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Estimated cost of universal public coverage of prescription drugs in Canada

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Abstract

Background: With the exception of Canada, all countries with universal health insurance systems provide universal coverage of prescription drugs. Progress toward universal public drug coverage in Canada has been slow, in part because of concerns about the potential costs. We sought to estimate the cost of implementing universal public coverage of prescription drugs in Canada.

Methods: We used published data on prescribing patterns and costs by drug type, as well as source of funding (i.e., private drug plans, public drug plans and out-of-pocket expenses), in each province to estimate the cost of universal public coverage of prescription drugs from the perspectives of government, private payers and society as a whole. We estimated the cost of universal public drug coverage based on its anticipated effects on the volume of prescriptions filled, products selected and prices paid. We selected these parameters based on current policies and practices seen either in a Canadian province or in an international comparator.

Results: Universal public drug coverage would reduce total spending on prescription drugs in Canada by $7.3 billion (worst-case scenario $4.2 billion, best-case scenario $9.4 billion). The private sector would save $8.2 billion (worst-case scenario $6.6 billion, best-case scenario $9.6 billion), whereas costs to government would increase by about $1.0 billion (worst-case scenario $5.4 billion net increase, best-case scenario $2.9 billion net savings). Most of the projected increase in government costs would arise from a small number of drug classes.

Interpretation: The long-term barrier to the implementation of universal pharmacare owing to its perceived costs appears to be unjustified. Universal public drug coverage would likely yield substantial savings to the private sector with comparatively little increase in costs to government.

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Universal health care coverage encourages access to necessary care and protects patients from financial hardship, and the World Health Organization has declared that governments are obligated to promote universal coverage of necessary health care services, including prescription drugs.[1] All developed countries with universal health insurance systems provide universal coverage of prescription drugs — with the exception of Canada.

Federal cost-sharing of provincially run programs established Canada's national system of universal, comprehensive public insurance for hospital care in the 1950s and medical care in the 1960s.[2] Canada has a single-payer public insurance system for these services in each province and territory. Such coverage for prescription drugs was recommended by the 1964 Royal Commission on Health Services, the 1997 National Forum on Health, and the 2002 Royal Commission on the Future of Health Care in Canada.[3–5] Despite these recommendations, prescription drugs in Canada are currently 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 at all.[6]

Federal drug plans cover First Nations and other targeted populations that account for 2% of prescription costs in Canada; provincial drug plans cover various populations, accounting for a total of 36% of prescription costs in Canada (ranging from 28% in New Brunswick to 41% in Alberta).[7] A total of 36% of drug costs Canada-wide are funded through private insurance plans,

4% of costs are funded through compulsory social insurance policies (i.e., workers' compensation funds and compulsory drug coverage required for residents of Quebec), and 22% of costs are funded out-of-pocket by patients.[7]

Awareness that the lack of universal drug coverage is a serious shortcoming of the Canadian health care system is growing.[8–10] Owing to variations in drug coverage by province and patient group, about 1 in 10 Canadians report that they cannot afford to take their medications as prescribed.[11,12] In contrast, such cost-related barriers to prescription drugs are reported by only about 1 in 50 residents of the United Kingdom, where universal coverage of prescription drugs is provided at little or no cost to patients.[13] Canadians who fill prescriptions incur out-of-pocket costs that vary considerably depending on their age, employment status and province of residence.[13–15] Overall, 5.7% of Canadians incurred more than $1000 in out-of-pocket costs for prescription drugs in 2007, whereas just 1.2% of British citizens reported incurring such levels of out-of-pocket costs.[13]

Progress toward universal public drug coverage in Canada has been slow, in part because of concerns about the potential cost of such a program.[16,17] Previous studies concerning the impact of a universal public drug plan in Canada have been limited by a lack of data on prescribing patterns, costs by drug type and source of funding (i.e., private drug plans, public drug plans and out-of-pocket).[18–20] Researchers therefore have been unable to model details concerning expected changes in the volume, type and price of prescription drugs purchased by patients with different levels of coverage within and across provinces. We address this information gap using recently published data describing prescription drug spending by province, drug type and source of funding.

