4)	218 127 (16.7)	162 157 (17.4)	13 816 (15.5)	629 613 (17.3)	87 367 (23.4)	1 651 687 (17.4)
Psychosocial ADGs in look-back period†								
0	1 458 436 (63.2)	530 378 (64.2)	848 479 (65.1)	609 479 (65.2)	59 651 (67.1)	2 405 454 (66.0)	202 272 (54.2)	6 114 149 (64.5)
1	658 251 (28.5)	232 994 (28.2)	361 883 (27.7)	259 414 (27.8)	23 261 (26.2)	996 946 (27.4)	125 393 (33.6)	2 658 142 (28.0)
2	159 368 (6.9)	52 723 (6.4)	79 046 (6.1)	55 698 (6.0)	5056 (5.7)	204 210 (5.6)	36 605 (9.8)	592 706 (6.3)
3	31 764 (1.4)	9778 (1.2)	14 740 (1.1)	9908 (1.1)	922 (1.0)	36 187 (1.0)	9219 (2.5)	112 518 (1.2)
Psychiatric hospitalization in look-back period†								
Mean ± SD	0.02 ± 0.25	0.02 ± 0.24	0.02 ± 0.22	0.02 ± 0.21	0.01 ± 0.18	0.02 ± 0.22	0.04 ± 0.40	0.02 ± 0.24
Total core primary care visits in study period†								
0	237 754 (10.3)	79 765 (9.7)	130 508 (10.0)	89 789 (9.6)	10 136 (11.4)	344 073 (9.4)	16 186 (4.3)	908 211 (9.6)
1	222 485 (9.6)	79 499 (9.6)	124 800 (9.6)	85 956 (9.2)	9873 (11.1)	330 709 (9.1)	9381 (2.5)	862 703 (9.1)
2	229 656 (10.0)	82 718 (10.0)	130 338 (10.0)	90 181 (9.7)	10 101 (11.4)	337 166 (9.3)	14 167 (3.8)	894 327 (9.4)
3–5	588 811 (25.5)	214 719 (26.0)	339 289 (26.0)	237 518 (25.4)	24 628 (27.7)	879 080 (24.1)	76 899 (20.6)	2 360 944 (24.9)
6–10	581 432 (25.2)	210 175 (25.4)	332 059 (25.5)	242 029 (25.9)	21 686 (24.4)	922 331 (25.3)	117 603 (31.5)	2 427 315 (25.6)
≥11	447 681 (19.4)	158 997 (19.3)	247 154 (19.0)	189 026 (20.2)	12 466 (14.0)	829 438 (22.8)	139 253 (37.3)	2 024 015 (21.4)
Continuity of care,‡ %								
0–40	290 431 (18.0)	107 264 (18.4)	174 785 (19.0)	147 292 (22.0)	581 342 (21.6)	35 981 (10.8)	1 337 095 (19.6)	290 431 (18.0)
41–80	488 994 (30.2)	185 762 (31.8)	295 262 (32.1)	225 428 (33.7)	843 174 (31.3)	126 545 (37.9)	2 165 165 (31.8)	488 994 (30.2)
> 80	838 499 (51.8)	290 865 (49.8)	448 455 (48.8)	295 853 (44.3)	1 265 113 (47.0)	171 229 (51.3)	3 310 014 (48.6)	838 499 (51.8)

Note: ADGs = Aggregated Diagnosis Groups, PEM = patient enrolment model, SD = standard deviation, SMI = serious mental illness.
*Unless stated otherwise.
†Look-back period: Apr. 1, 2013–Mar. 30, 2016.
‡Continuity of care: proportion of primary care visits with the person's own physician (for those with ≥ 3 primary care visits in 2 years).

