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The Value of Expanded Pharmacy Services in Canada.

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The Value of Expanded Pharmacy Services in Canada

Isabelle Gagnon-Arpin, Alexandru Dobrescu, Greg Sutherland, Carole Stonebridge, Thy Dinh

Preface

The scope of pharmacy services has expanded in recent years, with each province and territory taking a different approach to better health and value. This report, the second in a three-part research series, models the health and economic impact of three services that are currently delivered within a community pharmacy setting in Canada and have the potential to be scaled up and spread: smoking cessation, advanced medication review and management for cardiovascular disease, and pneumococcal vaccination. By 2035, Canada-wide implementation of the three pharmacy services is estimated to yield total cost savings (including direct health care costs and indirect costs from increased productivity) ranging from $194 million in a low-uptake scenario to over $2 billion in a high-uptake scenario. A large return on investment, which considers both the investment and the downstream economic benefits of scaling up services, is also expected for all three community pharmacy services.

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EXECUTIVE SUMMARY

The Value of Expanded Pharmacy Services in Canada

At a Glance

- Changes to pharmacy legislation and standards, policy, and practices have created an opportunity for pharmacists to take on an expanded role in service delivery.
- This report showcases a modelling study that estimates the health and economic impact of three services currently delivered within a community pharmacy setting that have the potential to be expanded: smoking cessation, advanced medication review and management for cardiovascular disease, and pneumococcal vaccination.
- Over the 20-year forecast period, the estimated economic value of expanding these services ranges from $2.5 billion to $25.7 billion.
- A large return on investment is also expected for all three community pharmacy services over the medium and long terms.

This report focuses on three services that are currently delivered within a community pharmacy setting.

The scope of pharmacy services has expanded in many Canadian jurisdictions in recent years, with each province and territory taking a different approach to optimize these changes for better health and value. The Conference Board's 2016 Report, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence* examined this expanded scope of services from several perspectives. These included the expanded scope of services within a community pharmacy setting, the impact these services had on the well-being of Canadians and the sustainability of health care systems, and the potential opportunities to increase these outcomes.

This second report showcases a modelling study that estimates the health and economic impact of three services that are currently delivered within a community pharmacy setting in Canada that have the potential to be scaled up and spread. They include services for smoking cessation, advanced medication review and management for cardiovascular disease (CVD), and pneumococcal vaccination. These services were chosen based on evidence of the effectiveness of pharmacist services on an individual's health outcomes, as well as evidence of the economic impact (costs of investment and return on investment from the perspective of government funders and society).

In order to estimate the potential health and economic impact of scaling up the three selected pharmacy services in Canada, we used a macroeconomic approach that integrates various sources of data and modelling assumptions. These data and assumptions relate to the target population for each of the services, the relationship between risk factors[1] and the likelihood of a negative health event, the relationship between a

1 In this case, characteristics of the target population that would make them eligible for the services.

negative health event and premature mortality, and the associated direct and indirect costs related to these outcomes.

Further, the modelling exercise attempted to establish a range of possible values through sensitivity analyses regarding potential uptake of the interventions in a community pharmacy. We took a conservative approach to the sensitivity analysis around uptake, which acknowledges that some services are already or can be implemented in other settings such as general medicine (family physicians and nurse practitioners) and public health. In addition, this conservative approach takes into consideration the lag in uptake when a service is provided in a new setting (community pharmacy) and the gradual increase in uptake that could be seen through greater public awareness and trust over time.

Differences in the estimated health and economic impact of scaled-up pharmacy services in Canada were observed using an incremental-benefits analysis comparing a status quo scenario with alternative service scenarios forecast to the year 2035. For the year 2035, the scaled-up pharmacy services examined in this analysis were estimated to yield total cost savings (including direct health care cost and indirect productivity gains) ranging from $194 million in the lowest-uptake scenario to over $2 billion in the highest-uptake scenario.

The largest cumulative economic benefits (over the forecast period) of expanding the selected pharmacy services would result from scaling up advanced medication review and management for CVD (savings of $1.9 billion to $19.3 billion between the lowest- and highest-uptake scenarios), followed by smoking cessation services (savings of $563 million to $5.6 billion), and, lastly, pneumococcal vaccination for individuals aged 65 years and over (savings of $206 million to $761 million). When comparing conditions, the largest incremental cost savings would result from primary prevention of cerebrovascular disease and ischaemic heart disease, followed by lung cancer, secondary prevention of myocardial infarction, chronic obstructive pulmonary disease, secondary prevention of stroke, and hospitalized pneumonia.

