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Research

The impact of OHIP+ pharmacare on use and costs of public drug plans among children and youth in Ontario: a time-series analysis

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Abstract

Background: In 2018, Ontario implemented a pharmacare program (Ontario Health Insurance Plan Plus [OHIP+]) to provide children and youth younger than 25 years with full coverage for prescription medications in the provincial formulary. We aimed to assess the use of public drug plans and costs of publicly covered prescriptions before and after the program's implementation and modification.

Methods: We conducted a population-based, interrupted time-series analysis using data on prescription drug claims, from the Canadian Institute for Health Information's National Prescription Drug Utilization Information System, for people younger than 25 years from January 2016 to October 2019 in Ontario, using British Columbia as the control. We assessed changes in the level and trend of publicly covered prescriptions and expenditures after the introduction of OHIP+ in January 2018 and after program modifications in April 2019. We also assessed plan use and expenditures for publicly covered prescriptions for diabetes and asthma.

Results: Publicly covered prescriptions in Ontario increased by 290%, from 756 per 1000 people before OHIP+ to 2952 per 1000 ($p < 0.001$) after its implementation. After program modification, prescriptions decreased by 52% to 1421 per 1000 ($p < 0.001$). Similarly, total public drug expenditures increased by 254%, from $379 million in 2017 to $839 million in 2018, then reduced by 49% to $204 million in 2019. Monthly public plan expenditures increased by $115.94 (95% confidence interval [CI] $100.93 to $130.94) post-OHIP+ implementation and decreased by $99.97 (95% CI –$119.79 to –$80.15) per person per month after April 2019.

Interpretation: Adopting OHIP+ increased use of public drug plans and expenditures for publicly funded prescription medicines, and the program modification was associated with decreases in both outcomes. This study's findings can inform the national pharmacare debate; future research should investigate associations with health outcomes.

Universal health coverage promotes access to necessary care and protects patients from health-related financial hardship that may affect health outcomes. The World Health Organization declared that governments are obligated to promote universal coverage of essential health care services, including prescription drugs.[1–4] Given the importance of reducing out-of-pocket spending for prescription drugs, universal access to affordable, safe and appropriately prescribed treatments is an important goal for health systems in all countries.[2–5] However, approaches to universal health coverage for prescription medications or universal pharmacare varies according to the population covered (who), health products and technologies (what) and the extent of coverage (proportion of direct costs covered). The amount spent on prescription drugs, including per capita spending, has significantly increased over time.[4–7] Health system expenditure on prescription drugs has also increased in many countries, often growing faster than other health system costs.[5–14] Therefore, implementing universal pharmacare can enhance equitable access to needed care and medicines,[7–33] which is central to the ongoing debate about the need for a national pharmacare program in Canada.[11]

Although Canada's provincial and territorial health systems provide a single-payer system with coverage for medically necessary hospital and physician-based care, this universality does not extend to outpatient prescription medications.[2–5] Instead, prescription drugs are funded by a fragmented patchwork of public and private drug plans that varies by province and leaves many Canadians with little or no drug coverage.[4–6] Children and youth are a vulnerable population, and studies that have investigated coverage variation have shown that younger adults are the most disadvantaged in coverage.[7–23] In

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Ontario, the provincial government implemented the Ontario Health Insurance Plan Plus (OHIP+) in January 2018, which offered full coverage for publicly covered prescription medications to children and youth younger than 25 years. According to the provincial government, the estimated predicted additional annual investment was $465 million to expand coverage of young people through OHIP+.[25,26] However, the initial scope of OHIP+ was modified in April 2019, restricting eligibility to those without private drug plans, most often from parental coverage.[25–27] We sought to assess the impact of the introduction and subsequent modification of OHIP+ on the number of publicly covered prescriptions and plan expenditures. Using the same metrics, we also sought to assess prescription medications among the 2 most common chronic conditions (asthma and diabetes) affecting Canadian children and youth.[23–27]

Methods

Study design

We used an interrupted time-series design to estimate changes in the number of publicly covered prescriptions and plan expenditures. It is a rigorous method to examine the longitudinal effects of introducing new programs and policies, including changes in outcomes of interest, while controlling for pre-existing trends.[17–30]

Setting and policy intervention

The implementation of OHIP+ in January 2018 and its modification in April 2019 provides 2 time points of interest. The original program offered full coverage for more than 4400 medication products from the Ontario Drug Benefit formulary for children and youth younger than 25 years. In April 2019, the program was modified to exclude those covered by private drug plans and those eligible for the Ontario Drug Benefit program (e.g., through the Trillium Drug Program and those receiving social assistance). We used the province of British Columbia as a nonequivalent control jurisdiction, as it had comparable coverage for youth and children and similar social assistance programs during the study period.