Table 4 (part 1 of 2): Proportion of patients rostered to primary care by patient and provider characteristics

Variable	No. (%)*		
	SMI patients (rostered), *n* = 448 319	Diabetes mellitus patients (rostered), *n* = 854 668	Ontario population (rostered), *n* = 8 135 246
Patient characteristics			
Proportion of total Ontario population, %	4.3	8.2	77.8
Proportion rostered, %	88.4	93.3	90.8
Age, yr			
18–44	186 077 (86.4)	75 707 (90.3)	3 388 208 (88.7)
45–64	184 472 (89.2)	364 188 (92.8)	3 029 283 (91.8)
65–74	50 514 (91.4)	236 718 (94.1)	1 005 245 (93.6)
≥ 75	27 256 (91.7)	178 055 (94.4)	712 510 (94.0)
Age, yr, mean ± SD	48.34 ± 16.61	63.16 ± 13.53	48.91 ± 17.97
Sex			
Male	186 458 (87.5)	456 420 (93.2)	3 799 657 (90.1)
Female	261 861 (89.0)	398 248 (93.3)	4 335 589 (91.5)
Income quintile, patient			
Missing	1168 (79.2)	1348 (85.1)	14 808 (79.0)
Q1 (low)	117 950 (86.6)	195 392 (92.3)	1 477 462 (89.2)
Q2	96 584 (88.3)	188 533 (93.3)	1 602 289 (90.6)
Q3	84 809 (89.2)	178 112 (93.6)	1 657 195 (91.2)
Q4	74 650 (89.6)	155 313 (93.7)	1 666 417 (91.5)
Q5 (high)	73 158 (89.6)	135 970 (93.7)	1 717 075 (91.6)
New arrival to Ontario			
Yes	11 349 (84.9)	39 709 (89.6)	511 661 (86.8)
No	436 970 (88.5)	814 959 (94.3)	7 634 585 (91.9)
Rurality			
Missing	2365 (84.2)	7243 (90.8)	53 855 (87.1)
Rural	28 440 (88.9)	62 534 (94.0)	587 390 (92.6)
Suburban	87 323 (89.2)	162 483 (94.3)	1 631 452 (92.2)
Urban	330 191 (88.2)	622 408 (92.9)	5 862 549 (90.3)
Sum of ADGs in look-back period			
0	6884 (89.8)	NA	321 924 (90.8)
1–5	101 956 (88.5)	217 459 (93.8)	3 114 293 (90.0)
6–10	187 590 (88.9)	376 133 (93.6)	3 303 576 (91.5)
≥ 11	151 889 (87.7)	261 076 (92.4)	1 395 453 (91.2)
Psychosocial ADGs in look-back period			
0	92 430 (89.8)	534 174 (93.9)	5 307 675 (91.1)
1	160 749 (89.6)	251 122 (92.8)	2 263 334 (91.1)
2	147 070 (87.6)	59 281 (90.8)	480 171 (88.7)
3	48 070 (84.4)	10 091 (87.6)	84 066 (84.4)
Primary care attachment in look-back period			
Attached	444 994 (89.2)	852 469 (93.5)	8 040 316 (92.2)
Unattached	3325 (39.5)	2199 (49.3)	94 930 (40.2)
Primary care visits in the look-back period (primary care utilization), mean ± SD	22.80 ± 26.04	23.48 ± 19.01	13.92 ± 15.73

Table 4 (part 2 of 2): Proportion of patients rostered to primary care by patient and provider characteristics

