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Research

Trends in attachment to a primary care provider in Ontario, 2008–2018: an interrupted time-series analysis

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Abstract

Background: Attachment to a regular primary care provider is associated with better health outcomes, but 15% of people in Canada lack a consistent source of ongoing primary care. We sought to evaluate trends in attachment to a primary care provider in Ontario in 2008–2018, through an equity lens and in relation to policy changes in implementation of payment reforms and team-based care.

Methods: Using linked, population-level administrative data, we conducted a retrospective observational study to calculate rates of patients attached to a regular primary care provider from Apr. 1, 2008, to Mar. 31, 2019. We evaluated the association of patient characteristics and attachment in 2018 using sex-stratified, adjusted, multivariable logistic regression models and used segmented piecewise regression to evaluate changing trends before and after implementation of a policy that restricted physician entry to alternate models.

Results: Attachment increased from 80.5% (n = 10352385) in 2008 to 88.9% of the population (n = 12537172) in 2018, but was lower among people with low comorbidity, high residential instability, material deprivation, rural residence and recent immigrants. Inequities narrowed for recent immigrants, males and people with lower incomes over the study period, but disparities persisted for these groups. Attachment grew by 1.47% annually until 2014 ($p < 0.0001$), but was stagnant thereafter (annual percent change of 0.13, $p = 0.16$).

Interpretation: Lack of sustained progress in attachment followed reduced levels of physician entry to alternate funding models. Although disparities narrowed for many groups over the study period, persistent gaps remained for immigrants and people with lower incomes; targeted interventions and policy changes are needed to address these persistent gaps.

Strong primary care is fundamental to effective, efficient and equitable health care systems.[1,2] Attachment to a regular primary care provider, defined as formal or informal patient access to the same individual primary care provider or group of providers,[3] is associated with delivery of more preventive care, better chronic disease management and lower rates of hospital admission.[4–7] Lack of attachment to a primary care provider is associated with higher mortality; higher rates of emergency department visits, hospital admissions and readmissions; presentation to care with more advanced disease; and poor patient experiences.[8–10] Some groups are less likely to be attached (e.g., people who are new immigrants, have low income, were previously incarcerated, were prescribed opioid agonist treatment or have serious mental illness).[11–17]

Despite the importance of consistent primary care access, 14.5% of Canadians aged 12 years and older (about 4.6 million people) reported not having a regular primary care provider in 2019.[18] High numbers of unattached patients have important health systems impacts, such as high use emergency department and walk-in clinic use, poor follow-up after hospital discharge and high morbidity.[8,9]

Understanding trends in primary care attachment is a key policy priority[19] and is critical for ensuring effective health system planning that reduces inequities for structurally marginalized

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groups. Some drivers of attachment include recruitment and retention of family physicians. Professional organizations have called for alternate payment models and expansion of team-based care as factors that can incentivize physicians to practise family medicine.[20] Policy changes between 2012 and 2015 to restrict access to alternate payment models may have negatively affected patient attachment, and trends may have differed for some groups. Thus, we sought to evaluate trends in attachment to a primary care provider in Ontario in 2008–2018, through an equity lens and in relation to policy changes in implementation of payment reforms and team-based care.

Methods

Study setting

The study was set in Ontario (population of more than 15 million[21]), in which family physician and nurse practitioner visits are insured and free at the point of care. In 2002, Ontario increased investment and implemented voluntary reforms in the delivery and payment of primary care aimed at improving access, quality of care and physician retention.[22] Under the reforms, most physicians shifted from exclusive fee-for-service remuneration to one of several models that incorporated blended capitation payments, patient enrolment and, in some cases, access to interdisciplinary teams. Several models require patient enrolment (collectively described as patient enrolment models), including those in which physicians are paid by blended capitation (monthly age- and sex-adjusted payments and a small proportion of fee-for-service payments), and those paid by fee for service. Beginning in 2012, the Ontario government began to limit new physicians entering capitation-based models, culminating in 2015, when the government restricted new positions in some patient-enrolment models to 20 per month in areas of high physician need, or to replacement of physicians in existing teams.[23]

Study design

We conducted a repeated cross-sectional study using population-level administrative data. Study participants included all Ontario residents with a health card number in each year from Apr. 1, 2008, to Mar. 31, 2019.

Data sources and linkages

We used linked administrative data sets to evaluate trends in attachment at the patient level. Using a confidential and secure proprietary algorithm, health card numbers are converted to unique encoded identifiers, and are linked and analyzed at ICES.[24] 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.

