

# Patient characteristics associated with enrolment under voluntary programs implemented within fee-for-service systems in British Columbia and Quebec: a cross-sectional study

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## Abstract

**Background:** There is a paucity of information on patient characteristics associated with enrolment under voluntary programs (e.g. incentive payments) implemented within fee-for-service systems. We explored patient characteristics associated with enrolment under these programs in British Columbia and Quebec.

**Methods:** We used linked administrative data and a cross-sectional design to compare people aged 40 years or more enrolled under voluntary programs to those who were eligible but not enrolled. We examined 2 programs in Quebec (enrolment of vulnerable patients with qualifying conditions [implemented in 2003] and enrolment of the general population [2009]) and 3 in BC (Chronic disease incentive [2003], Complex care incentive [2007] and enrolment of the general population [A GP for Me, 2013]). We used logistic regression to estimate the odds of enrolment by neighbourhood income, rural versus urban residence, previous treatment for mental illness, previous treatment for substance use disorder and use of health care services before program implementation, controlling for characteristics linked to program eligibility.

**Results:** In Quebec, we identified 1 569 010 people eligible for the vulnerable enrolment program (of whom 505 869 [32.2%] were enrolled within the first 2 yr of program implementation) and 2 394 923 for the general enrolment program (of whom 352 380 [14.7%] were enrolled within the first 2 yr). In BC, we identified 133 589 people eligible for the Chronic disease incentive, 47 619 for the Complex care incentive and 1 349 428 for A GP for Me; of these, 60 764 (45.5%), 28 273 (59.4%) and 1 066 714 (79.0%), respectively, were enrolled within the first 2 years. The odds of enrolment were higher in higher-income neighbourhoods for programs without enrolment criteria (adjusted odds ratio [OR] comparing highest to lowest quintiles 1.21 [95% confidence interval (CI) 1.20–1.23] in Quebec and 1.67 [95% CI 1.64–1.69] in BC) but were similar across neighbourhood income quintiles for programs with health-related eligibility criteria. The odds of enrolment by urban versus rural location varied by program. People treated for substance use disorders had lower odds of enrolment in all programs (adjusted OR 0.60–0.72). Compared to people eligible but not enrolled, those enrolled had similar or higher numbers of primary care visits and longitudinal continuity of care in the year before enrolment.

**Interpretation:** People living in lower-income neighbourhoods and those treated for substance use disorders were less likely than people in higher-income neighbourhoods and those not treated for such disorders to be enrolled in programs without health-related eligibility criteria. Other strategies are needed to promote equitable access to primary care.

A longitudinal relationship between patients and providers is central to continuity and coordination of primary care.<sup>1,2</sup> Formal enrolment with providers or places of care (also called rostering or empanelment) is a feature of high-performing primary care, facilitating proactive prevention, chronic disease management and quality-improvement activities.<sup>3</sup> In many health care systems, patient enrolment is documented as part of capitated payment models.<sup>4–6</sup> In contrast, under fee-for-service payment (which is the dominant payment model in Quebec and British Columbia), enrolment is not required for a physician to receive payment for services; although primary care

providers may maintain a patient panel, and patients may have a regular place they go to for care, this is not formally documented to payers or system administrators.

**Competing interests:** None declared.

\*The list of members appears at the end of the article.

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From 2003 to 2013, both Quebec and BC implemented enrolment programs within fee-for-service whereby physicians could receive payments over and above regular fee-for-service billings in exchange for a commitment to providing longitudinal care for designated patients. In Quebec, annual payments were introduced first for patients with chronic conditions and those more than 70 years of age (vulnerable enrolment),<sup>7</sup> and then for the general population (general enrolment)<sup>8</sup> (Table 1). In British Columbia, payments took the form of additional fee codes billable for patients with chronic conditions (Chronic disease incentive<sup>9</sup> and Complex care incentive<sup>10</sup>) and subsequently a suite of payment incentives for physicians who agreed to provide longitudinal care to a panel of patients (A GP for Me, or Attachment initiative).<sup>11</sup>

It is important to understand the characteristics of people enrolled under such programs, particularly as barriers to primary care access have been observed by income,<sup>13,14</sup> by rural versus urban residence,<sup>15</sup> and among people with mental illness or a substance use disorder.<sup>16–18</sup> As the risk of developing chronic conditions is associated with socioeconomic status,<sup>19,20</sup> programs with health-related enrolment criteria such as having 1 or more chronic conditions may improve access among people of lower socioeconomic status. On the other hand, enrolment programs open to the general population may compound better access to primary care already observed among people of higher socioeconomic status.<sup>21</sup> For example, in Ontario, enrolment in capi-

tated models was found to be lower in the lowest income group,<sup>22–24</sup> and a study of a centralized waiting list for a primary care physician in Quebec showed that, although payments were higher for enrolling patients with chronic health conditions, most people enrolled through this mechanism were healthy.<sup>25,26</sup>

There is a paucity of information on characteristics associated with enrolment under voluntary programs implemented within fee-for-service systems, as in BC and Quebec. We compared the characteristics of enrolled people and people who were eligible but not enrolled, examining differences in the odds of enrolment by neighbourhood income, location of residence (rural v. urban), previous treatment for a mental illness or substance use disorder, and use of health care services before program implementation.