Data sources

The National Prescription Drug Utilization Information System (NPDUIS) provided anonymized, aggregated data on public prescriptions and drug plan reimbursement benefits for Ontario and BC for the 24 months preceding and 15 months following the adoption of OHIP+, and the 7 months after its modification. The NPDUIS, operated by the Canadian Institute for Health Information, is a data repository of public drug coverage plans from all provinces and territories except Quebec, Nunavut and the Northwest Territories, excluding those covered by provincial workers' compensation boards or federal drug programs. The NPDUIS has additional formulary data on which drugs are included in public drug plans, and the posted costs of prescribed drugs (as opposed to the negotiated price deductions), as well as prescription utilization. The data set for Ontario and BC included medication class, product name, the dose of the drug, the number of active beneficiaries enrolled in the plan over each month, the number of paid beneficiaries, the number of prescriptions and the amount the program paid for reimbursed claims.[8]

Outcomes

The primary outcome variables included the number and rate of publicly covered prescriptions, and public plan expenditures in Ontario and BC through the study period. To calculate the overall utilization rate of public drug plans, we used the number of publicly covered prescriptions, recorded as the total number of claims accepted per month, divided by the population aged 24 years and younger for both provinces, linearly interpolated for each month from annual Statistics Canada population estimates. We made the same calculations for the secondary analysis on prescription medications for asthma and diabetes. Overall, we calculated public plan expenditure as the average monthly public reimbursement in dollars per person and per 1000 population for all prescription drugs for Ontario and BC. The Ontario and BC population were linearly interpolated for each month from annual Statistics Canada population estimates over the study period.

Statistical analysis

We used a segmented regression analysis model. We calculated utilization rates in the following 3 segments for Ontario and BC based on the utilization aggregate numbers provided in the NPDUIS data, each with multiple observation periods: before adoption of OHIP+, after the adoption of OHIP+ and after the modification of OHIP+. We fit the segmented regression models using a generalized least squares model and incorporated appropriate autocorrelation parameters for each model based on standard diagnostic criteria.[19] The intervention and control group models included terms for the existing level and linear trend in the outcome and changes or shifts on both the level and linear trend. They also had an indicator variable for January, when use and cost change with a rollover of OHIP+. Our underlying model assumption was that the Ontario trend would change similarly to BC, without OHIP+. We differenced the outcomes between the intervention and the control group and plotted the counterfactuals from the models for both groups. We did not conduct any sensitivity analyses.

Ethics approval

Ethics approval was provided by the Hamilton Integrated Research Ethics Board before conducting the study (no. 10991-C).

Results

Table 1 contains data on the monthly counts and selected characteristics of the Ontario residents younger than 25 years who were eligible for OHIP+ and who filled publicly covered prescriptions during the study period. The study sample from Ontario was evenly balanced by age group (0–17 yr and 18–25 yr) and gender, but not by socioeconomic status, as 60% of those who received the publicly covered prescriptions during