In addition to measuring the health and economic gains that could result from scaling up pharmacy services, an important issue for governments is whether there would be a return on investment (ROI) with the

wide-scale implementation of any community pharmacy practice models. The results showed a large cumulative direct cost ROI for all three pharmacy-based services and across all uptake scenarios and pricing models. In the first year of the forecast (2016), the direct cost return for every dollar invested could have reached up to $1.20 for smoking cessation services and $2.80 for pneumococcal vaccination, while a small negative return of $0.40 could have been expected for advanced medication review and management for CVD services. By 2025, smoking cessation services could yield up to $6.50 in direct cost savings for every dollar invested, compared with $1.70 for advanced medication review and management for CVD and $31.60 for pneumococcal vaccination. By 2035, smoking cessation could reach a direct cost return of up to $9.10 per dollar invested; advanced medication review and management for CVD intervention, $2.30; and pneumococcal vaccination, $72.00.

The forthcoming and final report in this research series will include a narrative discussion addressing the policy, practice, and research challenges and gaps identified in the first two reports. It will expand on the potential solutions that can enable better pharmacy practices to be scaled up and spread, from the perspective of getting the best results for population health, patient experience, and financial efficiency.

CHAPTER 1

Introduction

Chapter Summary

- Services rendered in community pharmacies are largely possible due to expanded scopes of practice of pharmacists via regulatory policy.
- This report showcases a modelling study that estimates the health and economic impact of three services that are currently delivered within a community pharmacy setting in Canada and have the potential to be scaled up and spread.
- The analyses focus on the following community pharmacy services: smoking cessation, pneumococcal vaccination, and advanced medication review and management for cardiovascular disease.

Pharmacy services have expanded in recent years, with each province and territory taking a different approach to optimizing changes in pharmacists' scope of practice for better health and value. The Conference Board's 2016 report *A Review of Pharmacy Services in Canada and the Health and Economic Evidence* examined this more closely. Specifically, this reported looked at this expansion of a community pharmacy setting, the impact of these services on the health and well-being of Canadians and the sustainability of health care systems, and the potential opportunities to increase these health and sustainability outcomes by expanding services.

Services Expansion as a Result of Changing Scope of Practice in the Pharmacy Profession

Services rendered in community pharmacies are largely possible due to expanded scopes of practice of the pharmacy profession via regulatory policy. Community pharmacists across Canada have taken on an expanded role in many areas. In the first report, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence*,[1] we outlined the many areas of expanded scope across jurisdictions in Canada. The most visible expansion of scope, which has translated to expanded service provision in community pharmacies, is influenza vaccination, which can be administered by a pharmacist in every Canadian jurisdiction except for Quebec. Other expanded services attached to pharmacist scope of practice include prescribing and advanced medication review and management.

1 The Conference Board of Canada, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence.*

The translation of pharmacists' expanded scope of practice to expanded service provision in community pharmacies is not homogenous from one jurisdiction to the next. Some practice barriers and facilitators that we addressed in the previous report include funding models, pharmacists' time required and availability (i.e., resource capacity), physical infrastructure (e.g., availability of adequate facilities to deliver services, such as a private room to administer vaccinations), independent versus franchise pharmacies, a pharmacist's desire and opportunity, and client awareness of the service being offered and their trust in receiving that service from their pharmacist.

The evidence on the value of these services within the context of Canada's publicly funded health systems is not well articulated. This report, the second in a three-part research series, showcases a modelling study that will estimate the health and economic impact of three services that are currently delivered within a community pharmacy setting in Canada that have the potential to be scaled up and spread. The third and final briefing will consist in a narrative discussion that will address the barriers and challenges identified in the first report and expand on the potential solutions that can enable better pharmacy practices to be scaled up and spread, from the perspective of getting the best results for population health and financial efficiency.

Based on consultations with key stakeholders, specifically with provincial drug plan executives, and internal discussions between The Conference Board of Canada and the Canadian Pharmacists Association, it was established that this second phase of the research would focus on estimating the value of existing services and providing insights about how to leverage the success of existing services into future decision-making.

Leveraging the insights generated in the first report, consultations with stakeholders regarding high-value service areas for modelling, and data availability, the focus of the analysis is on the following community pharmacy services: smoking cessation, pneumococcal vaccination, and advanced medication review and management for cardiovascular disease.

The objectives of this report include the following:

- provide a summary of community pharmacies in Canada today based on previous research;[2]
- demonstrate the population health and economic impact of increasing access to smoking cessation services, advanced medication review and management for cardiovascular disease, and pneumococcal vaccination from a health care system and societal perspective, currently and into the future (out to 2035);
- discuss the potential solutions to the challenges and barriers to optimized practice, whereby optimal practice results in maximum effectiveness and efficiency from the point of view of population health, health care systems, and societal benefits.