We used the Primary Care Population data set (PCPOP), an ICES-derived, population-level data set that includes all eligible people in Ontario. An eligible person would be an Ontario resident who is alive at the index, has had contact with the health care system within 9 years of index and has Ontario Health Insurance Plan (OHIP) eligibility. We linked PCPOP with the Registered Persons Database (a health insurance registry), the Corporate Provider Database (a registry of providers and groups eligible to bill OHIP for their services), the Client Agency Program Enrolment database (which identifies patients enrolled in different primary care models over time) and the Community Health Centre (CHC) database (which lists patients receiving health services at CHCs, nonprofit health centres that provide primary care and health promotion to priority populations in which primary care providers are salaried). We assessed emergency department visits using the National Ambulatory Care Reporting System and hospital admissions using the Discharge Abstracts Database.

Outcome

The dependent variable was the percentage of eligible Ontario residents attached to a primary care provider, identified in administrative data using an algorithm developed and validated by our group against survey responses, with excellent sensitivity (90.5%) and modest specificity (46.1%).[25] The algorithm involved hierarchical assignment of attachment. First, patients enrolled to a patient enrolment model were considered attached. Next, patients receiving clinical care at a community health centre were included as attached. Next, patients were included as attached if they were virtually rostered to a primary care provider with the highest billings for that patient, with higher physician-level continuity of care. We sought to limit categorizing virtually rostered patients who received a substantial proportion of their care from physicians with low continuity of care for their patients, such as those practising in walk-in clinics. Therefore, virtually rostered patients were considered attached only if they received most of their primary care over the preceding 2-year period from a primary care provider with greater than 10% physician-level continuity of care. Physician-level continuity of care is a visit-based measure of the proportion of patients receiving ongoing care with the same provider and was determined with a numerator of patients virtually rostered to a primary care provider divided by the denominator of all unique patients the same primary care provider has seen over 2 years. Finally, and consistent with a previously validated algorithm used to evaluate access to pediatric health services,[26] children who were virtually attached to a primary care pediatrician were also considered attached.[25] All others were considered uncertainly attached (described in additional detail in Appendix 1, available at www.cmajopen.ca/content/11/5/E809/suppl/DC1).

Covariates

We derived age, sex, rurality and immigration status from the Registered Persons Database. We measured rurality using the postal code and the Rurality Index for Ontario, categorized as urban (score 0–9), suburban (score 10–39) and rural (score ≥ 40).[27] We used postal codes and the Ontario Marginalization Index to derive participants' Material Deprivation and Residential Instability quintiles. The Ontario Marginalization Index is an area-based index derived using variables

from the Census that seeks to understand differences in health between population groups or between geographical areas.[28] Material deprivation includes indicators such as the proportion of the adult population who are lone-parent families, are receiving government transfer payments, are low income, are unemployed or have no high school diploma. Residential instability is a measure of area-level concentration of people who experience high rates of family or housing instability and includes indicators of the proportion of people living alone, the proportion of dwellings that are apartment buildings and the proportion of the population who have moved in the previous 5 years. We identified people with first-time health care coverage in Ontario within the previous 10 years, most of whom are recent immigrants to Canada.[29] We used the Johns Hopkins Adjusted Clinical Groups System Version 10 to capture comorbidity according to Aggregated Diagnostic Groups (ADGs), in which the diagnostic codes describing each person's health conditions are assigned to 1 or more of 32 diagnostic groups based on clinical and expected health services use.[30] We used hospital admissions and OHIP claims from the preceding 2 years to determine the ADGs and Resource Utilization Bands, which are robust and validated measures of comorbidity and expected resource use. We categorized ADGs as low (0–4 ADGs), moderate (5–9 ADGs) or high comorbidity (≥ 10 ADGs). We categorized Resource Utilization Bands as nonuser or healthy user (0–1), low (2), moderate (3) or high expected resource use (≥ 4).

Statistical analysis

We identified attached and uncertainly attached populations for each year between 2008/09 and 2018/19, their characteristics and annual rates of emergency department visits and hospital admissions. We evaluated changes in attachment over time, stratified by demographic group. Next, we used logistic regression models using complete case analysis to evaluate the association between patient characteristics and attachment in 2018/19, adjusting for sex, age, rurality, comorbidity, resource utilization, recent immigration (≤ 10 yr v. those who had immigrated > 10 yr previously or those who were born in Canada), material deprivation and residential instability. We tested for and identified an interaction between age and sex, and developed stratified multivariable models for males and females of factors associated with attachment in 2018, using prespecified variables selected a priori from published literature. We did not use a model section process. Tolerance and variance inflation factors were consistent with lack of multicollinearity in the multivariable models.

To assess the association with restricted entry to alternate funding models in 2015, we used segmented piecewise linear regression models with correlated residuals, including year, policy change in 2015 and time after policy change as predictors. We tested for and found no evidence of autocorrelation (β for AR(1) = 0.57, p = 0.39, AR(2) = 0.59, p = 0.19). Therefore, we dropped the autoregressive terms from the regression model and included only time before and time after the policy change in the model.