## Methods

### Study design and setting

The enrolment programs studied were introduced in BC and Quebec over a period of 11 years (2003–2013). We adopted the same cross-sectional design to study each program, examining a period of 2 years after program implementation to identify people enrolled as well as people eligible before implementation but unenrolled within the first 2 years. We also examined use of health care services in the year before program implementation, so the data cover the period from

**Table 1: Description of enrolment programs implemented within fee-for-service systems in Quebec and British Columbia**

Variable	Quebec; name of program (date of implementation)		British Columbia; name of program (date of implementation)		
	Vulnerable enrolment <sup>7</sup> (Jan. 1, 2003)*	General enrolment <sup>8</sup> (Jan. 1, 2009)	Chronic disease incentive <sup>9</sup> (Sept. 1, 2003)	Complex care incentive <sup>10</sup> (Apr. 1, 2007)	A GP for Me <sup>11</sup> (Apr. 1, 2013)
Criteria for enrolment	<ul style="list-style-type: none"> <li>Chronic conditions, age &gt; 70 yr</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Diabetes, congestive heart failure</li> <li>List of eligible conditions expanded in 2006</li> </ul>	<ul style="list-style-type: none"> <li>≥ 2 eligible conditions</li> </ul>	<ul style="list-style-type: none"> <li>None; all primary care physicians and their patients</li> </ul>
Physician responsibilities for enrolled patients	<ul style="list-style-type: none"> <li>Formal enrolment between patient and physician through signed contract</li> <li>Physician agrees to take charge of patient regularly and provide required follow-up care</li> </ul>		<ul style="list-style-type: none"> <li>Physician bills code accepting responsibility for chronic disease management for 1 yr</li> </ul>	<ul style="list-style-type: none"> <li>Physician bills code indicating willingness to provide “full-service family practice” and confirm relationship with patient through “standardized conversation”</li> </ul>	
Annual payment amount per patient†	<ul style="list-style-type: none"> <li>\$14–\$21 (varies based on practice setting)</li> <li>Subsequently increased to \$35–\$75<sup>12</sup></li> <li>Enables billing of additional fee codes</li> </ul>	<ul style="list-style-type: none"> <li>\$7–\$11 (varies based on practice setting)</li> <li>Enables billing of additional fee codes</li> </ul>	<ul style="list-style-type: none"> <li>\$75</li> </ul>	<ul style="list-style-type: none"> <li>\$315</li> </ul>	<ul style="list-style-type: none"> <li>\$0 opt-in, but enables billing of additional fee codes</li> </ul>

\*Physicians who were members of family medicine groups could enrol patients in November 2002.

†In all programs, these amounts were in addition to regular fee-for-service payments.

2002 to 2015. As uptake increased gradually over the first year for all programs,<sup>27,28</sup> examining 2 years for each program allowed us to compare across programs at the same stage of implementation.

The enrolment programs in Quebec and BC differ with respect to eligibility criteria, requirements of enrolment and payment mechanisms (Table 1), but all are voluntary in that physicians choose whether they want to participate in the programs and which patients they bill codes for. None of the programs include negation or penalties if patients seek care elsewhere. In BC, programs are open to all fee-for-service primary care physicians. In Quebec, enrolment programs were also open to all primary care physicians, with eligibility depending on patient characteristics as described in Table 1. Primary care physicians working in Family Medicine Groups, an interdisciplinary team model, could enrol all patients regardless of their age or health status.

### Population

The study populations included people registered for health insurance for more than 75% of days in the 2 years before and the 2 years after program implementation who were aged 40 years or more (ages more likely to use primary care regularly) and who met the eligibility criteria for each program (based on diagnosis codes in physician and hospital records [Appendix 1, Table S1, available at [www.cmajopen.ca/content/10/1/E64/suppl/DC1](http://www.cmajopen.ca/content/10/1/E64/suppl/DC1)]) in the year before program implementation (Table 2). People who moved or died (and so were registered for < 75% of days) were excluded. We excluded people with missing age or sex, with a recorded age of more than 120 years, or who used services that indicated they were residents of a long-term care facility.