2 Ibid.

CHAPTER 2

Community Pharmacy in Canada

Chapter Summary

- Changes to pharmacy legislation, standards, policy, and practice have occurred in the provinces and territories over recent years, creating the opportunity for pharmacists to take on an expanded role in service delivery.
- Scaling up efforts to engage community pharmacists in helping people quit smoking could result in benefits for individuals and health systems.
- The evidence also suggests that pharmacists provide valuable care with respect to cardiovascular disease and related conditions, including the management of hypertension and dyslipidemia.
- There may be greater acceptance with the administration of vaccinations in community pharmacies, such as pneumococcal, based on the current experience with influenza vaccination.

Pharmacists provide expertise to help achieve optimal therapeutic outcomes from medications.

Services delivered by pharmacists are an integral part of the health care delivered to many individuals—in hospital and in the community. As key contributors of health services, "pharmacists, in partnership with the patient and in collaboration with other health professionals, meet the patient's health and drug-related needs to achieve the patient's health goals."[1] (See Appendix A for more details.)

The insights in this chapter were informed by the work conducted in the previous report, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence*, which involved two research approaches: consultations with pharmacy stakeholders and a review of the health and economic literature on the effectiveness and cost-effectiveness of pharmacy clinical interventions.

When drug therapy is indicated for an individual, pharmacists—as part of a cadre of health professionals—provide the requisite expertise to help achieve optimal therapeutic outcomes from medications. Pharmacists assess an individual's health and drug therapy needs, develop care plans, provide medication consultations and medication reconciliation, and resolve drug-related problems. Optimal drug therapy outcomes for individuals are possible when pharmacists provide high-quality services according to the core competencies and standards of practice designated in their profession. This can also include providing education services on topics such as healthy eating, exercise, and behavioural counselling for smoking cessation.

Getting the Most Out of Community Pharmacy Services

As noted in *A Review of Pharmacy Services in Canada and the Health and Economic Evidence,* changes to pharmacy legislation, standards,

1 National Association of Pharmacy Regulatory Authorities, *Professional Competencies for Canadian Pharmacists at Entry to Practice*, 11.

policy, and practice have occurred in the provinces and territories over recent years, creating the opportunity for pharmacists to take on an expanded role in service delivery. (See "Pharmacists: Changing Scope and Changing Services.") Each jurisdiction has taken its own unique approach in order to optimize medication management for individuals.

Pharmacists: Changing Scope and Changing Services

While there are differences between provinces and territories, changes to the scope of practice provide opportunities for changing services, including:[2]

- renew/extend prescriptions for continuity of care
- change drug dosage/formulation
- make therapeutic substitutions
- initiate prescription drug therapy
- prescribing[3] and smoking cessation
- administer a drug by injection
- order and interpret lab tests

Opportunities to optimize the expanded scope of practice of pharmacists centre on evidence of the effectiveness of pharmacist services on an individual's health outcomes, as well as evidence of the economic impact (costs of investment and return on investment from the perspective of government funders and society).

To understand these opportunities and to inform the modelling focus for this report, we completed a review of published and grey literature in *A Review of Pharmacy Services in Canada and the Health and Economic Evidence*. (See Appendix B for more details.) We prioritized experimental or quasi-experimental study designs and reviews; synthesized the information by type of service/therapeutic area, as well as the quality and

2 The Conference Board of Canada, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence.*

3 In some jurisdictions, prescribing is referred to as a "minor ailments" program.

Community pharmacists provide an avenue to help individuals take steps to quit smoking.

quantity of evidence; and documented measures of effectiveness and cost-effectiveness.

Although emerging research is on the horizon, the previous review of the literature found much research that lacked appropriate controls, outcomes (e.g., system efficiencies), and follow-up periods (e.g., smoking cessation). There was also a scarcity of health economic evidence or discussion of the potential economic impacts and modelling studies. The analysis in this report builds on the existing higher-quality evidence and employs a modelling approach to fill in some of these knowledge gaps. It is anticipated that, as more of the research currently under way across the country becomes available, the body of evidence will become stronger and will help further inform evidence-based decision-making.

Based on a previous review of the literature,[4] we determined that the following community pharmacist services had the best evidence and opportunity for incremental population health and economic benefits from scale and spread.

Smoking Cessation

In Canada, smoking is the leading cause of premature death.[5] It is costly to individuals, health systems, businesses, and society. Many people want to quit, but find it difficult to do so. There are multiple touch points for people to gain support in quitting, including help from primary care providers and workplace and public health programs. Community pharmacists provide an avenue to help interested individuals take steps to quit. (See “Prescribing and Smoking Cessation.”)