We model the cost-impact of a universal system of prescription drug coverage that would be akin to Canadian medicare: public coverage of medically necessary prescription drugs on universal terms and conditions across Canada, including limited patient copayments and a national formulary. We provide estimates of the cost of such a program from the perspective of government, private payers and society as a whole.

Methods

This is a secondary analysis of data published in the *Canadian Rx Atlas*, *3rd Edition*, which quantified drug use and spending patterns within each of 33 therapeutic categories of treatment during the 2012/13 fiscal year.[21] We used the *Canadian Rx Atlas* estimates of the annual volume and cost of prescriptions filled for brand-name drugs for which there are no generic competitors, brand-name drugs with generic competitors and generic drugs, stratified by province, therapeutic category and source of funding (private drug plans, public drug plans and out-of-pocket).

Using an economic framework developed for quantifying determinants of prescription drug spending, we modelled the total cost of prescriptions — stratified by province, therapeutic category and source of funding — as a function of the volume of purchases made, products selected and prices paid for selected products.[22–24] Patients who would become newly insured under a universal public drug plan would be expected to increase their use of prescriptions because they would no longer face cost-related barriers to access. However, a universal public drug benefit program would be expected to promote cost-effective product selection through a population-wide, evidence-based formulary with tiered copayments.[25] In addition, such a plan could lower drug prices by consolidating purchasing power into a single-payer system and enabling population-level supply contracts under the program.[26,27]

We used Canadian experiences with changes in prescription drug coverage to estimate the increase in the use of prescription drugs by patients who would no longer face cost-related barriers to access.[28] We used product selection decisions seen under existing provincial drug plans to estimate choices between brand-name and generic drugs under a universal public drug plan. Finally, we used drug prices found in Canada's official comparator countries to gauge the extent that brand-name and generic drug prices might decrease under a universal public drug plan.[29,30]

To appropriately capture the effects of potential changes in drug prices and product selection decisions, we conducted our analyses separately for each of 31 therapeutic classes of treatment, which account for about 83% of all retail prescription drug sales in Canada. The remaining drugs that did not fall into these therapeutic classes were treated as a single — albeit heterogeneous — class of medicines. We excluded drugs for erectile dysfunction and fertility treatments (2% of all retail sales of prescription drugs in Canada) because, in contrast to other therapeutic categories included in this study, most provinces currently do not provide public coverage for such medications.[21]

Given the narrow range of therapeutic options in specialty drug classes for serious conditions, we assumed no change in product selection in 6 specialty drug classes that accounted for 14% of

all retail sales: biologic agents for inflammatory conditions, antineoplastic agents, antiretroviral drugs for HIV, drugs for multiple sclerosis, drugs for glaucoma and drugs for ocular vascular conditions (e.g., macular degeneration). Changes in the costs of these medications in our analyses stemmed only from changes in use and changes in the price of brand-name and generic drugs.

We assumed that a universal public drug plan would apply small but tiered copayments to encourage cost-effective product selections, with exemptions for low-income families (Appendix 1, available at www.cmaj.ca/lookup/suppl/doi:10.1503/cmaj.141564/-/DC1). However, we assumed that a universal public drug plan would not change dispensing fees paid to pharmacies. Thus, our results include about $4.7 billion in dispensing fees paid for the prescriptions filled — equivalent to $195 000 in dispensing fees per community-based pharmacist working in Canada today.[31] In addition, our results include retail mark-ups on drug costs for prescriptions filled, which range from about $600 million to $1.2 billion across the scenarios we modelled.

Finally, to analyze the incremental public cost of a universal public drug plan, we accounted for the direct cost of existing public drug benefit programs and the current indirect cost to governments of private insurance for public sector employees.