Table 1: Characteristics of the Ontario sample

Characteristic	No. (%) of ODB beneficiaries*		
	December 2017 (Before OHIP+) *n* = 81 556	March 2019 (After OHIP+) *n* = 559 044	October 2019 (After OHIP+ modification) *n* = 251 218
Age, yr			
0–17	46 626 (57.2)	307 056 (54.9)	134 224 (53.4)
18–25	34 930 (42.8)	251 988 (45.1)	116 994 (46.6)
Sex			
Male	39 943 (49.0)	240 835 (43.1)	111 545 (44.4)
Female	40 612 (49.8)	317 954 (56.9)	139 467 (55.5)
Other	1001 (1.2)	255 (0.05)	206 (0.08)
SES (income quintile)			
Low (Q1)	33 964 (41.6)	108 218 (19.4)	68 372 (27.2)
Low–middle (Q2)	18 119 (22.2)	102 359 (18.3)	51 718 (20.6)
Middle (Q3)	12 407 (15.2)	109 887 (19.7)	46 292 (18.4)
Middle–upper (Q4)	8962 (11.0)	114 927 (20.6)	41 896 (16.7)
Upper (Q5)	6452 (7.9)	117 608 (21.0)	38 995 (15.5)
Prescriptions			
Total prescriptions	265 709	1 041 849	558 919
Overall plan cost, $	16 251 475	62 057 345	33 694 070
Prescriptions for asthma			
Total prescriptions	3166	12 183	5732
Overall plan costs, $	259 015	1 415 801	560 200
Prescriptions for diabetes			
Total prescriptions	20 715	108 300	54 919
Overall plan costs, $	722 872	4 763 749	2 179 416
Rate of use per 1000 population aged < 25 yr	783	2993	1606

Note: ODB = Ontario Drug Benefit, OHIP+ = Ontario Health Insurance Plan Plus, SES = socioeconomic status.
*Unless indicated otherwise.

the pre-OHIP+ period were of either low or low–middle socioeconomic status. Use of public drug plans was evenly distributed by income quintile when the full OHIP+ plan was in place. The number of people covered by all public drug plans in Ontario and BC averaged 260 930 and 119 881 per month, respectively.

Overall use of public drug plans

Overall, 24 869 544 publicly covered prescriptions were paid for by the benefits plan over the 46-month study period.

As shown in Figure 1 and Table 2, we found a level increase rate of 2.13 publicly covered prescriptions per person (age < 25 yr) per month paid for by the plans at OHIP+ implementation (95% confidence interval [CI] 1.89 to 2.37) and a significant immediate level drop of –1.61 (95% CI –1.95 to –1.26) at its modification; we did not observe a statistically significant increase in the trends after that time point. Compared with BC, where utilization was stable, publicly covered prescriptions in Ontario increased by 290%, from 756 per 1000 young people in the 2 years before OHIP+ implementation to 2952 per 1000 from January 2018 to April 2019, then decreased by 52% to 1421 per 1000, as shown in Table 3. Government total annual costs increased by $460 million, then decreased by 49% to 204 million.

Use of public drug plans for asthma and diabetes prescriptions

As shown in Table 2, we found an immediate increase of 0.27 publicly covered prescriptions per person per month for asthma paid for by the plans after the adoption of OHIP+ (95% CI 0.20 to 0.35) and an immediate drop of 0.16 of the same after its modification (95% CI –0.24 to –0.08). On the other hand, we found a level increase of 0.02 (95% CI 0.01 to 0.04) publicly covered drug prescriptions per person per month for diabetes paid for by the plans after the adoption of OHIP+ and a significant immediate drop of –0.02 (95% CI –0.04 to –0.02) after its modification. There was no statistically significant change in the trends for either policy interventions.