Our review of the research found that research evaluating tobacco cessation interventions in community pharmacies is of moderate quality. Many of the studies identified financial incentives for pharmacists and patients, such as remuneration of pharmacist time for counselling and in some cases coverage of medications for individuals. Almost all the studies indicated the need for further research with appropriate

4 The Conference Board of Canada, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence.*

5 Bounjam, Stonebridge, and Thériault, *Smoking Cessation and the Workplace.*

controls and follow-up times to ensure sustained quit rates. Few studies compared pharmacist intervention with a control intervention (such as a public health program or patients trying to quit on their own).

Scaling up efforts to engage community pharmacists in helping people quit smoking could result in benefits for individuals and health systems.

Prescribing and Smoking Cessation

Pharmacists in all provinces except British Columbia and Ontario can assess and prescribe Schedule 1 drug therapy for the treatment of specific conditions outlined in jurisdictional legislation/regulation (additional training and/or authorization through the college may apply).[6] All provinces also allow pharmacists to provide non-prescription and non-pharmacological counselling and options. Conditions that pharmacists are allowed to prescribe for vary across the provinces. Pharmacists in every province except British Columbia and Saskatchewan can also prescribe Schedule 1 drug therapy for smoking or tobacco cessation (additional training and/or authorization through the college may apply).[7] Pharmacists in Quebec can only prescribe Schedule 1 drug therapy under a collaborative agreement.[8]

Saskatchewan provides $18 and Quebec provides $16 per minor ailment assessment. Prescribing in Alberta is reimbursed through Comprehensive Annual Care Plans (CACPs), Standard Medication Management Assessments (SMMAs), or initial-access prescribing. Manitoba, New Brunswick, Prince Edward Island, and Newfoundland and Labrador do not provide funding for these services.[9] For annual smoking cessation-related services, Saskatchewan provides up to $300 annually and Ontario provides up to $125. Alberta includes these services as part of a Tobacco Cessation SMMA.[10] Funding is not provided in Manitoba, Prince Edward Island, or Newfoundland and Labrador.[11]

6 The Conference Board of Canada, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence.*

7 Ibid.

8 Ibid.

9 Ibid.

10 Ibid.

11 Ibid.

Medication Review and Management for Cardiovascular Disease

Medication reviews (a service provided by a health care provider to help individuals understand their medication regimen and improve health outcomes) and medication management (active involvement of a pharmacist to optimize safe, effective, and appropriate drug therapy)[12] are key services provided in community pharmacies across Canada. (See "Medication Review and Management.")

Medication Review and Management

To increase medication adherence and compliance, avoid harmful interactions, and deprescribe for unnecessary medications, pharmacists can provide medication consultations and care plans, which may include an assessment, medication reconciliation, resolution of drug-related problems, and a follow-up and monitoring plan.[13] Eligibility requirements (e.g., the minimum number of qualifying medications a patient is taking, specific chronic disease, or risk factors) determine the type of medication management or care plan and the number of follow-up consultations for which a patient qualifies.[14]

Our previous review of the literature revealed some evidence emerging on the effectiveness of certain services activities. Studies are varied in terms of the population, intervention, and health and economic outcomes. There is evidence that medication reviews can improve adherence and outcomes, and a review of systematic reviews found positive outcomes with medication management interventions by pharmacists. The evidence also suggests that pharmacists provide valuable care with respect to cardiovascular disease and related conditions, including the management of hypertension and dyslipidemia.

Many jurisdictions offer government-sponsored medication review and management programs, and they vary in terms of design (e.g., number

12 Ibid.
13 Ibid.
14 Ibid.

of chronic conditions present, number of medications, or beneficiaries of provincial drug plan) and remuneration.[15] Remuneration ranges from $100 per CACP and $60 per SMMA in Alberta[16] to $60 per MedsCheck in Ontario.[17] There are certain distinctions across jurisdictions when it comes to medication review and management, and therefore variance in fees may represent the differences in services provided from one province/territory to another. During the review and management, opportunities may arise for additional activities, such as initial prescribing (depending on the jurisdiction). In some cases, these programs have been subject to revision over time (e.g., disease and medication parameters for qualifying population). Research on health and economic outcomes of these programs is starting to emerge. For example, a new evaluation of Ontario's MedsCheck program suggests that refinements are needed to improve the health and economic value by shifting focus from the number of services provided to the quality of the service.[18]