We used our modelling parameters to create base scenarios, as well as best- and worst-case scenarios, from the perspective of assessing the cost to government of a universal public drug plan (Appendix 1).

Results

Overall, Canadians spent just over $22 billion on the medications included in our analysis during the fiscal year 2012/13 (Table 1). Under our base scenario estimates, total spending on these prescription drugs under a system of universal public coverage would be about $15.1 billion, representing a decline of $7.3 billion or 32%. Estimated total savings are the result of almost equal contributions of changes in generic prices (base case –11%; range –14% to –9%), brand-name prices (base case –11%; range –14 to –5%) and product selection (base case –12%; range –16% to –10%), net of a small cost increase driven by increased use by previously uninsured patients (base case 3%; range 2% to 8%) (see sensitivity analysis, Appendix 2, available at www.cmaj.ca/lookup/suppl/doi:10.1503/cmaj.141564/-/DC1).

When we set all model parameters to worst-case scenario values, a universal pharmacare program in Canada would reduce total spending on the prescription drugs covered in this analysis by about $4.2 billion, or 19%. When we set all model parameters to the best-case scenario values, total spending would decrease by about $9.4 billion, or 42%. The variation in these extremes is driven by the multiplicative effects of having all parameters set at best-case or worst-case values. Sensitivity analyses involving changes in individual para-

Table 1: Comparison of actual total retail spending in fiscal year 2012/13 with estimated spending on prescription drugs with universal public coverage, private and public spending combined, by province

Province	Actual total retail spending 2012/13, $ millions	Estimated spending with universal public coverage, $ millions (% change)					
		Base scenario		All model parameters set to worst-case scenario values*		All model parameters set to best-case scenario values*	
All	22 344	15 087	(–32)	18 163	(–19)	12 926	(–42)
British Columbia	2 280	1 564	(–31)	1 875	(–18)	1 324	(–42)
Alberta	2 157	1 474	(–32)	1 776	(–18)	1 257	(–42)
Saskatchewan	577	397	(–31)	478	(–17)	337	(–42)
Manitoba	662	480	(–27)	574	(–13)	406	(–39)
Ontario	8 371	5 470	(–35)	6 631	(–21)	4 665	(–44)
Quebec	6 506	4 463	(–31)	5 341	(–18)	3 878	(–40)
New Brunswick	597	414	(–31)	499	(–16)	354	(–41)
Nova Scotia	700	481	(–31)	578	(–17)	410	(–41)
Prince Edward Island	94	65	(–30)	78	(–17)	56	(–40)
Newfoundland and Labrador	400	279	(–30)	333	(–17)	239	(–40)

*From the perspective of assessing the cost impact to government.

meters and pairs of parameters generated savings estimates that ranged between $5.3 billion (24%) and $8.9 billion (40%) (Appendix 2).

Total private spending on prescription drugs would decrease in each of our scenarios (Table 2). Under the base scenario, private spending on prescription drugs would decrease by $8.2 billion. Our estimates of savings to the private sector ranged from $6.6 billion to $9.6 billion.

Under the base scenario, the total cost to government of implementing a universal public drug benefit program would be $958 million. Our estimated cost to government of a universal, public drug plan ranged from a $5.4-billion increase in spending when all model parameters are set to worst-case scenario values to a net savings of $2.9 billion when all model parameters are set to best-case scenario values.

Cost estimates by therapeutic class (Table 3) showed that most of the increase in government spending required to implement a universal, public drug plan would stem from a few drug classes. The largest increase in public costs ($330 million) would be for the coverage of biologic drugs for inflammatory conditions (e.g., rheumatoid arthritis, psoriasis and Crohn disease). Other large increases in public spending would be required for the universal coverage of antibiotics ($173 million) and hormonal contraceptives ($157 million) — drugs that are commonly used by younger populations that have not historically been primary recipients of public drug benefits in Canada.[6,21]