Variable	No. (%)*		
	SMI patients (rostered), *n* = 448 319	Diabetes mellitus patients (rostered), *n* = 854 668	Ontario population (rostered), *n* = 8 135 246
Patient characteristics			
Psychiatric hospital admissions in look-back period			
0	403 260 (88.9)	845 144 (93.3)	8 058 855 (90.9)
1	27 809 (85.1)	6865 (89.0)	54 145 (85.9)
≥ 2	17 250 (83.1)	2659 (85.1)	22 246 (83.3)
Psychiatry visits during the study period, mean ± SD	3.03 ± 9.23	0.33 ± 2.97	0.32 ± 3.27
Psychiatric hospital admissions during the study period			
0	415 028 (88.8)	846 442 (93.3)	8 074 434 (90.9)
1	21 934 (84.4)	6429 (89.1)	45 620 (85.6)
≥ 2	11 357 (82.3)	1797 (85.9)	15 192 (82.8)
Provider characteristics			
Physician sex			
Female	180 920 (89.4)	294 295 (93.6)	3 272 627 (91.5)
Male	267 399 (87.7)	560 373 (93.1)	4 862 619 (90.4)
Physician age, yr, mean ± SD	51.87 ± 11.63	53.30 ± 11.46	52.39 ± 11.37
Rurality			
Missing	701 (83.1)	1859 (87.9)	14 078 (87.9)
Rural	22 932 (89.6)	51 201 (94.7)	460 515 (93.3)
Suburban	77 781 (89.3)	147 931 (94.6)	1 447 933 (92.7)
Urban	346 905 (88.1)	653 677 (92.9)	6 212 720 (90.3)
Panel size, mean ± SD	1957.03 ± 1025.16	2091.80 ± 1055.08	2034.42 ± 1036.28
Total core primary care visits in study period			
0	30 482 (100.0)	21 561 (100.0)	871 124 (100.0)
1	24 629 (80.3)	20 651 (86.1)	711 475 (83.9)
2	27 961 (84.8)	29 263 (89.6)	762 917 (87.5)
3–5	90 066 (87.8)	133 167 (92.3)	2 027 137 (90.0)
6–10	121 877 (89.3)	288 343 (94.0)	2 075 481 (91.6)
≥ 11	153 304 (88.2)	361 683 (93.3)	1 687 112 (91.4)
Mean ± SD	9.93 ± 10.30	11.38 ± 9.25	6.92 ± 7.43
Continuity of care, %			
0–40	79 427 (89.5)	95 283 (93.3)	1 163 249 (91.2)
41–80	110 935 (84.5)	184 573 (90.4)	1 736 926 (87.7)
> 80	174 885 (90.6)	503 337 (94.6)	2 889 555 (93.0)
Attachment by collapsed model of care			
Blended capitation team-based care	147 487 (91.0)	240 428 (95.2)	2 517 934 (94.1)
Blended capitation no team-based care	149 674 (88.7)	294 021 (94.5)	2 862 906 (92.6)
Enhanced fee for service	145 252 (85.2)	312 141 (90.6)	2 677 226 (86.1)
Other	5906 (100.0)	8078 (100.0)	77 180 (100.0)

*Unless otherwise stated.
Note: ADGs = Aggregated Diagnosis Groups, NA = not applicable, SD = standard deviation, SMI = serious mental illness.

Table 5: Adjusted models of proportion of patients rostered, weighted by practice size*

Model	Estimate (95% CI)		
	SMI	Diabetes mellitus	Ontario population
Regression model without SMI premium			
Enrolment model (Ref. = enhanced fee for service)			
Family health team	1.03 (1.02–1.04)	1.02 (1.02–1.03)	1.04 (1.04–1.05)
Capitation model	1.00 (0.99–1.01)	1.03 (1.02–1.03)	1.03 (1.03–1.04)
Other group	1.05 (1.02–1.08)	1.03 (1.00–1.05)	1.03(1.02–1.04)
Regression model with SMI premium			
Enrolment model (Ref. = enhanced fee for service)			
Family health team	1.02 (1.01–1.03)	1.02 (1.01–1.03)	1.04 (1.04–1.04)
Capitation model	1.00 (0.99–1.01)	1.02 (1.01–1.03)	1.03 (1.03–1.03)
Other group	1.04 (1.01–1.07)	1.02 (0.99–1.04)	1.02 (1.01–1.03)

Note: CI = confidence interval, SMI = serious mental illness.
*All models adjusted for patient age, sex, income quintile, newly arrived in Ontario, rurality, Aggregated Diagnosis Groups, health system utilization in 3 years before study dates (primary care attachment, mean number of primary care visits, psychiatric hospital admissions), primary care visits during the study period, continuity of care and physician age, sex, rurality of practice, location of training, panel size.

Our findings are consistent with a substantial body of research demonstrating the limited effect of pay-for-performance measures. Pay for performance has been implemented in many countries and settings, and by using different structures and targets. A recent systematic review found that most pay-for-performance programs target chronic disease management in primary care, and found evidence of short-term improvements in process of care outcomes, but little or no effect was shown for improved health outcomes (intermediate or patient-important outcomes), or longer term improvements.[28] Older systematic reviews drew similar conclusions.[29,30] Few studies have examined pay for performance for mental health care. Rudoler and colleagues[31] found no increased provision of follow-up care after psychiatric hospital admission or after suicide attempts after implementation of a financial incentive. In the United Kingdom, financial incentives were associated with improvements in screening and intervention on physical health (weight, blood pressure, lipid and glucose screening) in people with psychosis in secondary care.[32] Gutacker and colleagues[33] found that better performance on quality metrics of mental health care in the UK was associated with higher rates of psychiatric hospital admission. A pay-for-performance program in Taiwan was associated with reduction in unscheduled outpatient visits and compulsory admissions but no change in emergency department visits or acute psychiatric hospital admissions or readmissions.[34] In British Columbia, incentives targeting primary mental health care for people with depression were associated with incremental improvements in the targeted domains but worsening continuity of care.[35]