Pneumococcal Vaccination

Our previous review of the literature found that, since influenza vaccination has been offered in community pharmacies, uptake has increased in many jurisdictions, although the evidence of the impact on health outcomes and health system costs is limited. Part of this challenge is the reliance on the effectiveness of the vaccine itself. There was evidence showing the effectiveness and feasibility of administering other vaccines in other countries, such as the impact of community pharmacy in administering pneumococcal and/or herpes zoster vaccinations.[19] Despite the need for more research, there has already been widespread introduction of injection authority and remuneration for flu vaccines in community pharmacies. (See "Administering a Drug or Vaccine by Injection.") There have been impressive trends in uptake

15 Canadian Foundation for Pharmacy, *Fee and Claims Data for Government-Sponsored Pharmacist Services*.

16 Or $125 and $75, respectively, for pharmacists with "additional prescribing authorization."

17 Or $75 for MedsCheck for people with diabetes, $90 for for people who live in a long-term care facility, and $150 for MedsCheck at Home for those unable to visit a pharmacy.

18 Ontario Pharmacy Evidence Network, *MedsCheck Tune-Up Needed*.

19 The Conference Board of Canada, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence* .

There may be greater acceptance of other vaccinations being administered in community pharmacies based on the experience with influenza vaccination.

in certain provinces, and new research has shown a positive impact on increasing the population that is covered.[20] Our review found that individuals who received their flu vaccine in a community pharmacy were generally satisfied or very satisfied with the service they received, with convenience and acceptability being key factors. There may also be greater acceptance of other vaccinations being administered in community pharmacies based on the current experience with influenza vaccination.

Administering a Drug or Vaccine by Injection

For routine injections or immunizations and other preventative measures, pharmacists in most jurisdictions are allowed to administer a drug or substance by injection, although jurisdiction-specific regulations apply (e.g., training requirements, age limitations).[21] Pharmacists in Alberta have authorization for all drugs and blood products to be injected (subcutaneous or intramuscular) for anyone over 5 years old. Pharmacists in Saskatchewan, Manitoba, New Brunswick, Newfoundland and Labrador, and Prince Edward Island have injection authority for most drugs (limitations apply). Pharmacists in these provinces and British Columbia and Nova Scotia have injection authority for vaccines (limitations apply). As of December 15, 2016, Ontario pharmacists are authorized to inject for 13 different preventable diseases.[22] Quebec is the only province that does not currently allow pharmacists to administer any drug or vaccine, other than for demonstration/education purposes.

All provinces (except Quebec) provide public remuneration for flu vaccines.[23] The following section presents flu vaccine reimbursement rates by province, along with the proportion of the respective provincial population[24] that received

20 Buchan and others, "Impact of Pharmacist Administration of Influenza Vaccines."

21 Ibid.

22 Ontario Pharmacists Association, *Pharmacists to Provide Travel Vaccinations*.

23 The Conference Board of Canada, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence*.

24 Statistics Canada, *Population by Year, by Province and Territory*.

pharmacist-administered flu vaccination in 2015.[25] Alberta provides the highest public payment ($20) covering 11.4 per cent of the provincial population and Manitoba provides the lowest ($7) covering 2.8 per cent of the population. British Columbia provides $10 (9.0 per cent of the population); Saskatchewan, $13 (not available); Ontario, $7.50 (6.5 per cent); Nova Scotia, $12 (10.7 per cent); New Brunswick, $12 (for seniors and high-risk groups) (7.1 per cent); Prince Edward Island, $12.36 (for high-risk groups) (3.4 per cent); and Newfoundland and Labrador provides $13 (for provincial drug plan beneficiaries) (not available).

The volume of pharmacist-administered flu vaccinations, as well as changes in uptake year over year, varies by province. For example, over 475,000 influenza vaccinations were administered by Alberta pharmacists in 2015–16, representing a 42 per cent increase compared with 2013–14,[26] while in Ontario 467,000 more influenza vaccinations were administered by pharmacists in 2013–14 compared with 2011–12.[27] There may be a relationship between higher fees and higher uptake rates, but this needs to be explored further. (See "The Impact of Funding on Services Delivery Behaviours" in Chapter 5.)

Three provinces provide public remuneration for administering a drug or substance by injection. Manitoba provides public remuneration for the administration of the pneumococcal, Tdap, Td, and HPV vaccines, and British Columbia provides for all publicly funded vaccines (except the primary and pre-school series). Alberta provides public remuneration for the assessment and injection of drugs that are listed as benefits on the Alberta Drug Benefit List, the Alberta Human Services Drug Benefit Supplement, or the Palliative Care Drug Benefit Supplement.