Interpretation

Provided that Canada could achieve the pricing found in several comparable countries and the rates of generic drug use currently seen under several provincial drug plans, a universal public drug plan would reduce total spending on prescription drugs in Canada by $7.3 billion per year, or 32%. This estimate is in line with other estimates of the potential savings from a universal public drug plan that draw on aggregate comparisons of prescription spending in Canada and comparable countries.[13,18] Savings of this order of magnitude would put spending per capita in Canada on par with the levels seen in comparable countries such as Switzerland, Austria, Spain and Italy. However, spending would still be significantly higher than that in the UK, Sweden, Finland, the Netherlands, Norway, New Zealand and Denmark.[32]

Based on our estimates, the private sector in Canada — primarily employers and unions that sponsor work-related drug benefit plans — could save $8.2 billion under a universal public drug plan. Reducing the need for work-related private drug insurance plans would also reduce administration costs and eliminate the need for the tax subsidies currently given to encourage employers to offer such plans — neither of which has been factored into our analysis, but each of which could produce substantial additional savings to the private and public sectors.[13,18] Similarly, we

Table 2: Estimated total change in public and private retail spending on prescription drugs with universal public coverage, all provinces combined

Spending	Actual retail spending 2012/13, $ millions	Change in spending, $ millions (% change)					
		Base scenario		All model parameters set to worst-case scenario values*		All model parameters set to best-case scenario values*	
Public							
Direct public spending on public drug plans	9 725	3 383	(35)	7 813	(80)	–438	(–5)
Indirect public spending on private drug plans	2 425	–2 425	(–100)	–2 425	(–100)	–2 425	(–100)
Subtotal	12 151	958	(8)	5 388	(44)	–2 863	(–24)
Private							
Private-sector spending on private drug plans	5 659	–5 659	(–100)	–5 659	(–100)	–5 659	(–100)
Patient out-of-pocket spending	4 534	–2 556	(–56)	–3 911	(–86)	–896	(–20)
Subtotal	10 193	–8 215	(–81)	–9 569	(–94)	–6 555	(–64)
Total	22 344	–7 257	(–32)	–4 181	(–19)	–9 418	(–42)

*From the perspective of assessing the cost-impact to government.

have not accounted for the health benefits and reduced demand on other health services that have been shown to result from providing patients with drug coverage.[33]

Perhaps most surprisingly, our analysis suggests that a universal public drug benefit program could achieve these savings for the private sector with a comparatively small increase in public sector spending. In our base scenario, total public spending on prescriptions in several drug classes would be lower under a such a program than under the status quo. Moreover, if Canada were to achieve better-than-average outcomes from a universal public drug plan as compared with countries with

Table 3: Total (direct and indirect) public spending on prescription drugs with universal public coverage, all provinces combined, by drug class