### Data sources

Administrative databases were accessed and housed separately within provinces, although measures and analysis were the same. We used databases maintained by the Quebec Ministry of Health and Social Services and the provincial health insurer

(provided through the National Institute for Excellence in Health and Social Services) and the BC Ministry of Health (provided through Population Data BC)<sup>29-34</sup> (Appendix 1, Table S2). Databases included central demographic files maintained by provincial insurers (consolidation file in BC and Le Fichier d'inscription des personnes assurées in Quebec), billing data from fee-for-service practitioners (Medical Services Plan payments information file in BC and Régie de l'assurance maladie in Quebec), hospital discharges (Discharge Abstract Database in BC and MED-ÉCHO in Quebec), information about emergency department visits (National Ambulatory Reporting Care System in BC and Banque de données communes des urgences in Quebec) and prescription data (PharmaNet, BC only).

### Measures

For all programs except A GP for Me, the intervention (enrolled) population included people who had a billing record indicating enrolment within the first 2 years of program implementation, and the comparison population, those who were eligible but not enrolled within the first 2 years. The mechanism of confirming enrolment between physicians and provincial funders was submission of fee items; thus, enrolment is captured completely in our data.

A GP for Me is a physician-level program in which physicians opt in for all patients. For analysis of this program, the intervention population was people who received a majority of their care from an opted-in physician. We restricted this analysis to people with 3 or more primary care visits so we could identify a majority source of care.

All measures of patient characteristics were captured before program implementation and patient enrolment. Patient age and sex or gender are collected at time of registration for provincial insurance programs. The latter field is labelled “gender” in BC and “sex” in Quebec; in both cases, only binary “male” and “female” options are provided. Whether this reflects gender, sex at birth or legal sex cannot be determined.

Table 2: Intervention and comparison populations used in analysis			
Population	Quebec	British Columbia	
	Vulnerable enrolment and general enrolment	Chronic disease incentive and Complex care incentive	A GP for Me
Intervention	Patients for whom relevant billing codes were submitted within the first 2 yr of implementation	Patients with qualifying chronic conditions in the year before the policy change for whom the relevant code was billed within the first 2 yr of implementation	Patients who received the majority of their care from physicians who opted into the program*
Comparison	Patients who were eligible but were not enrolled within the first 2 yr of implementation	Patients with qualifying chronic conditions in the year before the policy change with no code billed within the first 2 yr of implementation	Patients with ≥ 3 visits who received the majority of their care from a physician who did not opt in

\*We restricted analysis to patients with 3 or more visits.

We used the Elixhauser Comorbidity Index<sup>35</sup> to count the number of comorbid conditions.

We used the census enumeration area of the patient's residence to assign neighbourhood income quintile and to classify residence by rurality, employing the Statistics Canada Statistical Area Classification type metropolitan influenced zones.<sup>36</sup> We compared census metropolitan areas, census agglomerations and areas with strong metropolitan influence (which we termed "smaller urban") and areas with moderate to no metropolitan influence (which we termed "rural/remote"). In BC, we were also able to identify people whose prescription coverage indicated they received income assistance.

We identified people who received mental health services (*International Classification of Diseases, Ninth Revision* [ICD-9] codes 295–302, 306–319, 50B [BC only]; enhanced Canadian version of *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* codes F20–F99, excluding F55) or services for substance use disorders (ICD-9 codes 291, 292, 303–305, 980; *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* codes F10–F16, F18–F19 and T51) based on service use (1 hospital admission or 2 physician claims for mental health services, 1 hospital admission or 1 physician claim for substance use services) in the year before program implementation.

We counted the number of ambulatory physician visits with a primary care physician and of emergency department visits in the year before program implementation. Ambulatory visits were based on unique physician–patient–date combinations with a claim specialty of primary care that occurred in an office, home or other ambulatory location (excluding hospital, emergency department and long-term care) and excluding laboratory claims and diagnostic tests. We measured longitudinal continuity of care as the proportion of primary care visits with the physician seen most often (usual provider continuity).

### Statistical analysis

We describe age, sex or gender, chronic health conditions, neighbourhood income quintile, urban or rural residence, and use of health care services for mental illness and substance use disorders among patients eligible for the programs as well as for the entire provincial population aged 40 years or more, presenting counts and percentages, or means and standard deviations as appropriate. We compared people enrolled and people who were eligible but not enrolled with respect to these characteristics and reported standardized differences.<sup>37</sup>

We constructed logistic regression models for each enrolment program separately, estimating odds of enrolment by neighbourhood income quintile, rurality, use of health care services for mental illness and substance use disorders, and use of health care services in the year before enrolment. We present bivariable (unadjusted) and multivariable odds ratios (ORs) adjusted for patient age, sex or gender, and number of comorbidities.

### Ethics approval

This project was reviewed and approved by the McGill University Research Ethics Board (A05-B33-17B), the University

of British Columbia/Simon Fraser University Harmonized Research Ethics Board (H17-01497) and the Comité d'éthique de la recherche – Éducation et sciences sociales, Université de Sherbrooke (2017-1655/Strumpf).