We completed all analyses with SAS Enterprise Edition.

Ethics approval

The use of the data in this project is authorized under section 45 of Ontario's *Personal Health Information Protection Act* and does not require review by a Research Ethics Board.

Results

In 2008, 10 352 385 (80.5%) of 12 863 036 eligible Ontario residents were attached to a primary care provider (Appendix 2, available at www.cmajopen.ca/content/11/5/E809/suppl/DC1). Attachment increased over the study period to 12 537 172 (88.9%) of the 14 096 100 population in 2018. The characteristics of the attached and general population are summarized in 2008, 2014 and 2018 (Table 1). Proportionately fewer males were attached at baseline (77.4% v. 83.5% females) and in 2018 (86.9% v. 90.9% females). Young adults (aged 19–34 yr) had lower rates of attachment compared with all other age groups at baseline (71.5%) and study end (83.6%). Children and youth had the highest rates of attachment, followed by older adults. Attachment was lower among those who lived in rural areas, those with low comorbidity, those with the highest residential instability, those with the highest material deprivation and recent immigrants throughout the study period. About 25% of uncertainly attached people visited the emergency department, which remained stable throughout the study period. Rates of hospital admission for uncertainly attached patients decreased from 12.1% in 2008 to 9.8% in 2018. Health system use was higher for attached patients, of whom about 37% visited the emergency department and 20%–22% were admitted to hospital in a given year.

Attachment increased over the study period overall and for all demographic groups, with the largest relative gains seen among new immigrants, patients aged 19–34 years and patients with low comorbidity. Overall, we observed gains between 2008 and 2014, after which attachment plateaued (Figure 1). Gaps between some groups narrowed from 2008 to 2014, after which the rate of change slowed overall (Figure 2). The disparity for recent immigrants continued to close after 2014, though more slowly than before 2014. We observed rapid gains in the proportion of attached patients among those with low comorbidity until 2014, after which the rate was essentially unchanged. We observed limited reduction in disparities by material deprivation between 2008 and 2014, but the gap continued to close throughout the study period.

We used sex-stratified, unadjusted, single variable (Table 2) and multivariable models of 2018 data to further evaluate predictors of attachment (Table 3). Compared with adults aged 50–64 years, children and youth were most likely to be attached (males: adjusted odds ratio [OR] 2.70, 95% confidence interval [CI] 2.67–2.73; females: adjusted OR 2.40, 95% CI 2.37–2.43). Adults aged 19–34 years were least likely to be attached (males: adjusted OR 0.86, 95% CI 0.86–0.87; females: 0.83, 95% CI 0.83–0.84). Older adult males were more likely to be attached to a provider, but not older females.

Males and females with moderate-to-high comorbidity had higher odds of attachment, as did those with moderate-to-high health care use. Urban and small-town residents had higher odds of attachment than those living in rural areas.