Drug class or condition treated	Actual public spending 2012/13, $ millions	Change in spending, $ millions (% change)					
		Base scenario		All parameters set to worst-case scenario values		All parameters set to best-case scenario values	
Cholesterol-lowering drugs	957	–244	(–26)	19	(2)	–527	(–55)
Antipsychotic agents	497	–128	(–26)	18	(4)	–263	(–53)
Diabetes drugs: non-insulin	414	–121	(–29)	0	(0)	–243	(–59)
Anticoagulant agents	199	–68	(–34)	–22	(–11)	–141	(–70)
Pregabalin and gabapentin	218	–40	(–18)	14	(6)	–97	(–44)
Osteoporosis	193	–28	(–14)	25	(13)	–101	(–52)
Dementia	190	–25	(–13)	30	(16)	–63	(–33)
Benign prostatic hypertrophy	151	–18	(–12)	37	(25)	–78	(–52)
Hypothyroidism	102	–16	(–15)	75	(74)	–90	(–88)
Ocular vascular conditions	148	–8	(–5)	24	(16)	–18	(–12)
Antiplatelet therapy	116	–6	(–5)	25	(22)	–52	(–45)
Glaucoma	148	1	(0)	50	(33)	–34	(–23)
Antihypertensive agents	1 392	4	(0)	457	(33)	–433	(–31)
Urinary frequency and incontinence	80	10	(12)	40	(50)	–8	(–10)
Androgens	28	18	(64)	32	(116)	8	(28)
Antidepressants	668	24	(4)	246	(37)	–209	(–31)
Migraines	59	32	(54)	59	(99)	–5	(–9)
Hormone replacement therapy	82	34	(42)	86	(105)	–9	(–11)
Antiretroviral agents for HIV	286	40	(14)	114	(40)	15	(5)
Acid-reducing drugs	673	51	(8)	266	(40)	–185	(–27)
Opioids	387	55	(14)	232	(60)	–72	(–19)
Diabetes drugs: insulins	315	59	(19)	174	(55)	13	(4)
Nonsteroidal anti-inflammatory drugs	221	60	(27)	175	(79)	–69	(–31)
ADHD	146	70	(48)	173	(119)	–14	(–9)
Antineoplastic agents	259	84	(32)	165	(64)	48	(18)
Multiple sclerosis	196	91	(47)	157	(80)	70	(36)
Benzodiazepines	145	96	(66)	166	(114)	12	(9)
Respiratory conditions	815	103	(13)	414	(51)	-51	(–6)
Hormonal contraceptives	126	157	(125)	291	(231)	62	(49)
All other drugs not classified in study	1 785	168	(9)	922	(52)	–594	(–33)
Antibiotic agents	281	173	(61)	317	(113)	26	(9)
Biologics for inflammatory conditions	871	330	(38)	605	(69)	238	(27)
Total	12 151	958	(8)	5 388	(44)	–2 863	(–24)

Note: ADHD = attention-deficit/hyperactivity disorder.

similar health care systems, our analysis shows the overall net cost to governments would be negative.

Finally, it is worth noting that the goals of universal, affordable public coverage of prescription drugs are not inconsistent with science policy. Location decisions regarding pharmaceutical research and development are driven by the value of the scientific investment, which has more to do with direct scientific investments in a country than the level of pharmaceutical spending.[34] Indeed, Canada currently spends much more on medications than comparable countries with universal health insurance, yet attracts a fraction of the per capita research investment.[13,35] To attract investment, Canada would be advised to increase public investment in health sciences, possibly by using a portion of the savings generated through a single-payer system for universal public coverage of prescription drugs.

Strengths and limitations

As a simulation study, our analysis is necessarily based on assumptions concerning changes in drug use, product selection and prices. We have based our assumptions on available evidence, where appropriate, and on prevailing practices in Canada or abroad. Furthermore, we compared results using a range of assumptions representing best- and worst-case scenarios from the perspective of assessing the cost-impact to government.

Our analysis includes an estimate of the increased use that would result from increased coverage. Provided medications are prescribed appropriately, reducing financial barriers to drugs can be expected to improve patient health outcomes and generate further government savings by way of reduced demands on other forms of publicly funded health care.[33,36,37] In addition, our study analysis models only Canada's provinces. We did not include models of Canada's 3 territories.

Although the inappropriate use of medications is of concern, we did not consider it in this analysis. As many as 1 in 4 older adults in Canada fill 1 or more prescriptions for potentially inappropriate medications each year at an annual cost that could be as high as $1 billion nationwide.[38–40] Clinical leadership is essential; however, an evidence-based national formulary can help to stem overuse and inappropriate use of prescription medications.[41,42] Furthermore, improved integration of medications into Canada's universal public health care system should increase — not decrease — incentives and opportunities to promote their appropriate use.

We were unable to account for confidential rebates paid by drug manufacturers to public drug plans in comparator countries or to existing provincial drug plans.[27] However, private insurers and patients without insurance in Canada generally do not negotiate discounts with manufacturers.[43] Thus, our assumption that a universal public drug plan would expand the negotiating power of the public drug plans in Canada and the scope of sales on which negotiated rebates would apply is reasonable, and our estimates of the decline in prices of brand-name drug are probably conservative.