## Results

### Comparison of people eligible for enrolment programs with the general population

In Quebec, we identified 1 569 010 people eligible for the vulnerable enrolment program and 2 394 923 people eligible for the general enrolment program (Table 3). A total of 505 869 people (32.2%) were enrolled within the first 2 years under the vulnerable enrolment program and 352 380 (14.7%) within the first 2 years under the general enrolment program.

In BC, we identified 133 589 people eligible for the Chronic disease incentive, 47 619 for the Complex care incentive and 1 349 428 for A GP for Me (Table 4). Of these, 60 764 (45.5%), 28 273 (59.4%) and 1 066 714 (79.0%), respectively, were enrolled within the first 2 years of program implementation.

People eligible for programs with health-related enrolment criteria (vulnerable enrolment in Quebec, Chronic disease incentive and Complex care incentive in BC) were older, had a higher average number of comorbidities and lived in lower-income neighbourhoods compared to the general population (Table 3, Table 4). They also had more primary care and emergency department visits and higher longitudinal continuity before enrolment than the general population (Table 3, Table 4, Table 5). Slightly higher proportions of people living outside metropolitan areas than those living elsewhere were eligible for programs with health-related eligibility criteria (data not shown).

In Quebec, the population eligible for the general enrolment program did not include people previously eligible under the vulnerable enrolment program. As a result, the eligible population was somewhat younger and had fewer comorbidities than the general population. In BC, because analysis of A GP for Me was limited to people with 3 or more primary care visits for more reliable assignment, the study population was older and had more comorbidities than the general population (Table 4).

### Comparison of enrolled people with people who were eligible but not enrolled

#### Neighbourhood income quintile and income assistance

People living in higher-income neighbourhoods were more likely than those living in lower-income neighbourhoods to be enrolled in programs without enrolment criteria (Quebec's general enrolment program and BC's A GP for Me) (Table 5). In BC, those receiving income assistance had lower odds of enrolment than those not receiving income assistance (adjusted OR 0.76, 95% confidence interval [CI] 0.75–0.78). For Quebec's vulnerable enrolment program, the relation with income was in the other direction: the odds of enrolment were somewhat lower among people who lived in the highest-income neighbourhoods than among those in the lowest-income neighbourhoods (adjusted OR 0.95, 95% CI 0.94–0.96) (Table 5).