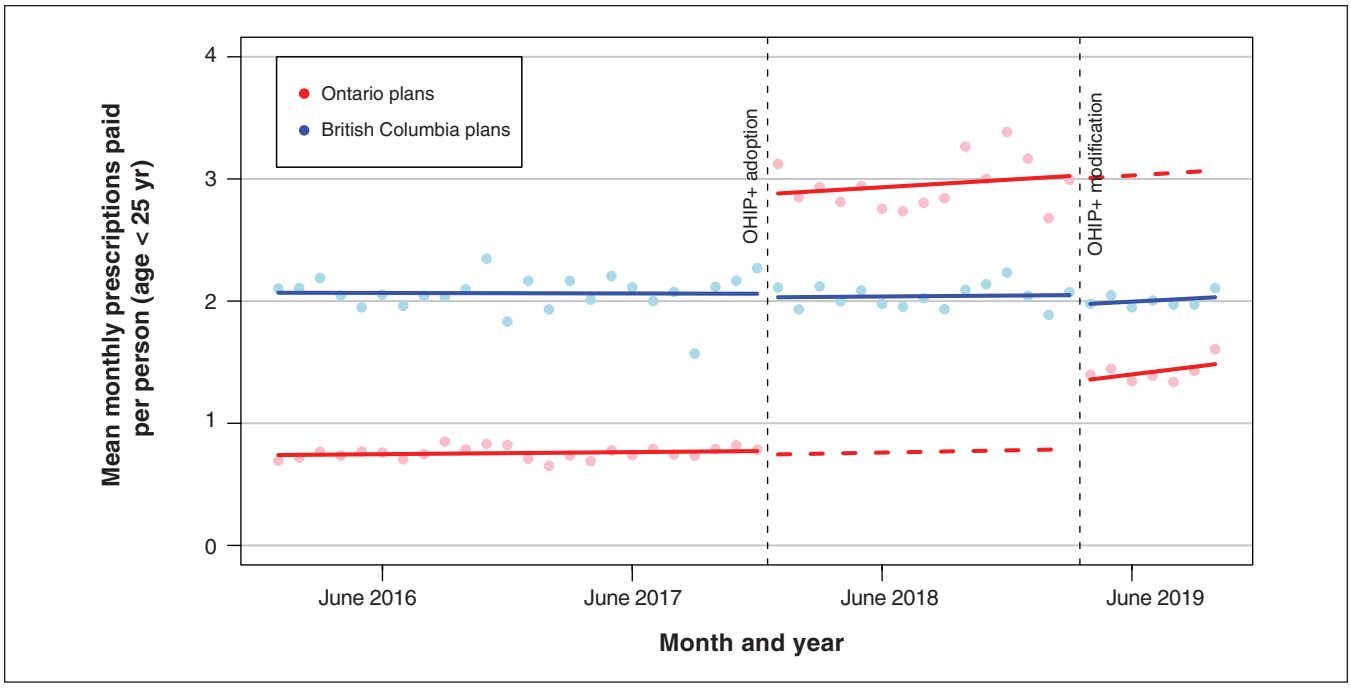

Figure 1: Average monthly number of publicly covered prescriptions per person (age < 25 yr), where at least a portion was paid by the provincial public benefits plan, before and after the adoption and modification of the Ontario Health Insurance Plan Plus (OHIP+) in January 2018 and in April 2019, respectively. Note: The solid lines represent the estimated monthly rates, and dashed lines (counterfactual) represent predicated estimates.

Table 2: Effect of Ontario Health Insurance Plan Plus (OHIP+) on rate change in monthly publicly covered prescriptions and plan expenditure volumes

	Rate change (95% CI)	
Parameter	Period before OHIP+ to adoption of OHIP+	Period between adoption and modification of OHIP+
Overall		
Overall prescription		
Level change	2.13 (1.89 to 2.37)	–1.61 (–1.95 to –1.26)
Trend change	0.01 (–0.02 to 0.03)	0.003 (–0.07 to 0.07)
Overall plan costs, $		
Level change	115.94 (100.93 to 130.94)	–99.97 (–119.79 to –80.15)
Trend change	1.86 (–0.27 to 3.46)	–0.64 (–3.70 to 4.98)
Asthma		
Overall prescription		
Level change	0.27 (0.20 to 0.35)	–0.16 (–0.24 to –0.08)
Trend change	0.0002 (–0.11 to 0.01)	0.0008 (–0.03 to 0.02)
Overall plan costs, $		
Level change	12.80 (10.85 to 14.76)	–8.58 (–10.82 to –6.33)
Trend change	0.04 (–0.23 to 0.31)	0.1781 (–0.44 to 0.80)
Diabetes		
Overall prescription		
Level change	0.02 (0.01 to 0.04)	–0.02 (–0.04 to –0.02)
Trend change	0.0002 (–0.0001 to 0.0003)	–0.0004 (–0.0005 to 0.0003)
Overall plan costs, $		
Level change	2.80 (1.15 to 4.10)	–2.30 (–3.60 to –1.80)
Trend change	0.03 (–0.02 to 0.04)	–0.04 (–0.05 to 0.03)

Note: CI = confidence interval.