Conclusion

Universal health coverage is first and foremost about providing appropriate care to patients on the basis of need, not ability to pay. Canada's system is unique insofar as such access is assured for medical and hospital care but not for prescription drugs. A long-time barrier to the implementation of universal prescription drug coverage in Canada has been the perception that it would necessitate substantial tax increases. Our analysis shows that this need not be the case. Universal public coverage of prescription drugs can achieve access and equity goals while also achieving considerable economies of scale that stem from better pricing and more cost-conscious product selection under a single-payer system.

References

1. Evans DB, Etienne C. Health systems financing and the path to universal coverage. *Bull World Health Organ* 2010;88:402.
2. Marchildon GP. *Health systems in transition: Canada*. Toronto: University of Toronto Press; 2006.
3. *Royal Commission on Health Services*. Ottawa: Queen's Printer; 1964.
4. Canada health action: building on the legacy. Vol. II. Ottawa: Health Canada; 1997.
5. Romanow RJ. *Building on values: the future of health care in Canada — final report*. Saskatoon: Commission on the Future of Health Care in Canada; 2002.
6. Daw JR, Morgan SG. Stitching the gaps in the Canadian public drug coverage patchwork? A review of provincial pharmacare policy changes from 2000 to 2010. *Health Policy* 2012;104:19-26.
7. *National health expenditure trends, 1975 to 2013*. Ottawa: Canadian Institute for Health Information; 2013.
8. Hoskins E. Why Canada needs a national pharmacare program. *The Globe and Mail* [Toronto] 2014 Oct. 14.
9. Stanbrook MB, Hébert PC, Coutts J, et al. Can Canada get on with national pharmacare already? *CMAJ* 2011;183:E1275.
10. Dutt M. *Affordable access to medicines: a prescription for Canada*. Toronto: Canadian Doctors for Medicare; 2014.
11. Kennedy J, Morgan S. Cost-related prescription nonadherence in the United States and Canada: a system-level comparison using the 2007 international health policy survey in seven countries. *Clin Ther* 2009;31:213-9.
12. Law MR, Cheng L, Dhalla IA, et al. The effect of cost on adherence to prescription medications in Canada. *CMAJ* 2012;184:297-302.
13. Morgan SG, Daw JR, Law MR. *Rethinking pharmacare in Canada*. Toronto: CD Howe Institute; 2013.
14. Demers V, Melo M, Jackevicius C, et al. Comparison of provincial prescription drug plans and the impact on patients' annual drug expenditures. *CMAJ* 2008;178:405-9.
15. Law MR, Daw JR, Cheng L, et al. Growth in private payments for health care by Canadian households. *Health Policy* 2013;110:141-6.
16. Boothe K. How the pace of change affects the scope of reform: pharmaceutical insurance in Canada, Australia, and the United Kingdom. *J Health Polit Policy Law* 2012;37:779-814.
17. Daw JR, Morgan SG, Collins PA, et al. Framing incremental expansions to public health insurance systems: the case of Canadian pharmacare. *J Health Polit Policy Law* 2014;39:295-330.