**Table 3: Demographic characteristics, comorbidities and use of health care services among the general population, patients enrolled and patients eligible but not enrolled within the first 2 years before program implementation in Quebec**

Variable	No. (%) of people*						
	Population aged ≥ 40 yr† n = 4 043 955	Vulnerable enrolment			General enrolment		
		Enrolled n = 505 869	Not enrolled n = 1 063 141	Standardized difference‡	Enrolled n = 352 384	Not enrolled n = 2 042 543	Standardized difference‡
Age group, yr				-0.853			-0.118
40–49	1 399 458 (34.6)	33 699 (6.7)	253 701 (23.9)		143 111 (40.6)	946 807 (46.4)	
50–59	1 177 884 (29.1)	68 075 (13.5)	303 729 (28.6)		138 721 (39.4)	740 845 (36.3)	
60–69	785 691 (19.4)	107 541 (21.3)	259 932 (24.4)		70 552 (20.0)	354 827 (17.4)	
70–79	457 215 (11.3)	218 163 (43.1)	174 997 (16.5)		NA	NA	
≥ 80	220 113 (5.4)	78 391 (15.5)	70 774 (6.7)		NA	NA	
Missing	3594 (0.1)	0 (0.0)	8 (0.0)		0 (0.0)	64 (0.0)	
Female sex	2 079 367 (51.5)	281 512 (55.7)	603 040 (56.7)	-0.022	195 164 (55.4)	957 321 (46.9)	-0.171
No. of ECI categories, mean ± SD	0.57 ± 0.87	1.26 ± 1.18	0.80 ± 1.00	0.424	0.29 ± 0.52	0.22 ± 0.48	0.143
Neighbourhood income quintile				-0.022			-0.074
Q1 (lowest)	802 422 (19.8)	108 911 (21.5)	223 954 (21.1)		59 713 (16.9)	407 162 (19.9)	
Q2	786 080 (19.4)	103 836 (20.5)	210 634 (19.8)		65 660 (18.6)	381 600 (18.7)	
Q3	781 599 (19.3)	95 395 (18.9)	196 445 (18.5)		72 634 (20.6)	384 663 (18.8)	
Q4	763 762 (18.9)	93 118 (18.4)	192 452 (18.1)		73 162 (20.8)	392 944 (19.2)	
Q5 (highest)	778 603 (19.3)	88 794 (17.6)	192 457 (18.1)		77 909 (22.1)	392 706 (19.2)	
Missing	131 489 (3.3)	15 815 (3.1)	47 199 (4.4)		3306 (0.9)	83 468 (4.1)	
Residence				-0.124			-0.077
Metropolitan	2 655 942 (65.7)	298 494 (59.0)	685 284 (64.4)		252 526 (71.7)	1 361 442 (66.7)	
Smaller urban	703 685 (17.4)	112 305 (22.2)	180 674 (17.0)		51 286 (14.6)	341 448 (16.7)	
Rural/remote	584 843 (14.5)	86 929 (17.2)	165 944 (15.6)		46 765 (13.3)	269 430 (13.2)	
Missing	99 485 (2.5)	8141 (1.6)	31 239 (2.9)		1807 (0.5)	70 223 (3.4)	
<b>Use of health care services</b>							
Mental illness§	52 357 (1.3)	10 667 (2.1)	33 934 (3.2)	-0.067	NA	NA	
Substance use disorder¶	19 909 (0.5)	3352 (0.7)	12 366 (1.2)	-0.053	NA	NA	
No. of primary care visits, mean ± SD**	3.26 ± 5.48	6.65 ± 7.46	4.28 ± 5.85	0.353	2.47 ± 2.65	1.80 ± 2.73	2.56
No. of emergency department visits, mean ± SD**	0.53 ± 1.69	0.86 ± 2.14	0.68 ± 1.99	0.085	0.26 ± 0.84	0.25 ± 0.87	0.005
Proportion of visits with usual care provider, mean ± SD	0.59 ± 0.43	0.59 ± 40.28	0.38 ± 41.92	0.522	0.44 ± 0.45	0.25 ± 0.40	0.443