Considering this legacy of experience with the administration of vaccines in community pharmacies, there is the potential to model the future impact of expanding pharmacist privileges (in those provinces where this service is not currently authorized) and providing remuneration (to increase implementation and uptake), and/or the impact of increasing

25 Pharmacy claims volume for flu vaccinations are from provincial ministries of health and provincial pharmacy associations. More specifically, claims volume for Prince Edward Island, Nova Scotia, New Brunswick, Ontario, and Manitoba was published by the Canadian Foundation for Pharmacy, in *Changing Face of Pharmacy: What Patients Need*. Claims volume for British Columbia was published by the British Columbia Ministry of Health, in "Clinical Service Fees 2015/16." Claims volume for Alberta was obtained directly from Alberta Health. Claims data for Saskatchewan and Newfoundland and Labrador were not available.

26 Claims volume was obtained from Alberta Health.

27 Ontario Pharmacy Evidence Network, *A New Scope of Practice*.

access in those provinces where the authority for pneumococcal vaccination exists. Pneumonia is a highly prevalent disease in Canada and imposes an important financial burden on the Canadian health care system. Increasing the opportunities for pneumococcal vaccination through community pharmacists could improve individual health outcomes and health system costs.

CHAPTER 3

Methods and Data

Chapter Summary

- We employed a macroeconomic approach that integrates various sources of data and modelling assumptions relating to the target populations; participation rates; services' effectiveness; the relationship between risk factors, health outcomes, and premature mortality; and the associated direct and indirect costs related to these outcomes.
- The Conference Board's Cardiovascular Disease and Respiratory Disease Model and Burden of Pneumonia Model were used for these analyses.
- The impact of pharmacy-delivered smoking cessation services, advanced medication review and management for cardiovascular disease, and pneumococcal vaccination on health care system costs and societal costs was estimated to determine the value of expanded pharmacy services over a 20-year forecast period.

The modelling exercise attempts to establish a range of possible values through sensitivity analyses regarding potential uptake of services in a community pharmacy.

In order to estimate the potential health and economic impact of scaling up[1] selected pharmacy services in Canada, we employed a macroeconomic approach that integrates various sources of data and modelling assumptions. These data and assumptions relate to the target population for each of the services, the relationship between risk factors (characteristics of the target population that would make them eligible for the services) and the likelihood of a negative health event. They also connect the negative health event with premature mortality.

Further, the modelling exercise attempts to establish a range of possible values through sensitivity analyses regarding potential uptake of services in a community pharmacy. This acknowledges that many of these services are already or can be implemented in several settings, including primary care (family physicians and nurse practitioners) and in public health. However, before addressing those analyses, this chapter provides an overview of the modelling methodology, data sources, and assumptions.

Modelling Approach

The Conference Board has built two models that project the prevalence and economic burden of seven conditions—ischaemic heart disease (IHD), myocardial infarction (MI), cerebrovascular disease (CeVD), stroke, lung cancer, chronic obstructive pulmonary disease (COPD), and hospitalized pneumonia—in Canada out to 2035:

- Model 1—Cardiovascular Disease and Respiratory Disease (CVD-RD)[2]
- Model 2—Burden of Pneumonia Model (BoP)

1 Scaling up an intervention or program involves taking one that has demonstrated efficacy, and hopefully effectiveness, on a small scale and expanding it to reach a greater proportion of the eligible population while retaining effectiveness. Source: Milat and others, "The Concept of Scalability."

2 This model shares many similarities with the models used in Bounajm, Dinh, and Thériault, *Améliorer les habitudes de vie : des retombées importantes pour la santé et l'économie du québec*.

The CVD-RD model is approached from the perspective of primary and secondary prevention of IHD/MI and CeVD/stroke. Both the CVD-RD and BoP models rely on the Conference Board's population forecast to project the prevalence of each condition. The Public Health Agency of Canada's Economic Burden of Illness in Canada[3] (EBIC) data were used to create a forecast of the direct costs for most chronic conditions, while the human capital approach was used to calculate indirect costs.

Two scenarios were created. In the first scenario, named the "base case," we assumed the status quo, or no expansion of pharmacy services to reduce public health risk factors. In the second scenario (the "alternative scenario"), we assumed increased access to the following community pharmacy services aimed at reducing the prevalence of risk factors identified in this study:

- smoking cessation
- advanced medication review and management for cardiovascular disease (CVD)
- pneumococcal vaccination

The difference in the measured economic burden between the two scenarios represents the potential benefits of increasing access to expanded community pharmacy services.

In the following sections we provide more detail on our approach, data sources, and other key assumptions.