Table 1 (part 1 of 2): Patient demographic characteristics

Variable	2008		2014		2018		Difference 2018–2008, %	
	No. (%) of attached patients	Total population	No. (%) of attached patients	Total population	No. (%) of attached patients	Total population	Absolute difference	Relative difference
Overall	10 352 385 (80.5)	12 863 036	11 972 070 (88.1)	13 371 946	12 537 172 (88.9)	14 096 100	8.4	10.4
Sex								
Male	4 902 611 (77.4)	6 336 768	5 731 257 (86.3)	6 641 622	6 021 636 (86.9)	6 928 191	9.5	12.3
Female	5 449 774 (83.5)	6 526 268	6 240 813 (90.6)	6 886 323	6 515 536 (90.9)	7 167 909	7.4	8.9
Age category, yr								
< 19	2 731 580 (91.6)	2 983 281	2 707 855 (93.7)	2 889 839	2 688 182 (93.6)	2 872 967	2	2.2
19–34	1 941 613 (71.5)	2 713 735	2 387 721 (82.8)	2 883 509	2 491 779 (83.6)	2 979 286	12.1	16.9
35–49	2 345 430 (76.3)	3 073 175	2 468 965 (86.4)	2 856 163	2 471 632 (86.7)	2 850 490	10.4	13.6
50–64	1 947 237 (80.2)	2 429 426	2 536 267 (89.0)	2 849 501	2 708 959 (89.6)	3 024 685	9.4	11.7
65–79	1 038 837 (83.3)	1 246 586	1 402 343 (91.3)	1 536 482	1 646 130 (91.9)	1 791 552	8.6	10.3
≥ 80	347 688 (83.4)	416 833	468 919 (91.5)	512 451	530 490 (91.9)	577 120	8.5	10.2
Rurality Index for Ontario								
Urban (0–9)	7 397 897 (79.8)	9 275 239	8 692 101 (88.2)	9 855 613	9 144 956 (88.8)	10 302 737	9	11.3
Small town (10–39)	2 116 215 (84.8)	2 496 232	2 345 182 (90.9)	2 579 570	2 434 140 (90.9)	2 676 741	6.1	7.2
Rural (≥ 40)	765 279 (78.2)	978 283	857 518 (87.4)	980 713	874 527 (87.9)	994 441	9.7	12.4
Missing	72 994 (64.4)	113 282	77 269 (69.0)	112 049	83 549 (68.4)	122 181	4	6.2
Comorbidity (ADG)								
No or low comorbidity (0–4)	4 977 558 (73.3)	6 791 348	6 068 182 (83.8)	7 245 411	6 237 180 (84.0)	7 427 923	10.7	14.6
Moderate comorbidity (5–9)	4 272 094 (88.7)	4 816 930	4 625 684 (94.0)	4 920 446	4 859 500 (94.5)	5 142 000	5.8	6.5
High comorbidity (≥ 10)	1 102 733 (87.9)	1 254 758	1 278 204 (93.8)	1 362 088	1 440 492 (94.4)	1 526 177	6.5	7.4
Resource Utilization Band								
Nonuser or healthy user (0–1)	1 026 238 (48.4)	2 118 830	1 472 205 (67.5)	2 182 561	1 539 471 (67.3)	2 286 918	18.9	39.1
Low morbidity (2)	2 218 280 (84.8)	2 616 422	2 457 443 (90.6)	2 711 249	2 454 723 (91.0)	2 696 051	6.2	7.3
Moderate morbidity (3)	5 248 159 (87.5)	5 999 986	5 818 534 (93.0)	6 254 661	6 042 110 (93.6)	6 452 615	6.1	7.0
High morbidity (≥ 4)	1 859 708 (87.4)	2 127 798	2 223 888 (93.5)	2 379 474	2 500 868 (94.0)	2 660 516	6.6	7.6

However, we also identified lower odds of attachment for people who had recently immigrated to Ontario (males: adjusted OR 0.63, 95% CI 0.63–0.64; females: adjusted OR 0.60, 95% CI 0.59–0.60). In addition, we observed lower odds of attachment for those with higher residential instability (highest instability males: adjusted OR 0.67, 95% CI 0.67–0.68; highest instability females: adjusted OR 0.72, 95% CI 0.71–0.73) and higher material deprivation (adjusted OR highest deprivation males 0.75 [0.75–0.76], females 0.80 [0.79–0.80]). Both marginalization measures followed a gradient by quintile, with lower odds of attachment for more vulnerable males than females.

We modelled change in the percentage of attached patients using segmented regression models, including initial slope, intercept and a paravermis at 2014 as variables, with correlated residuals. Given the lack of evidence of either first- or second-order autocorrelation, we assumed the residuals to

Table 1 (part 2 of 2): Patient demographic characteristics

	2008		2014		2018		Difference 2018–2008, %	
Variable	No. (%) of attached patients	Total population	No. (%) of attached patients	Total population	No. (%) of attached patients	Total population	Absolute difference	Relative difference
Recent immigrant								
No	7 920 620 (80.1)	9 882 644	9 466 538 (88.6)	10 682 618	10 045 967 (89.0)	11 287 661	8.9	11.1
Yes	924 122 (67.8)	1 363 337	970 576 (79.8)	1 216 706	975 069 (81.4)	1 198 483	13.6	20.1
Residential instability quintile								
1 (lowest instability)	2 245 592 (83.8)	2 678 771	2 746 156 (90.9)	3 019 913	2 858 167 (91.3)	3 130 363	7.5	9.0
2	2 091 120 (83.3)	2 511 738	2 311 451 (90.4)	2 556 842	2 412 349 (90.6)	2 661 479	7.3	8.8
3	1 917 243 (82.1)	2 335 277	2 142 267 (89.5)	2 393 882	2 280 527 (89.9)	2 535 978	7.8	9.5
4	1 893 272 (79.6)	2 377 687	2 136 073 (88.1)	2 425 107	2 213 598 (88.5)	2 500 126	8.9	11.2
5 (highest instability)	2 087 599 (75.1)	2 780 816	2 524 839 (84.9)	2 972 369	2 671 039 (85.5)	3 123 843	10.4	13.9
Material deprivation quintile								
1 (lowest deprivation)	2 381 696 (83.4)	2 857 306	2 623 982 (90.2)	2 910 272	2 893 438 (90.4)	3 201 555	7.0	8.4
2	2 099 290 (82.5)	2 545 256	2 518 205 (90.2)	2 791 259	2 663 134 (90.5)	2 942 539	8	9.7
3	1 982 173 (81.0)	2 447 798	2 297 416 (89.1)	2 577 049	2 382 518 (89.6)	2 659 189	8.6	10.6
4	1 863 131 (79.4)	2 346 986	2 199 123 (87.9)	2 503 068	2 244 028 (88.3)	2 540 744	8.9	11.2
5 (highest deprivation)	1 908 536 (76.7)	2 486 943	2 222 060 (85.9)	2 586 465	2 252 562 (86.4)	2 607 762	9.7	12.7
ED visit in previous 2 years								
Yes	3 760 038 (85.4)	4 403 177	4 397 211 (91.5)	4 805 605	4 708 543 (92.1)	5 113 652	6.7	7.5
No	6 592 347 (77.9)	8 459 859						
Hospital admission in previous 2 years								
Yes	2 338 830 (88.5)	2 642 562	2 551 439 (93.8)	2 719 265	4 708 543 (92.1)	2 761 144	3.6	4.1
No	8 013 555 (78.4)	10 220 474						

