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. 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. 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. 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.

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). 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 auniversal 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 markups 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-

| 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

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**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.\textsuperscript{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 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                                        | 19 (2)                                   | –527 (–55)                                |
| Antipsychotic agents                            | 497                                        | 18 (4)                                   | –263 (–53)                                |
| Diabetes drugs: non-insulin                     | 414                                        | 0 (0)                                    | –243 (–59)                                |
| Anticoagulant agents                            | 199                                        | –22 (–11)                                | –141 (–70)                                |
| Pregabalin and gabapentin                       | 218                                        | 14 (6)                                   | –97 (–44)                                 |
| Osteoporosis                                    | 193                                        | 25 (13)                                  | –101 (–52)                                |
| Dementia                                        | 190                                        | 30 (16)                                  | –63 (–33)                                 |
| Benign prostatic hypertrophy                    | 151                                        | 37 (25)                                  | –78 (–52)                                 |
| Hypothyroidism                                  | 102                                        | 75 (74)                                  | –90 (–88)                                 |
| Ocular vascular conditions                      | 148                                        | 24 (16)                                  | –18 (–12)                                 |
| Antiplatelet therapy                            | 116                                        | 25 (22)                                  | –52 (–45)                                 |
| Glaucoma                                        | 148                                        | 50 (33)                                  | –34 (–23)                                 |
| Antihypertensive agents                         | 1 392                                      | 457 (33)                                 | –433 (–31)                                |
| Urinary frequency and incontinence              | 80                                         | 40 (50)                                  | –8 (–10)                                  |
| Androgens                                       | 28                                         | 32 (116)                                 | 8 (28)                                    |
| Antidepressants                                  | 668                                        | 246 (37)                                 | –209 (–31)                                |
| Migraines                                       | 59                                         | 59 (99)                                  | –5 (–9)                                   |
| Hormone replacement therapy                     | 82                                         | 86 (105)                                 | –9 (–11)                                  |
| Antiretroviral agents for HIV                   | 286                                        | 114 (40)                                 | 15 (5)                                    |
| Acid-reducing drugs                             | 673                                        | 266 (40)                                 | –185 (–27)                                |
| Opioids                                         | 387                                        | 232 (60)                                 | –72 (–19)                                 |
| Diabetes drugs: insulins                        | 315                                        | 174 (55)                                 | 13 (4)                                    |
| Nonsteroidal anti-inflammatory drugs            | 221                                        | 175 (79)                                 | –69 (–31)                                 |
| ADHD                                            | 146                                        | 173 (119)                                | –14 (–9)                                  |
| Antineoplastic agents                           | 259                                        | 165 (64)                                 | 48 (18)                                   |
| Multiple sclerosis                              | 196                                        | 157 (80)                                 | 70 (36)                                   |
| Benzodiazepines                                 | 145                                        | 166 (114)                                | 12 (9)                                    |
| Respiratory conditions                          | 815                                        | 414 (51)                                 | –51 (–6)                                  |
| Hormonal contraceptives                         | 126                                        | 291 (231)                                | 62 (49)                                   |
| All other drugs not classified in study         | 1 785                                      | 922 (52)                                 | –594 (–33)                                |
| Antibiotic agents                               | 281                                        | 317 (113)                                | 26 (9)                                    |
| Biologics for inflammatory conditions           | 871                                        | 605 (69)                                 | 238 (27)                                  |
| **Total**                                       | 12 151                                     | 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.14 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.30,36,37 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.28-40 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.

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