Table 3: Changes in publicly covered prescriptions and plan expenditure volumes after the adoption and modification of Ontario Health Insurance Plan Plus (OHIP+)

Parameter	Pre-OHIP+	Adoption phase		Modification phase	
		Post-OHIP+ adoption	Change from pre-OHIP+ adoption, %	Post-OHIP+ modification	Change from pre-OHIP+ modification, %
Total no. of beneficiaries	1 864 796	8 314 971	+613	1 822 971	–53
Total no. of prescriptions	6 126 278	15 280 827	+299	3 462 439	–52
Rate of prescription use per 1000 people	756	2,952	+74	1421	–52
Overall plan costs, $	378 864 749	838 556 189	+254	203 827 168	–49
Rate of cost per 1000 people, $	4602	16 202	+252	1606	–99
Drug prescriptions (asthma)	408 517	1 617 430	+534	307 354	–59
Omalizumab	28	2704	+17 900	552	–56
Mometasone	51	1369	+4450	46	–92
Budesonide	8632	47 245	+775	11 194	–49
Formoterol and mometasone	3733	18 618	+696	3513	–60
Rate of use of asthma drugs per 1000 people	52	309	+494	126	-59
Drug prescriptions (diabetes)	69 598	172 492	+297	36 471	–55
Empagliflozin	98	1596	+2500	655	–12
Insulin glulisine	340	1818	+764	318	–63
Metformin and sitagliptin	1270	2731	+244	1106	–13
Rate of use of diabetes drugs per 1000 people	9	33	+288	15	–55
Drug plan expenditure (asthma), $	15 731 734	67 238 150	+584	12 598 120	–20
Omalizumab	41 642	4 183 232	+15 974	765 228	–61
Ipratropium	25 720	6827	+9452	17 331	–98
Mometasone	2456	75 830	+4856	2344	–93
Rate of cost for asthma prescriptions per 1000 people	1940	12 990	+570	4548	–64
Drug expenditure (diabetes), $	15 731 734	67 238 150	+584	12 598 120	–20
Empagliflozin	8785	176 536	+3100	56 926	–31
Dapagliflozin	3856	51 501	+2032	5075	–79
Insulin glulisine	28 803	173 455	+864	32 635	–60
Rate of cost for diabetes prescriptions per 1000 people	716	3584	+410	1489	–62

There were substantial increases of 100% or more in the monthly mean publicly covered prescriptions for asthma and diabetes, and then decreases for overall and individual prescriptions by 50% or more, with the adoption and modification of OHIP+, respectively (Table 3). The largest increases (> 900%) for asthma prescriptions were reported for omalizumab, mometasone, vilanterol fluticasone and budesonide (Table 3 and Appendix 1, available at www.cmajopen.ca/content/10/3/E848/suppl/DC1). The largest declines (> 90%) were for ivacaftor and mometasone. For diabetes prescriptions, the largest increase was for insulin glulisine and empagliflozin (both with > 700% change). The largest decline (> 65%) was found for insulin detemir, insulin aspart and diagnostic test strips (Table 3 and Appendix 1).

Prescription drug plan expenditures

The total number of publicly covered prescription and plan expenditures reimbursed by the benefits plan over the 46 months was $1 421 248 106. As shown in Figure 2, there was an increased plan expenditure rate of $115.94 (95% CI $100.93 to $130.94) per person (age < 25 yr) per month after the adoption of OHIP+ and a level drop of $99.97 (95% CI –$119.79 to –$80.15) after its modification. The estimated trend change noted a slight monthly increase of $1.86 (95% CI –$0.27 to $3.46) per person per month, with a trend change in the opposite direction after modification. Compared with the stable BC utilization, plan expenditures in Ontario increased by 252%, from a mean of $4602 per 1000 young people in the 2 years before OHIP+ implementation to