Limitations

Study strengths include the inclusion of linked population level data, which limits potential selection bias. Our study has some limitations. The administrative data used were not designed for research purposes. Only people with valid health care coverage were included, which limited the sample to permanent residents of Ontario. The cross-sectional design precludes determination of a causal relation between premium payment with increased enrolment of people with SMI into new models. In addition, the results may be biased by residual confounding. For example, a substantial proportion of people experiencing homelessness or precarious housing are affected by SMI[36] and have challenges accessing health care services.[37,38] However, history of homelessness is not reported in administrative data. We also could not directly assess severity of illness through administrative data, though we used psychiatric hospital admissions as a proxy measure. We were unable to account for clustering at a clinic level. In addition, we could not account for people who did not access health services during the study period. Nonetheless, we expect the effect to be limited as we believe we have been thorough in identifying relevant confounders. The diagnostic code to select for bipolar disorder has not been validated. The extent to which it may include people with major depressive disorder is unclear.

Conclusion

This study found that incentives were not associated with rostering SMI patients. Though overall rostering for people with SMI was high, there were still inequities in the likelihood to be rostered. Additional policy measures are needed to promote rostering of this underserved population with complex needs.

References

1. *Table 1: Rates of selected mental or substance use disorders, lifetime and 12 month, Canada, household population 15 and older, 2012*. Ottawa: Statistics Canada; 2012. Available: https://www150.statcan.gc.ca/n1/pub/82-624-x/2013001/article/tbl/tbl1-eng.htm (accessed 2021 Nov. 29).
2. Center for Behavioral Health Statistics and Quality. *Behavioral health trends in the United States: results from the 2014 National Survey on Drug Use and Health*. Vol. HHS Publication No. SMA 15-4927, NSDUH Series H-50. Rockville (MD): SAMHSA, U.S. Department of Health and Human Services (HHS); 2015. Available: https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR1-2014/NSDUH-FRR1-2014.pdf (accessed 2021 Nov. 29).
3. Whiteford HA, Degenhardt L, Rehm J, et al. Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. *Lancet* 2013;382:1575-86.
4. Planner C, Gask L, Reilly S. Serious mental illness and the role of primary care. [Review]. *Curr Psychiatry Rep* 2014;16:458.
5. Kontopantelis E, Olier I, Planner C, et al. Primary care consultation rates among people with and without severe mental illness: a UK cohort study using the Clinical Practice Research Datalink. *BMJ Open* 2015;5:e008650. doi: 10.1136/bmjopen-2015-008650.
6. Bradford DW, Kim MM, Braxton LE, et al. Access to medical care among persons with psychotic and major affective disorders. *Psychiatr Serv* 2008;59:847-52.
7. Ross LE, Vigod S, Wishart J, et al. Barriers and facilitators to primary care for people with mental health and/or substance use issues: a qualitative study. *BMC Fam Pract* 2015;16:135.
8. Kurdyak P, Vigod S, Duchen R, et al. Diabetes quality of care and outcomes: comparison of individuals with and without schizophrenia. *Gen Hosp Psychiatry* 2017;46:7-13.
9. Aggarwal A, Pandurangi A, Smith W. Disparities in breast and cervical cancer screening in women with mental illness: a systematic literature review. *Am J Prev Med* 2013;44:392-8.
10. Hutchison B, Glazier RH. Ontario's primary care reforms have transformed the local care landscape, but a plan is needed for ongoing improvement. *Health Aff (Millwood)* 2013;32:695-703.
11. Steele LS, Durbin A, Sibley J, et al. Inclusion of persons with mental illness in patient-centred medical homes: cross-sectional findings from Ontario, Canada. *Open Med* 2013;7:e9-20.
12. Steele LS, Durbin A, Lin E, et al. Primary care reform and service use by people with serious mental illness in Ontario. *Healthc Policy* 2014;10:31-45.
13. Billing & payment guide for Family Health Organization (FHO) physicians – opting for solo payment. Blended models – primary health care. Version 1.0. Toronto: Ministry of Health and Long-Term Care; November 2014. Available: https://www.health.gov.on.ca/en/pro/programs/ohip/publications/docs/fho_billing_payment_guide_nov2014_en.pdf (accessed 2022 Dec. 1).
14. Billing & payment guide for family health organization (FHO) physicians-opting for solo payment. Toronto: Ontario Ministry of Health and Long-Term Care; 2014. Available: https://www.health.gov.on.ca/en/pro/programs/ohip/publications/docs/fho_billing_payment_guide_nov2014_en.pdf (accessed 2021 Nov. 29).
15. von Elm E, Altman DG, Egger M, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *BMJ* 2007;335:806-8.
16. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders (DSM-5®), fifth edition*. Washington (D.C.): American Psychiatric Association Publishing; 2013.
17. Hux JE, Ivis F, Flintoft V, et al. Diabetes in Ontario: determination of prevalence and incidence using a validated administrative data algorithm. *Diabetes Care* 2002;25:512-6.
18. Singh J, Dahrouge S, Green ME. The impact of the adoption of a patient rostering model on primary care access and continuity of care in urban family practices in Ontario, Canada. *BMC Fam Pract* 2019;20:52.
19. Glazier R, Moineddin R, Agha M, et al. The impact of not having a primary care physician among people with chronic conditions: ICES investigative report. Toronto: ICES; 2008. Available: https://www.ices.on.ca/flip-publication/the-impact-of-not-having-a-primary-care-physician-chronic-conditions/files/assets/common/downloads/ICES%20.pdf (accessed 2021 Oct. 7).
20. ICES Data Dictionary. Toronto: ICES. Available: https://datadictionary.ices.on.ca/Applications/DataDictionary/Default.aspx (accessed 2022 July 2).
21. Kralji B. Measuring rurality — RIO2008 BASIC: methodology and results. Toronto: Ontario Medical Association; 2009. Available: https://docplayer.net/91599736-Measuring-rurality-rio2008_basic-methodology-and-results.html (accessed 2022 Feb. 26).
22. Selected demographic, cultural, educational, labour force and income characteristics, mother tongue, age groups and sex for the population of Canada, provinces, territories, census divisions and census subdivisions, 2006 Census. Ottawa: Statistics Canada; 2006. Available: https://www12.statcan.gc.ca/census-recensement/2006/dp-pd/tbt/Rp-eng.cfm?LANG=E&APATH=3&DETAIL=0&DIM=0&FL=A&FREE=0&GC=0&GID=0&GK=0&GRP=1&PID=99015&PRID=0&PTYPE=88971,97154&S=0&SHOWALL=0&SUB=0&Temporal=2006&THEME=70&VID=0&VNAMEE=&VNAMEF= (accessed 2019 Aug. 21).
23. Johns Hopkins ACG® System. Baltimore (MD): Johns Hopkins. Available: https://www.hopkinsacg.org/about-the-acg-system/ (accessed 2022 July 2).
24. Jaakkimainen L, Bayoumi I, Glazier R, et al. Development and validation of an algorithm using health administrative data to define patient attachment to primary care providers. *J Health Organ Manag* 2021;July 26:733-43. doi: 10.1108/JHOM-05-2020-0171. [Epub ahead of print].
25. Schultz SE, Glazier RH. Identification of physicians providing comprehensive primary care in Ontario: a retrospective analysis using linked administrative data. *CMAJ Open* 2017;5:E856-63.
26. Hippisley-Cox J, Vinogradova Y, Coupland C, et al. Risk of malignancy in patients with schizophrenia or bipolar disorder: nested case-control study. *Arch Gen Psychiatry* 2007;64:1368-76.
27. Ontario's doctors ratify new three-year agreement with province [news release]. Toronto: Ontario Medical Association; 2022 Mar. 28. Available: https://www.oma.org/newsroom/news/2022/march/ontarios-doctors-ratify-new-three-year-agreement-with-province/ (accessed 2021 Oct. 29).
28. Mendelson A, Kondo K, Damberg C, et al. The effects of pay-for-performance programs on health, health care use, and processes of care: a systematic review. *Ann Intern Med* 2017;166:341-53.
29. Campbell SM, Reeves D, Kontopantelis E, et al. Effects of pay for performance on the quality of primary care in England. *N Engl J Med* 2009;361:368-78.
30. Eijkenaar F, Emmert M, Scheppach M, et al. Effects of pay for performance in health care: a systematic review of systematic reviews. *Health Policy* 2013;110:115-30.
31. Rudoler D, de Oliveira C, Cheng J, et al. Payment incentives for community-based psychiatric care in Ontario, Canada. *CMAJ* 2017;189:E1509-16.
32. Crawford MJ, Huddart D, Craig E, et al. Impact of secondary care financial incentives on the quality of physical healthcare for people with psychosis: a longitudinal controlled study. *Br J Psychiatry* 2019;215:720-5.
33. Gutacker N, Mason AR, Kendrick T, et al. Does the quality and outcomes framework reduce psychiatric admissions in people with serious mental illness? A regression analysis. *BMJ Open* 2015;5:e007342. doi: 10.1136/bmjopen-2014-007342.
34. Chen T-T, Yang J-J, Hsueh Y-SA, et al. The effects of a schizophrenia pay-for-performance program on patient outcomes in Taiwan. *Health Serv Res* 2019;54:1119-25.
35. Puyat JH, Kazanjian A, Wong H, et al. Is the road to mental health paved with good incentives? Estimating the population impact of physician incentives on mental health care using linked administrative data. *Med Care* 2017;55:182-90.
36. Fazel S, Khosla V, Doll H, et al. The prevalence of mental disorders among the homeless in western countries: systematic review and meta-regression analysis. *PLoS Med* 2008;5:e225.
37. Desai MM, Rosenheck RA. Unmet need for medical care among homeless adults with serious mental illness. *Gen Hosp Psychiatry* 2005;27:418-25.
38. Hwang SW, Burns T. Health interventions for people who are homeless. *Lancet* 2014;384:1541-7.