Population Model

The demographic forecast for Canada is at the heart of the analysis, as it drives a significant portion of the changes in disease and risk factor prevalence. This analysis uses data from the Conference Board's Long-Term Population Forecast, which projects changes in the age structure of the population. (See Appendix C for more detail.) The forecast data also incorporate recent trends in fertility rates, mortality rates, international and interprovincial migration, and the flow of temporary workers.

3 Public Health Agency of Canada, *Economic Burden of Illness in Canada*.

The Burden of Pneumonia (BoP) model investigated the widespread administration of the pneumococcal vaccine in community pharmacies for individuals aged 65 and over.

Target Populations

The Cardiovascular Disease and Respiratory Disease (CVD-RD) model includes adults 18 years of age and older, and conditions are examined from both primary prevention (IHD and CeVD) and secondary prevention (MI and stroke) perspectives. Further, the populations featured in the models are generally aligned with eligibility criteria of the RxEACH study led by Dr. Ross T. Tsuyuki from the EPICORE Centre, Department of Medicine, University of Alberta.[4] (See Appendix C for more detail.)

A sensitivity analysis was also performed on the proportion of the target population modelled to receive the services. This was done to consider varying degrees of implementation (due to financial or other constraints) and patient acceptability if services were scaled up. The sensitivity analysis assumed five levels of patient participation, where 10 per cent, 25 per cent, 50 per cent, 75 per cent, or 100 per cent of those eligible for the services would in fact receive them. For the first year of all uptake scenarios, a low uptake of 5 per cent was modelled.

The Burden of Pneumonia (BoP) model investigated the widespread administration of the pneumococcal vaccine in community pharmacies for individuals aged 65 and over. The uptake rate of pneumococcal vaccination is modelled using newly published results from Buchan and others on the impact of policies permitting pharmacists to administer the influenza vaccines in community pharmacies.[5] The study found that the introduction of such policies resulted in a modest increase of 1.6 per cent in population coverage for individuals aged 65 and over compared with provinces or influenza seasons without a pharmacist policy. Since patient acceptability of the pneumococcal vaccine is assumed to be lower than the influenza vaccine, given its lower visibility and public health awareness, a sensitivity analysis was performed to model varying degrees of uptake of pneumococcal vaccination administered by community pharmacies. The sensitivity analysis assumes four levels of increases in population coverage, namely 0.4 per cent, 0.8 per cent, 1.2 per cent, and 1.6 per cent.

4 Tsuyuki and others, "The Effectiveness of Pharmacist Interventions on Cardiovascular Risk."

5 Buchan and others, "Impact of Pharmacist Administration of Influenza Vaccines."

Data Sources

Prevalence of Chronic Conditions and Risk Factors

The majority of prevalence and risk factor data were estimated from the Canadian Community Health Survey (CCHS) (2010–14)[6] and Canadian Health Measures Survey (CHMS).[7] (See Appendix C for more details.) The prevalence of lung cancer was estimated from the Canadian Cancer Registry.[8]

Deaths Statistics

Data on the number of deaths by cause, age, and sex, in Canada were derived from the Canadian Vital Statistics, Birth, and Death Databases at Statistics Canada.[9]

Relative Risk of Chronic Conditions

Most estimates for the relative risk of each condition, with and without a risk factor or for different levels of exposure/intensity of a risk factor, were obtained from a review of the literature conducted by Dionne and others.[10] This literature review included systematic reviews[11] examining the quantified relationship between various behaviour and lifestyle risk factors and chronic conditions. For instances where a systematic review was not available to quantify the risk factor/condition relationship, other individual studies were included. The majority of systematic reviews used broad inclusion criteria when defining the outcome conditions. (See Appendix C for more details.)

Table 1 shows the relative risk estimate used in the analysis. The risk factor categories are defined based on the systematic review or

6 Statistics Canada, *Canadian Community Health Survey*.

7 Statistics Canada, *Cholesterol Levels of Adults.*

8 Statistics Canada, CANSIM table 103-0550.

9 Statistics Canada, CANSIM table 102-0552.

10 Dionne and others, *The Economic Value of the Healthy Habits Policies in Quebec*.

11 Systematic review refers to a rigorous methodological approach in the search, identification, critical appraisal, and synthesis of published and unpublished research literature. A meta-analysis is a kind of systematic review that pools results from individual studies in order to report a measure of effectiveness or pooled result, usually including only individual studies of high quality. A narrative systematic review, on the other hand, does not pool results but rather provides a descriptive analysis of individual studies.

individual reference studies, as well as categories used when estimating population prevalence. For CeVD, the same relative risks are used for primary and secondary prevention due to limited availability of data on the risk of a recurrent stroke. Therefore, the impact of reduced risk factors on the risk of a recurrent stroke is probably underestimated in this study. Where a population member has two or more risk factors at the same time, an additive model was used to measure the total relative risk. (See Appendix C for more details.)