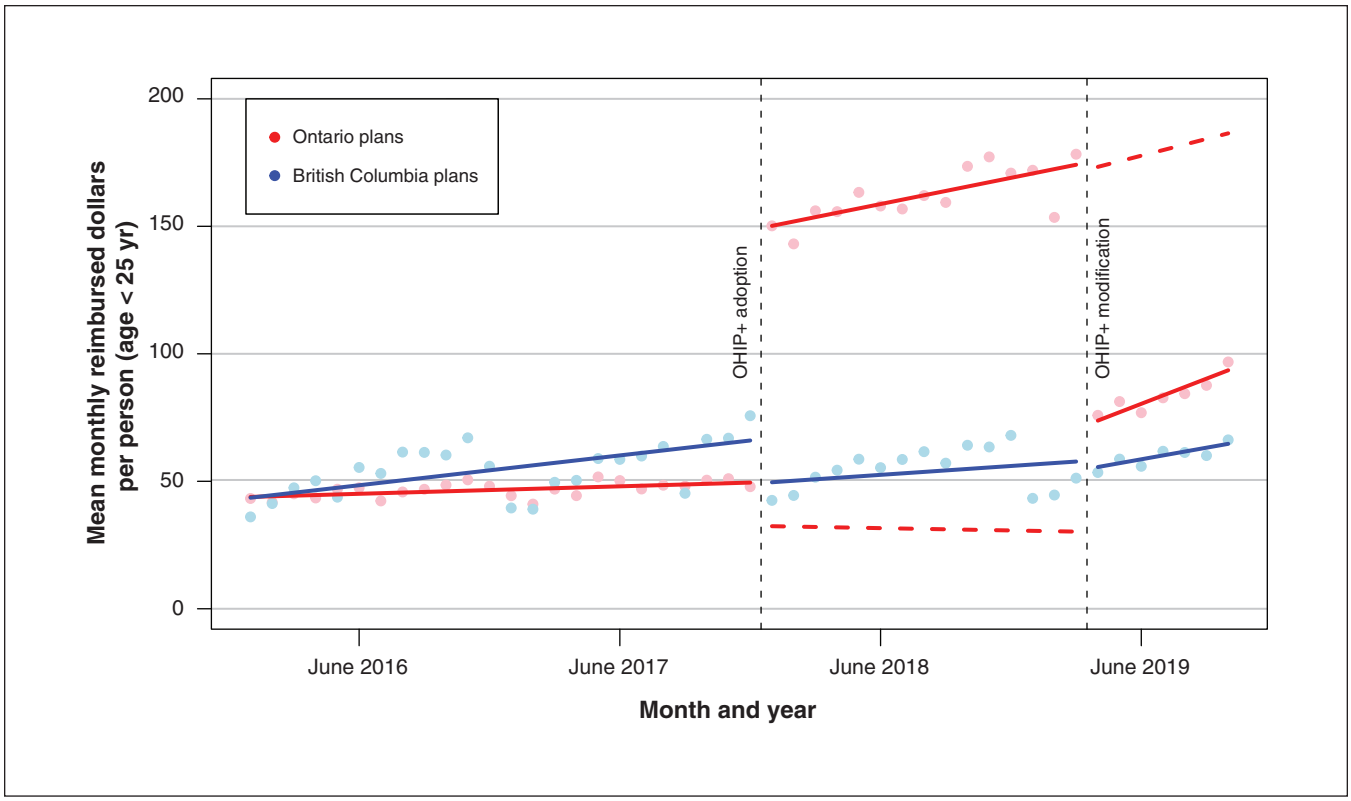

Figure 2: Interrupted time-series analysis of overall reimbursed dollars per person (age < 25 yr), before and after the adoption and modification of the Ontario Health Insurance Plan Plus (OHIP+) in January 2018 and in April 2019, respectively. Note: The solid lines represent the estimated monthly rates and dashed lines (counterfactual) represent predicated estimates.

$16 202 per 1000 from January 2018 to April 2019, which then decreased by 99% to $1606 per 1000 after modification.

Plan expenditures for asthma and diabetes drug prescriptions

As shown in Table 2, we found an immediate increase in the plan expenditure rate of $12.80 (95% CI $10.85 to $14.76) per person per month for asthma prescriptions reimbursed by the benefits plans after the adoption of the first OHIP+ policy, and a subsequent immediate drop of $8.58 (95% CI –$10.82 to –$6.33) per person per month after modification. After the adoption of OHIP+, the estimated trend change was $0.04 (95% CI –$0.23 to $0.31) per person per month. For diabetes, drug plan expenditure increased by $2.80 (95% CI $1.15 to $4.10) per person per month after adopting OHIP+ and a level drop of $2.30 (95% CI –$3.60 to –$1.80) after the program modification. There was no statistically significant change in the trend for either policy interventions.

Many of the changes in plan expenditures for asthma and diabetes were substantial, with reimbursements increasing by 100% or more and dropping for the overall and individual prescriptions by 50% or more after the program modification (Table 3). The largest increases in the monthly mean for publicly covered asthma prescriptions plan expenditures was for omalizumab, mometasone, ipratropium, tiotropium and budesonide (above 900% change), and the largest declines were for ivacaftor and ipratropium (> 90% change). For diabetes prescriptions, the most significant increases were for empagliflozin, dapagliflozin and insulin glulisine (> 800%), and the largest declines were for dapagliflozin and insulin detemir (> 70% change) (Appendix 1).