Note: ADG = Aggregated Diagnostic Group, ED = emergency department.

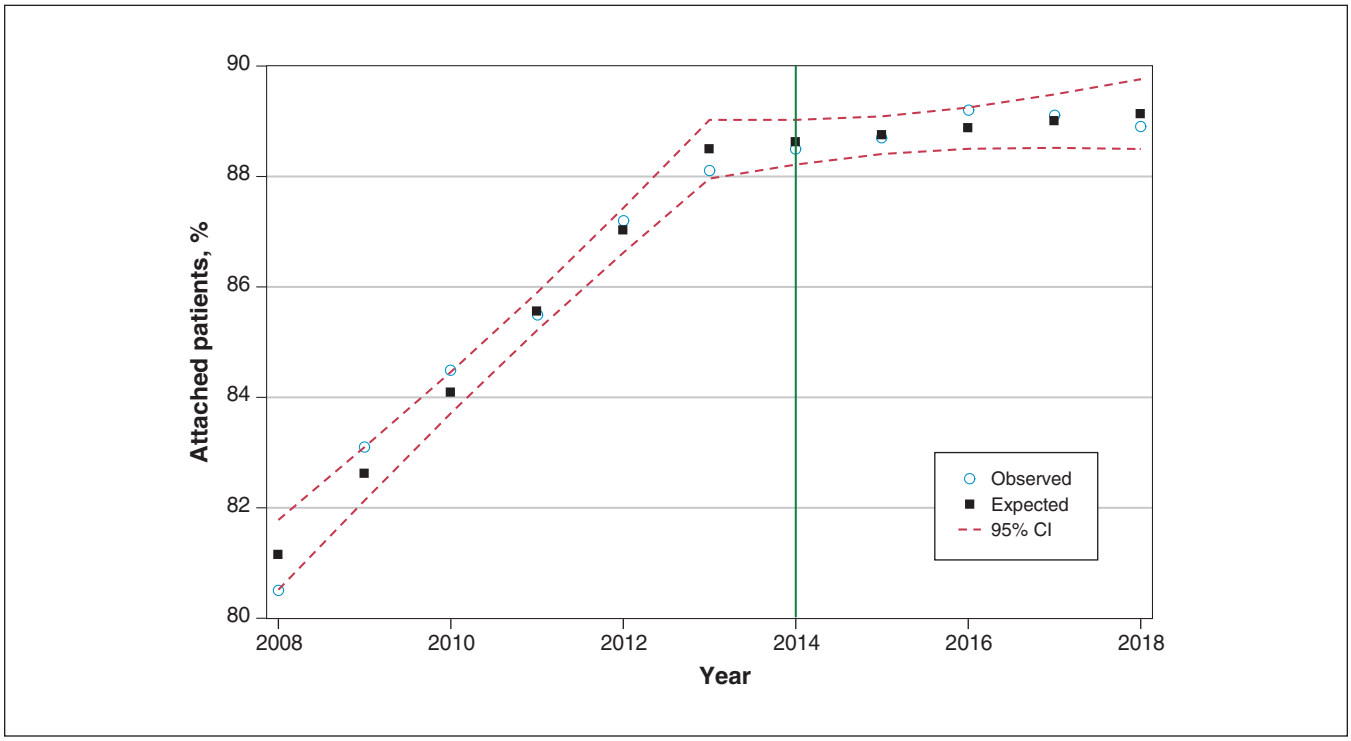

Figure 1: Proportion of patients attached to a primary care provider, 2008–2018. Note: CI = confidence interval.

be independent and thus dropped the autoregressive terms. We observed a significant trend before 2014 (slope = 1.47% increase in attachment rate per year, $p < 0.0001$), which flattened after 2014 (slope = 0.13%, $p = 0.16$).

Interpretation

The crude number of attached patients increased by 21.1% over the study period, a rate in excess of population growth (9.6%), but plateaued after 2014, when it matched but no longer exceeded population growth.