Note: ECI = Elixhauser Comorbidity Index, NA = not applicable, Q = quintile, SD = standard deviation.

\*Except where noted otherwise.

†In 2007.

‡Reflects the difference in means or proportions between people enrolled and people eligible but not enrolled. We consider a standardized difference of 0.2 to be a small effect size, 0.5 a medium effect size and 0.8 a large effect size.

§One hospital admission or 2 physician claims in the year before program implementation.

¶One hospital admission or 1 physician claim in the year before program implementation.

\*\*In the year before program implementation.

**Table 4: Demographic characteristics, comorbidities and use of health care services among the general population, patients enrolled and patients eligible but not enrolled within the first 2 years before program implementation in British Columbia**

Variable	No. (%) of people*									
	Population aged ≥ 40 yr† n = 1 953 390	Chronic disease incentive			Complex care incentive			A GP for Me		
		Enrolled n = 60 764	Not enrolled n = 72 825	Standardized difference	Enrolled n = 28 273	Not enrolled n = 19 346	Standardized difference	Enrolled n = 1 066 714	Not enrolled n = 282 714	Standardized difference
Age group, yr				0.11			0.40			0.16
40–49	636 535 (32.6)	6693 (11.0)	9037 (12.4)		790 (2.8)	1477 (7.6)		221 202 (20.7)	72 390 (25.6)	
50–59	584 379 (29.9)	14 342 (23.6)	17 356 (23.8)		3222 (11.4)	3584 (18.5)		290 914 (27.3)	82 109 (29.0)	
60–69	376 210 (19.3)	17 488 (28.8)	19 244 (26.4)		7089 (25.1)	5409 (28.0)		276 542 (25.9)	68 406 (24.2)	
70–79	235 635 (12.1)	16 023 (26.4)	18 116 (24.9)		10 160 (35.9)	5745 (29.7)		179 607 (16.8)	40 170 (14.2)	
≥ 80	120 631 (6.2)	6218 (10.2)	9072 (12.5)		7012 (24.8)	3131 (16.2)		98 449 (9.2)	19 639 (6.9)	
Female gender	1 011 075 (51.8)	27 454 (45.2)	33 362 (45.8)		11 455 (40.5)	8393 (43.4)	–0.06	613 937 (57.6)	152 978 (54.1)	0.07
No. of ECI categories, mean ± SD	0.88 ± 1.08	2.13 ± 1.25	2.15 ± 1.38	–0.02	3.25 ± 1.66	2.89 ± 1.62	0.22	1.39 ± 1.26	1.27 ± 1.21	0.09
Neighbourhood income quintile				0.03			0.03			0.20
Q1 (lowest)	368 926 (18.9)	13 952 (23.0)	17 393 (23.9)		6793 (24.0)	4850 (25.1)		195 711 (18.3)	65 901 (23.3)	
Q2	374 503 (19.2)	12 654 (20.8)	15 257 (21.0)		6193 (21.9)	4293 (22.2)		205 854 (19.3)	63 655 (22.5)	
Q3	387 101 (19.8)	11 788 (19.4)	13 716 (18.8)		5488 (19.4)	3749 (19.4)		212 035 (19.9)	54 539 (19.3)	
Q4	391 346 (20.0)	10 632 (17.5)	12 109 (16.6)		4977 (17.6)	3352 (17.3)		219 252 (20.6)	49 942 (17.7)	
Q5 (highest)	402 447 (20.6)	9732 (16.0)	11 674 (16.0)		4553 (16.1)	2848 (14.7)		224 937 (21.1)	46 028 (16.3)	
Missing	29 067 (1.5)	2006 (3.3)	2676 (3.7)		269 (1.0)	254 (1.3)		8925 (0.8)	2649 (0.9)	
Income assistance‡	66 911 (3.4)	4054 (6.7)	4873 (6.7)	0.00	2038 (7.2)	1707 (8.8)	–0.06	52 147 (4.9)	18 278 (6.5)	–0.07
Residence				0.12			0.19			0.42
Metropolitan	1 275 866 (65.3)	37 301 (61.4)	45 415 (62.4)		17 807 (63.0)	12 285 (63.5)		670 582 (62.9)	228 827 (80.9)	
Smaller urban	449 767 (23.0)	17 308 (28.5)	18 109 (24.9)		7830 (27.7)	4196 (21.7)		278 942 (26.1)	33 312 (11.8)	
Rural/remote	221 884 (11.4)	6049 (10.0)	9161 (12.6)		2630 (9.3)	2858 (14.8)		116 952 (11.0)	20 501 (7.3)	
Missing	5873 (0.3)	106 (0.2)	140 (0.2)		6 (0.0)	7 (0.0)		238 (0.0)	74 (0.0)	
<b>Use of health care services</b>										
Mental illness	179 352 (9.2)	5846 (9.6)	7382 (10.1)	–0.02	3379 (12.0)	2588 (13.4)	–0.04	143 376 (13.4)	33 874 (12.0)	0.04
Substance use disorder	23 538 (1.2)	582 (1.0)	1029 (1.5)	–0.04	551 (1.9)	597 (3.1)	–0.07	18 671 (1.8)	8077 (2.9)	–0.07
No. of primary care visits, mean ± SD	5.58 ± 7.02	10.09 ± 7.91	9.97 ± 8.58	0.01	14.34 ± 10.17	12.69 ± 10.40	0.16	7.45 ± 6.48	7.78 ± 8.11	–0.06
No. of emergency department visits, mean ± SD	0.28 ± 1.06	0.43 ± 1.30	0.52 ± 1.34	–0.07	1.26 ± 2.32	1.33 ± 2.59	–0.03	0.48 ± 1.36	0.46 ± 1.43	0.02
Proportion of visits with usual care provider, mean ± SD	0.80 ± 0.22	0.84 ± 0.18	0.83 ± 0.19	0.05	0.82 ± 0.18	0.80 ± 0.20	0.10	0.80 ± 0.22	0.78 ± 0.24	0.09

Note: ECI = Elixhauser Comorbidity Index, NA = not applicable, Q = quintile, SD = standard deviation.

\*Except where noted otherwise.

†In 2007.

‡As indicated by prescription drug coverage.

**Table 5: Crude and adjusted\* odds of enrolment by income, rurality and previous treatment for mental illness or substance use disorder**