18. Gagnon MA. *A roadmap to a rational pharmacare policy in Canada*. Ottawa: Canadian Federation of Nurses Unions; 2014.
19. National pharmacare cost impact study. Ottawa: Palmer D'Angelo Consulting; 1997.
20. Cost impact study of a national pharmacare program for Canada: an update to the 1997 report. Ottawa: Palmer D'Angelo Consulting; 2002.
21. Morgan SG, Smolina K, Mooney D, et al. The Canadian Rx atlas, 3rd edition. Vancouver: UBC Centre for Health Services and Policy Research; 2013.
22. Morgan S. Sources of variation in provincial drug spending. *CMAJ* 2004;170:329-30.
23. Morgan S. Drug spending in Canada: recent trends and causes. *Med Care* 2004;42:635-42.
24. Morgan SG. Prescription drug expenditures and population demographics. *Health Serv Res* 2006;41:411-28.
25. Aaserud M, Dahlgren AT, Kosters JP, et al. Pharmaceutical policies: effects of reference pricing, other pricing, and purchasing policies. *Cochrane Database Syst Rev* 2006;(2):CD005979.
26. Morgan S, Hanley G, McMahon M, et al. Influencing drug prices through formulary-based policies: lessons from New Zealand. *Healthc Policy* 2007;3:e121-40.
27. Morgan S, Daw J, Thomson P. International best practices for negotiating 'reimbursement contracts' with price rebates from pharmaceutical companies. *Health Aff (Millwood)* 2013;32:771-7.
28. Contoyannis P, Hurley J, Grootendorst P, et al. Estimating the price elasticity of expenditure for prescription drugs in the presence of non-linear price schedules: an illustration from Quebec, Canada. *Health Econ* 2005;14:909-23.
29. *Patented Medicine Prices Review Board annual report 2013*. Ottawa: Patented Medicine Prices Review Board; 2014.
30. *Generic drugs in Canada, 2013*. Ottawa: Patented Medicine Prices Review Board; 2014.
31. Pharmacists in Canada. Ottawa: Canadian Pharmacists Association; 2014. Available: www.pharmacists.ca/index.cfm/pharmacy-in-canada/pharmacists-in-canada/ (accessed 2014 Oct. 20)
32. OECD health statistics 2014 — frequently requested data. Paris: OECD; 2014. Available:www.oecd.org/health/health-systems/oecd-health-statistics-2014-frequently-requested-data.htm (accessed 2014 July 31).
33. Kesselheim AS, Huybrechts KF, Choudhry NK, et al. Prescription drug insurance coverage and patient health outcomes: a systematic review. *Am J Public Health* 2015;105:e17-30.
34. Morgan S, Cunningham C. The effect of evidence-based drug coverage policies on pharmaceutical R&D: a case study from British Columbia. *Healthc Policy* 2008;3:54-63.
35. Structural Analysis (STAN) Databases. R&D expenditures by Industry. Paris: OECD; 2012. Available: http://stats.oecd.org/ (accessed 2013 Feb. 17).
36. Choudhry NK, Patrick AR, Antman EM, et al. Cost-effectiveness of providing full drug coverage to increase medication adherence in post-myocardial infarction medicare beneficiaries. *Circulation* 2008;117:1261-8.
37. Dhalla IA, Smith MA, Choudhry NK, et al. Costs and benefits of free medications after myocardial infarction. *Healthc Policy* 2009;5:68-86.
38. *Drug use among seniors on public drug programs in Canada, 2012*. Ottawa: Canadian Institute for Health Information; 2014.
39. Cahir C, Fahey T, Teeling M, et al. Potentially inappropriate prescribing and cost outcomes for older people: a national population study. *Br J Clin Pharmacol* 2010;69:543-52.
40. Bradley MC, Fahey T, Cahir C, et al. Potentially inappropriate prescribing and cost outcomes for older people: a cross-sectional study using the Northern Ireland Enhanced Prescribing Database. *Eur J Clin Pharmacol* 2012;68:1425-33.
41. Hashim S, Gomes T, Juurlink D, et al. The rise and fall of the thiazolidinediones: impact of clinical evidence publication and formulary change on the prescription incidence of thiazolidinediones. *J Popul Ther Clin Pharmacol* 2013;20:e238-42.
42. Sketris IS, Lummis H, Langille E. *Optimal prescribing and medication use in Canada: challenges and opportunities*. Toronto: Health Council of Canada; 2007.
43. *Ensuring the accessibility, affordability and sustainability of prescription drugs in Canada*. Toronto: Canadian Life and Health Insurance Association; 2013.

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Data sharing: The data used in this study are available for download at https://circle.ubc.ca/handle/2429/50349