Rapid growth in attachment occurred during the period of growth policy reforms, including new models of primary care based on patient enrolment and blended capitation payment. Attachment plateaued around the time that the Ontario government restricted entry to blended capitation models, many of which were also interprofessional teams.[31] From 2012 to 2015, primary care was affected by a series of policy changes aimed at containing costs, including restricted access to new family health teams, government-imposed fee cuts and discontinuation of a new patient fee code. Finally, expansion of alternate models was limited to physicians practising in underserved areas or addressing attrition within existing teams. In 2015, 122 physicians entered these new models, compared with 489 in 2014. Our results support a strong rationale for investment in funding reform and expansion of interdisciplinary teams in primary care. Expansion of patient enrolment models was included in the recently approved Ontario Physician Services Agreement, although specific implementation details remain unclear.[32]

A substantial proportion of uncertainly attached people had frequent contact with the health system, including about 25% with an emergency department visit and 10%–12% who were admitted to hospital in a given year. Although these proportions were lower than those seen for attached people (38% with an emergency department visit and 21%–23% admitted to hospital), each of these encounters represents an opportunity for attachment, which will require appropriate policy innovations.

Overall equity in attachment improved. In contrast to other jurisdictions, we found higher attachment among people with higher comorbidity, likely because those with lower comorbidity were less likely to seek care, and therefore had fewer enrolment opportunities. However, important gaps in attachment remained for specific groups, particularly new immigrants and people living with economic and residential insecurity. Targeted interventions are needed to reach these communities, who have not benefited as much from policy reforms.[33]

In other jurisdictions, attachment has either decreased or remained fixed over time. In the United States, attachment among adults decreased from 77% (95% CI 76%–78%) in 2002 to 75% (95% CI 74%–76%) in 2015 (adjusted OR 0.90, 95% CI 0.82–0.98).[34] Another study reported reduced attachment of older adults from 94.2% in 2010 to 91.0% in 2016 ($p < 0.0001$).[35] Both studies found lower attachment among males, people with lower incomes or those whose race or ethnicity was Black or Latino, even after controlling for insurance status. In New Zealand, 93%–95% of the population was enrolled in primary care from 2015 to 2019, with lower attachment among Maori people and those living with higher deprivation.[13]