Variable	Vulnerable enrolment; OR (95% CI)		General enrolment; OR (95% CI)			
	Crude	Adjusted	Crude	Adjusted		
<b>Quebec</b>						
Neighbourhood income quintile (Ref: Q1 [lowest])						
Q2	1.01 (1.00–1.03)	1.03 (1.02–1.04)	1.11 (1.10–1.12)	1.10 (1.09–1.11)		
Q3	1.00 (0.99–1.01)	1.04 (1.03–1.05)	1.19 (1.18–1.21)	1.18 (1.16–1.19)		
Q4	1.00 (0.98–1.01)	1.04 (1.03–1.06)	1.20 (1.19–1.21)	1.18 (1.17–1.20)		
Q5 (highest)	0.95 (0.94–0.96)	0.95 (0.94–0.96)	1.23 (1.22–1.24)	1.21 (1.20–1.23)		
Residence (Ref: metropolitan)						
Smaller urban	1.43 (1.42–1.44)	1.62 (1.60–1.63)	0.81 (0.80–0.82)	0.76 (0.79–0.80)		
Rural/remote	1.20 (1.19–1.21)	1.37 (1.36–1.39)	0.94 (0.93–0.95)	0.93 (0.92–0.94)		
Treatment for mental illness/substance use disorder						
Mental illness	0.65 (0.64–0.69)	0.94 (0.92–0.96)	NA	NA		
Substance use disorder	0.57 (0.55–0.59)	0.60 (0.58–0.63)	NA	NA		
Variable	Chronic disease incentive; OR (95% CI)		Complex care incentive; OR (95% CI)		A GP for Me; OR (95% CI)	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
<b>British Columbia</b>						
Neighbourhood income quintile (Ref: Q1 [lowest])						
Q2	1.03 (1.00–1.07)	1.03 (0.99–1.06)	1.03 (0.98–1.09)	1.02 (0.97–1.08)	1.09 (1.08–1.10)	1.09 (1.08–1.11)
Q3	1.07 (1.04–1.11)	1.06 (1.03–1.10)	1.05 (0.99–1.10)	1.05 (0.99–1.11)	1.31 (1.29–1.33)	1.33 (1.31–1.34)
Q4	1.09 (1.06–1.13)	1.09 (1.05–1.12)	1.06 (1.00–1.12)	1.06 (1.00–1.13)	1.48 (1.46–1.50)	1.50 (1.48–1.52)
Q5 (highest)	1.04 (1.00–1.08)	1.03 (1.00–1.07)	1.14 (1.08–1.21)	1.10 (1.04–1.17)	1.65 (1.62–1.67)	1.67 (1.64–1.69)
Income assistance	1.00 (0.95–1.04)	1.01 (0.97–1.05)	0.80 (0.75–0.86)	1.02 (0.95–1.09)	0.74 (0.73–0.76)	0.76 (0.75–0.78)
Residence (Ref: metropolitan)						
Smaller urban	1.16 (1.14–1.19)	1.17 (1.14–1.19)	1.29 (1.23–1.35)	1.27 (1.22–1.33)	2.86 (2.82–2.89)	2.82 (2.78–2.85)
Rural/remote	0.80 (0.78–0.83)	0.80 (0.78–0.83)	0.63 (0.60–0.67)	0.62 (0.58–0.66)	1.95 (1.92–1.98)	1.92 (1.89–1.95)
Treatment for mental illness/substance use disorder						
Mental illness	0.94 (0.91–0.98)	0.98 (0.94–1.02)	0.88 (0.83–0.93)	0.87 (0.82–0.93)	1.14 (1.13–1.16)	1.14 (1.13–1.16)
Substance use disorder	0.67 (0.61–0.75)	0.72 (0.65–0.80)	0.62 (0.56–0.70)	0.64 (0.56–0.72)	0.61 (0.59–0.62)	0.61 (0.59–0.63)

Note: CI = confidence interval, NA = not applicable, OR = odds ratio, Q = quintile, Ref = reference.  
 \*Multivariable models used to generate adjusted odds ratios included age, gender or sex, and Elixhauser Comorbidity Index score.

### Residence

There was no consistent pattern of enrolment by urban versus rural residence. In Quebec’s vulnerable enrolment program, the odds of enrolment were higher among people outside metropolitan areas than those in metropolitan areas, whereas the reverse was true for the general enrolment program. In the BC programs with eligibility criteria, people who lived in smaller urban areas were more likely to be enrolled than those in metropolitan areas. In the A GP for Me program, people living outside metropolitan areas had higher odds of having a primary care provider who participated in the enrolment program than those living in metropolitan areas.

### Mental illness and substance use disorders

The odds of enrolment among people who received mental health services before enrolment were somewhat lower than

among those who did not (adjusted OR 0.87–0.98) with the exception of A GP for Me (adjusted OR 1.14, 95% CI 1.13–1.16). People who had received services for a substance use disorder had lower odds of enrolment than those who had not across all programs (adjusted OR 0.60–0.72).

### Service use in the year before program implementation

In Quebec, having made additional visits to primary care in the year before enrolment was associated with higher odds of enrolment (adjusted OR 1.03–1.06) (Table 6). In BC, the odds of enrolment did not differ by number of primary care visits. For the vulnerable enrolment program in Quebec, having made additional emergency department visits in the year before enrolment was associated with higher odds of enrolment (adjusted OR 1.04, 95% CI 1.04–1.04). In all other programs, the number of emergency department visits