Affiliations: ICES Queen's (Bayoumi, Whitehead, Li), Queen's University, Kingston, Ont.; ICES Central (Kurdyak, Glazier), Toronto, Ont.; Department of Family Medicine (Bayoumi), Queen's University, Kingston, Ont.; Centre for Addiction and Mental Health (Kurdyak), Toronto, Ont.; Department of Psychiatry (Kurdyak), University of Toronto; Department of Family and Community Medicine (Glazier), University of Toronto and St. Michael's Hospital; MAP Centre for Urban Health Solutions (Glazier), St. Michael's Hospital, Toronto, Ont.

Contributors: All authors take responsibility for the integrity of the data and the accuracy of the data analysis. All authors conceptualized and designed the study, interpreted the data, critically revised and reviewed the manuscript for important intellectual content, and approved the final manuscript. Imaan Bayoumi prepared the initial draft of the manuscript. Marlo Whitehead and Wenbin Li performed the statistical analysis.

Funding: This study was supported by ICES, which is funded by an annual grant from the Ontario Ministry of Health (MOH) and the Ministry of Long-Term Care. This study also received funding from the Centre for Studies in Primary Care Research Initiation Grant, Queen's University. Parts of this material are based on data and information compiled and provided by the MOH, the Canadian Institute for Health Information, Cancer Care Ontario and The Johns Hopkins ACG® System Version 10. The analyses, conclusions, opinions and statements expressed herein are solely those of the authors and do not reflect those of the funding or data sources; no endorsement is intended or should be inferred.

Data sharing: The data set from this study is held securely in coded form at ICES. While legal data sharing agreements between ICES and data providers (e.g., health care organizations and government) prohibit ICES from making the data set publicly available, access may be granted to those who meet prespecified criteria for confidential access, available at https://www.ices.on.ca/DAS (email: das@ices.on.ca). The full data set creation plan and underlying analytic code are available from the authors upon request, understanding that the computer programs may rely upon coding templates or macros that are unique to ICES and are therefore either inaccessible or may require modification.

Supplemental information: For reviewer comments and the original submission of this manuscript, please see www.cmajopen.ca/content/11/1/E1/suppl/DC1.