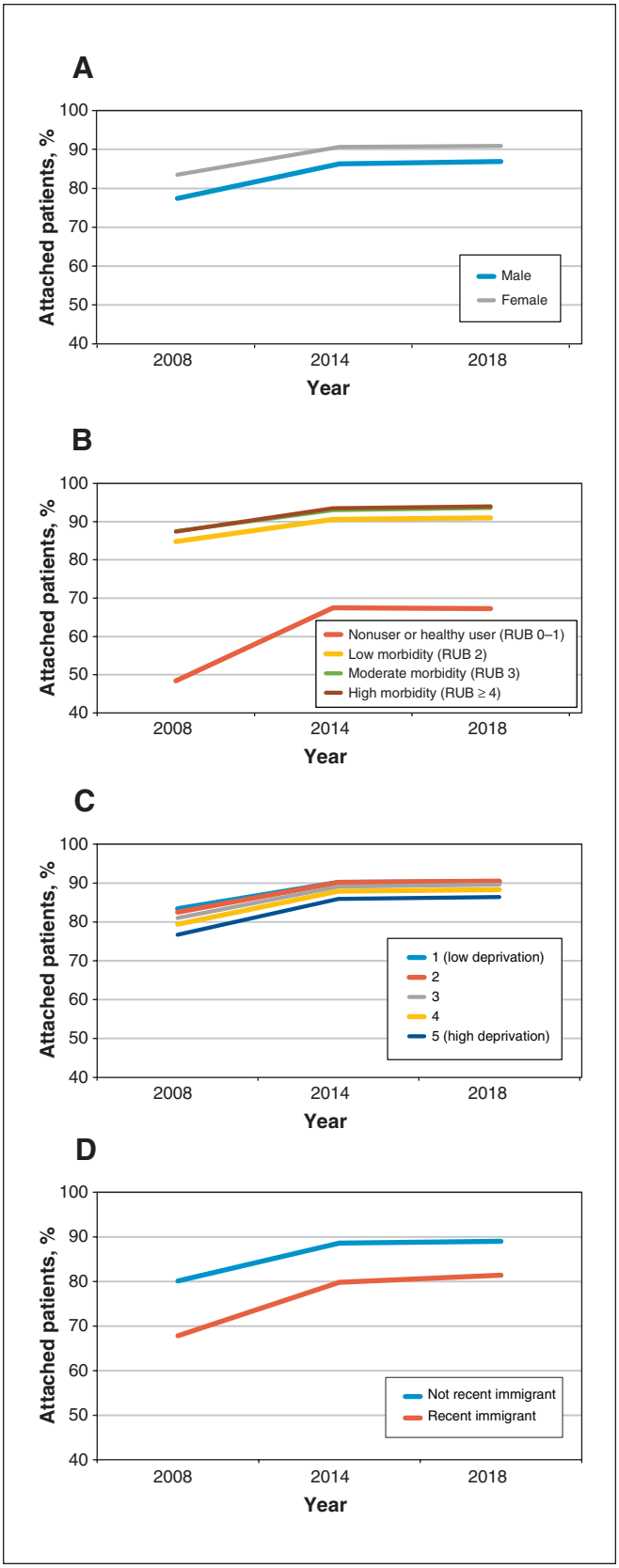

Figure 2: Proportion of patients attached to a primary care provider, 2008–2018 by (A) sex, (B) Resource Utilization Band (RUB), (C) material deprivation quintile and (D) recent immigrant status.

Nationally, Ontario has the lowest proportion of residents who are unattached to a primary care provider.[18] Data from the Canadian Community Health Survey show that Quebec and the Western provinces fare considerably worse and, nationwide, more than 4.5 million people in Canada do not have access to a regular primary care provider.[18] Some provinces have established centralized wait lists to improve attachment.[19] Cross-sectional studies have shown increased attachment with this strategy; however, people with fewer comorbid conditions were preferentially enrolled and demand exceeded primary care capacity.[36,37] Longitudinal analyses of centralized waitlists are underway. Additional measures taken in Canada include payment reforms, implementation of interdisciplinary teams, specific fee codes for attachment of complex patients, expansion of nurse practitioner roles and geographic attachment.[38] Our work underscores the importance of payment reform and interdisciplinary team models for supporting attachment.[39]

Overall gains in attachment may be threatened by upcoming trends in health human resources. About 14.4% of Ontario family physicians are aged 65 years and older,[40] and the mean age of retirement is 70.5 years.[41] Increased pressures during the COVID-19 pandemic have accelerated retirement plans of older physicians,[42] and almost 20% of Toronto primary care providers report considering closing their practice in the next 5 years.[43] In addition, the comprehensiveness of practice has been decreasing.[44] Overall patient panel sizes are reduced in all career phases[41] and practice patterns are shifting away from comprehensive primary care practices to more focused practices and roles in hospital and emergency departments.[45] The combined impact of fewer medical students ranking family medicine as their first choice for residency training[46] and an aging family physician workforce[47] suggest upcoming problems in health human resources, which could substantially erode the gains observed in our study.

Limitations

Administrative data cannot be used to track services provided by nurse practitioners, except in CHCs. In Ontario, 25 nurse practitioner–led clinics serve around 100 000 patients, largely located in rural and remote settings.[48] Although they play an important role in these communities, the volume of service is unlikely to change the overall trends. In addition, although the attachment algorithm showed high sensitivity, specificity was more modest, meaning that some uncertainly attached individuals may have been misclassified. In addition, measures of income and residential instability were all determined at a neighbourhood level using Census data. Area-level measures are economical and widely used to examine population-level differences, but are limited by their inability to capture variation within neighbourhoods.[49] Some young adults without clear primary care providers may have been temporarily living outside Ontario, which we could not identify in our data. We also could not assess the quality of attachment or whether unattached patients were seeking attachment. Finally, the associations found do not imply causation and additional unmeasured reasons may contribute to lack of attachment to a primary care provider.

Table 2: Unadjusted, single-predictor logistic regression models for association between patient characteristics and patient attachment in 2018, stratified by sex