**Table 6: Odds of enrolment by use of health care services in the year before enrolment**

Variable	Vulnerable enrolment; OR (95% CI)		General enrolment; OR (95% CI)			
	Crude	Adjusted*	Crude	Adjusted*		
<b>Quebec</b>						
Primary care visits	1.05 (1.05–1.05)	1.03 (1.03–1.03)	1.08 (1.08–1.08)	1.06 (1.06–1.06)		
Emergency department visits	1.04 (1.04–1.04)	1.04 (1.04–1.04)	1.05 (1.001–1.009)	0.99 (0.99–0.99)		
Proportion of visits with usual care provider†	1.13 (1.13–1.14)	1.13 (1.13–1.13)	1.12 (1.12–1.12)	1.11 (1.11–1.11)		
Variable	Chronic disease incentive; OR (95% CI)		Complex care incentive; OR (95% CI)		A GP for Me; OR (95% CI)	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
<b>British Columbia</b>						
Primary care visits	1.00 (1.00–1.00)	1.00 (1.00–1.01)	1.02 (1.02–1.02)	1.01 (1.01–1.01)	0.99 (0.99–0.99)	0.98 (0.98–0.98)
Emergency department visits	0.95 (0.94–0.95)	0.96 (0.95–0.97)	0.99 (0.98–1.00)	0.98 (0.97–0.98)	1.01 (1.01–1.01)	1.00 (1.00–1.00)
Proportion of visits with usual care provider†	1.03 (1.02–1.03)	1.02 (1.02–1.03)	1.06 (1.05–1.07)	1.04 (1.03–1.05)	1.04 (1.04–1.04)	1.03 (1.03–1.04)

Note: CI = confidence interval, OR = odds ratio.  
 \*Multivariable models used to generate adjusted ORs included age, sex or gender, and Elixhauser Comorbidity Index score.  
 †Scaled such that ORs correspond to a 10% change in continuity.

in the prior year was not associated with odds of enrolment. In both provinces, people with higher longitudinal continuity in the year before enrolment had higher odds of enrolment (adjusted OR per 10% change in continuity 1.02–1.13).

## Interpretation

In the context of voluntary enrolment programs introduced within fee-for-service payment, people who lived in higher-income neighbourhoods were more likely to be enrolled than those in lower-income neighbourhoods, especially in programs with no health-related eligibility criteria. The odds of enrolment by urban–rural location varied. People who had received services for mental illness or substance use disorders in the year before enrolment generally had lower odds of enrolment. Greater continuity of care in the year before enrolment was associated with slightly higher odds of enrolment, as was the number of primary care visits in the year before enrolment in Quebec.

Our findings with respect to enrolment by neighbourhood income are consistent with previous research.<sup>22–26</sup> Our observation that people who were previously treated for mental illness and substance use disorders were less likely to be enrolled than those who had not received such treatment is consistent with literature documenting barriers to accessing primary care for these patients.<sup>16–18</sup>

Our finding that, compared to people eligible but not enrolled, people enrolled tended to have similar or higher

numbers of primary care visits and longitudinal continuity of care in the year before enrolment suggests that enrolment programs may formalize existing care relationships between patients and providers, or that presenting at a practice more often may increase the chance of enrolment.<sup>27</sup>

## Limitations

It is possible that people enrolled in the 2 years after program implementation differed from those who would later be enrolled. Another analysis that included a broader range of programs targeting chronic conditions showed that physician participation in enrolment programs stabilized after the first 2 years,<sup>27</sup> but including only 2 years is a limitation of the present analysis. By using measures of treatment for mental illness and substance use disorder, we missed people who did not seek care and who may have had the greatest need for primary care enrolment. Similarly, we assessed eligibility criteria for the programs using diagnostic codes recorded in billing data. Although this accurately reflects people who would be confirmed eligible by funders, there may have been people whose conditions were not recorded and who would have otherwise been eligible for the programs.

There is the potential for geographic clustering that is not accounted for in our analysis, although we observed little variation in enrolment among regions. We cannot determine whether the patterns observed reflect physician choices about which patients to enrol or simply the characteristics of patients who already had relationships with physicians. Furthermore, although programs used billing codes to formalize



enrolment between physicians and payers, this may not have been confirmed with patients. The effect of enrolment programs on access to or quality of care is therefore uncertain and requires further scrutiny. Regardless of this effect, the substantial investments in enrolment programs appear to have compensated physicians for providing services to patients from disproportionately more affluent areas.

### Conclusion

In both BC and Quebec, people living in lower-income neighbourhoods were less likely than people in higher-income neighbourhoods to be enrolled in voluntary enrolment programs open to the general population. Across all programs, people treated for substance use disorders were less likely than those not treated for such disorders to be enrolled. When enrolment programs had health-related eligibility criteria, the odds of enrolment were similar across income groups. Voluntary programs do not appear to promote enrolment for groups that often experience lower access to primary care. Other strategies to promote equity in access to primary care are needed.

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**Data sharing:** The data that support the findings of this study are approved for use by the respective data stewards in either province. In British Columbia, data were accessed through a process managed by Population Data BC (PopData). In Quebec, data were accessed as part of a traineeship at l'Institut national d'excellence en santé et en services sociaux (INESSS). The data sets used for this study will be archived, and requests for access to them in the context of verification of study findings can be made to PopData ([https://www.popdata.bc.ca/data\\_access](https://www.popdata.bc.ca/data_access)) and INESSS. The authors are not permitted to share the research extract used in this analysis with other researchers.

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