Interpretation

Findings from this study have implications both for policy and future research. For policy, our results can be used to inform the ongoing discussions regarding a national, universal pharmacare program in Canada. Expanding coverage would increase access to prescription medicines (essential and nonessential) and would likely reduce cost burdens on many people in lower socioeconomic strata, but would increase costs for governments by an amount that appears to be predictable. Future research should focus on implementing and modifying OHIP+ by type of insuree — based on age, sex and social economic status (i.e., income quantile categories) — and their health outcomes, as this would generate the crucial data for cost-effectiveness analysis.

Our study aligns with others that have found that public prescription drug plans that provide noncatastrophic, first-dollar coverage increase use of public coverage for medications.[5–7,34–43] Expanded coverage, on the other hand, may not improve clinical outcomes because access or adherence is not sufficiently improved, or because the benefit of essential

medicines is outweighed by the lack of benefit from nonessential or harmful medicines, which would likely reduce cost burdens for many people but would increase costs for governments.[41] Other studies have suggested that higher financial coverage promotes higher use of and financial access to drugs among populations.[1,16,41] In contrast, a more restrictive model of universal drug coverage offers limited access and mixed drug expenditure based on the payer.[1,4,6,16]

From a societal perspective (i.e., total use and costs from both private and public plan coverage), the total cost of medications would change if the total use per person changed after OHIP+ coverage or the total costs per medication changed. The utilization patterns in our study partially support those from the Telus report,[44,45] which found a 54% decrease in private plan expenditures and a similar increase in use of government public coverage after the implementation of OHIP+, and a 28% increase in private plans and an equal decrease in use of public plan coverage after the restriction of OHIP+ coverage to those without private coverage in 2019.[44] The cost to private insurance plans for drug therapies would likely be higher than the cost to public plans for the same drugs.[44,45]

Given limitations in data access, we did not assess impacts by type of insuree or clinical outcomes. This is crucial data to pursue, as improving health outcomes is the ultimate goal of these policy changes. Randomized trials were undertaken in the United States and Canada to examine the health outcomes and adherence of patients who were provided free access to their medications,[41,46] and reported no improvement in health outcomes. However, the recently published CLEANMeds randomized trial, which involved Ontario patients with cost-related nonadherence, showed improved adherence and reduced health care costs over the 2-year follow-up period.[42] Further work on the cost-effectiveness of various drug coverage policies is essential.[42,43,46] We are not aware of a randomized trial that has evaluated free essential medications just for children and youth, which is arguably the group likely to prove the most cost effective, given lower per-person costs and longer life-years remaining. Expanded financial coverage likely accounted for the increase in use of the publicly covered prescription drug plans found in our study.

We used province-wide data to calculate utilization rates and plan expenditure, which provides a robust assessment of the impact of OHIP+ and its modification on these outcomes. Although we could not conduct an assessment from a societal perspective given a lack of access to data from private drug plans, our findings still provide a clear picture for health care planners on the likely cost of implementing universal pharmacare. Therefore, public plans across Canada can use these data with their current utilization data to estimate the probable cost of providing first-dollar coverage for prescription drugs for children and youth of their population. Similarly, the study findings help inform the national debate in Canada about a national pharmacare program, which would enhance equitable access to medications.

Limitations

The limitations of our study include selecting a small number of indicators based on what was available through NPDUIS. In addition, although we are unaware of any changes that may have affected plan beneficiaries around the time of the OHIP+ policy change, there is potential for bias in our estimates if such changes did occur and these confounders were not included in our models. Other limitations are lack of data on offsets on utilization and costs from private plans and from self-pay, on patient clinical outcomes and on impacts by type of insuree.

Conclusion

Adopting a universal pharmacare (OHIP+) for Ontarians aged younger than 25 years increased the number of publicly covered prescriptions and public expenditures considerably, with a decrease in both after the modification of the program. Our findings can inform the debate over national pharmacare, which would enhance equitable access to medications, and largely confirmed the government-predicted additional cost of OHIP+. Future research should focus on examining associations of implementing OHIP+ and changes in policy with health outcomes so that cost-effectiveness can be estimated.

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