Variable	OR (95% CI)	
	Male *n* = 6 009 381	Female *n* = 6 297 372
Age category, yr		
< 19	1.99 (1.97–2.01)	1.41 (1.40–1.42)
19–34	0.57 (0.57–0.57)	0.64 (0.63–0.64)
35–49	0.71 (0.70–0.71)	0.83 (0.82–0.84)
50–64	Ref.	Ref.
65–79	1.45 (1.44–1.47)	1.16 (1.15–1.17)
≥ 80	1.54 (1.52–1.57)	1.10 (1.08–1.11)
Rurality Index for Ontario		
Urban (0–9)	1.08 (1.07–1.09)	1.07 (1.06–1.08)
Small town (10–39)	1.33 (1.32–1.34)	1.44 (1.42–1.45)
Rural (≥ 40)	Ref.	Ref.
Comorbidity (ADG)		
No or low comorbidity (0–4) (Ref.)	Ref.	Ref.
Moderate comorbidity (5–9)	3.33 (3.31–3.35)	3.03 (3.01–3.05)
High comorbidity (≥ 10)	3.28 (3.24–3.32)	2.89 (2.86–2.92)
Morbidity (Resource Utilization Band)		
Nonuser or healthy user (0–1)	Ref.	Ref.
Low comorbidity (2)	4.38 (4.36–4.41)	5.85 (5.80–5.89)
Moderate morbidity (3)	6.51 (6.47–6.54)	7.67 (7.62–7.71)
High morbidity (≥ 4)	7.13 (7.07–7.19)	7.64 (7.58–7.71)
Recent immigrant		
No	Ref.	Ref.
Yes	0.56 (0.56–0.56)	0.50 (0.50–0.51)
Residential instability quintile		
1 (lowest instability)	Ref.	Ref.
2	0.90 (0.89–0.91)	0.95 (0.94–0.96)
3	0.82 (0.82–0.83)	0.89 (0.88–0.89)
4	0.70 (0.70–0.71)	0.77 (0.77–0.78)
5 (highest instability)	0.53 (0.53–0.54)	0.59 (0.58–0.59)
Material deprivation quintile		
1 (lowest deprivation)	Ref.	Ref.
2	1.01 (1.00–1.01)	1.03 (1.02–1.03)
3	0.90 (0.90–0.91)	0.94 (0.93–0.94)
4	0.78 (0.78–0.79)	0.83 (0.82–0.84)
5 (highest deprivation)	0.65 (0.64–0.65)	0.71 (0.71–0.72)

Note: ADG = Aggregated Diagnostic Group, CI = confidence interval, OR = odds ratio, Ref. = reference category.

Conclusion

Attachment to a primary care provider in Ontario increased between 2008 and 2014, but was unchanged after 2014, following reduced physician entry to alternate funding and interdisciplinary team models. Targeted interventions are needed to address persistent gaps for immigrants and people with low incomes. Upcoming trends in health human resources may erode the gains seen. Future research should use robust longitudinal designs to evaluate trends during the COVID-19 pandemic and health outcomes associated with attachment for different patient populations.

Table 3: Multivariable logistic regression for association between patient characteristics and patient attachment in 2018, stratified by sex

Variable	OR (95% CI)	
	Male *n* = 6 009 381	Female *n* = 6 297 372
Intercept	2.23 (2.20–2.26)	2.39 (2.35–2.43)
Age category, yr		
< 19 v. 50–64	2.70 (2.67–2.73)	2.40 (2.37–2.43)
19–34 v. 50–64	0.86 (0.86–0.87)	0.83 (0.83–0.84)
35–49 v. 50–64	0.92 (0.91–0.92)	1.01 (1.00–1.02)
65–79 v. 50–64	1.13 (1.12–1.14)	1.00 (0.99–1.01)
≥ 80 v. 50–64	1.14 (1.13–1.16)	0.91 (0.90–0.92)
Rurality Index for Ontario		
Urban v. rural	1.11 (1.10–1.12)	1.11 (1.09–1.12)
Small town v. rural	1.28 (1.27–1.30)	1.35 (1.33–1.37)
Comorbidity (ADG)		
Moderate v. low comorbidity	1.41 (1.40–1.42)	1.33 (1.31–1.34)
High v. low comorbidity	1.58 (1.56–1.61)	1.36 (1.34–1.38)
Resource Utilization Band		
Low user v. nonuser	3.90 (3.87–3.93)	5.43 (5.38–5.48)
Moderate user v. nonuser	5.32 (5.28–5.36)	6.95 (6.89–7.01)
High user v. nonuser	4.82 (4.76–4.89)	7.07 (6.98–7.16)
Recent immigrant		
Immigrant v. nonimmigrant	0.63 (0.63–0.64)	0.60 (0.59–0.60)
Residential instability quintile		
Q2 v. Q1 (lowest instability)	0.93 (0.92–0.94)	0.94 (0.93–0.95)
Q3 v. Q1 (lowest instability)	0.88 (0.88–0.89)	0.91 (0.90–0.92)
Q4 v. Q1 (lowest instability)	0.81 (0.81–0.82)	0.84 (0.83–0.85)
Q5 (highest) v. Q1 (lowest instability)	0.67 (0.67–0.68)	0.72 (0.71–0.73)
Material deprivation quintile		
Q1 v. Q1 (lowest deprivation)	0.98 (0.97–0.99)	0.98 (0.98–0.99)
Q3 v. Q1 (lowest deprivation)	0.92 (0.91–0.93)	0.93 (0.92–0.94)
Q4 v. Q1 (lowest deprivation)	0.85 (0.84–0.86)	0.87 (0.86–0.88)
Q5 (highest) v. Q1 (lowest deprivation)	0.75 (0.75–0.76)	0.80 (0.79–0.80)

Note: ADG = Aggregated Diagnostic Group, CI = confidence interval, OR = odds ratio.

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Data sharing: The data set from this study is held securely in coded form at ICES. Although 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.

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