Table 1
Relative Risk Estimates by Condition and Risk Factor
(risk ratio)

	Dyslipidemia	Tobacco smoking	Hypertension	Type 2 diabetes
Cerebrovascular disease	Ischaemic stroke: 1.60 (M&F)	1.43 (M); 1.72 (F)	3.00 (M&F)	1.40 (M&F)
Ischaemic heart disease	1.54 (M); 1.58 (F) Secondary prevention: 2.19 (M&F)	1.60 (M); 3.22 (F) Secondary prevention: 2.83 (M&F)	1.44 (M); 2.43 (F) Secondary prevention: 1.63 (M&F)	1.60 (M&F) Secondary prevention: 1.73 (M&F)
Lung cancer	n.a.	8.96 (M); 7.58 (F)	n.a.	n.a.
Chronic obstructive pulmonary disorder	n.a.	4.11 (M); 3.28 (F)	n.a.	n.a.

M = male
F = female
n.a. = not available
Sources: The Conference Board of Canada; Tirschwell and others; Bond, Stonebridge, and Thériault; Stratton and others; Mainous and others; Saito and others; Serrano and others; Fresco and others; Kaplan and others; Gandini and others; Forey, Thornton, and Lee.

Forecasting the Prevalence of Risk Factors

For each service (smoking cessation, advanced medication review and management for CVD, and pneumococcal vaccination), two projections of the prevalence rate of risk factors are provided, each representing one of the two scenarios described in the previous section. The projection was estimated as follows:

- *Base case:* Under the base-case scenario, the prevalence rate of each risk factor remains constant over time.
- *Alternative scenario:* Under the alternative scenario, the prevalence rate of each risk factor decreases based on the estimated effectiveness of each service, as detailed below.

Sensitivity Analysis of Participation and Uptake Rates

The base case for the three community pharmacy services assumes no change in the prevalence of chronic conditions over the forecast period of 2016 to 2035, while the intervention scenarios model the impact of scaling up the services based on a range of hypothetical participation/uptake scenarios. For the smoking cessation and advanced medication review and management services, a 5 per cent participation rate of the eligible population was assumed in the first year, while a range of participation levels were modelled in subsequent years. Five participation scenarios were modelled: full reach of the target population (100 per cent participation) and decreasing increments where services reach 75, 50, 25, and 10 per cent of the target population. For the pneumococcal vaccination service, four uptake levels were modelled, based on evidence derived from the literature on the uptake of pharmacist-administered flu vaccination. The four uptake levels modelled were: 1.6 per cent of the population aged 65 years and over, followed by 1.2, 0.8, and 0.4 per cent of the over-65 population.

Effectiveness of Pharmacy Services

Results from various studies were leveraged to estimate the effectiveness of the services modelled in this study. The effectiveness estimates used in the CVD-RD and BoP models are presented in Table 2 and discussed in detail below.

Table 2
Relative Risk Reduction Estimates by Intervention and Risk Factor
(risk ratio)

	Tobacco smoking	Dyslipidemia	Hypertension	Type 2 diabetes	Having the pneumococcal vaccine (PPV23 or PPV13)
Smoking cessation	0.78	n.a.	n.a.	n.a.	n.a.
Advanced medication review and management for CVD	n.a.	0.70	0.68	0.65	n.a.
Pneumococcal vaccination	n.a.	n.a.	n.a.	n.a.	0.55–0.74 (aged 65–74) 0.61–0.80 (aged 75–84) 0.72–0.84 (aged 85+)

n.a. = not applicable
Sources: The Conference Board of Canada; Tsuyuki and others, "The Effectiveness of Pharmacist Interventions"; Tsuyuki and others, "A Randomized Trial"; Smith and others; Bonton, Bolkenbaas, and Huijts; Hak and others.

Effectiveness estimates of the services featured in the CVD-RD model are derived from two studies—RxEACH and RxACT—led by Dr. Tsuyuki. In the RxEACH study, a randomized trial conducted in 56 community pharmacies in Alberta, the authors evaluated the effectiveness of a community-based intervention on cardiovascular risk.[12] Participants were randomized in a 1:1 ratio to either usual care or intervention. The usual care group received customary pharmacist care without specific intervention. Patients in the intervention group received a medication therapy management consultation, called a Comprehensive Annual Care Plan (CACP) or Standard Medication Management Assessment (SMMA) in Alberta, and smoking cessation services when appropriate, as detailed below. The RxACT study was a randomized controlled trial conducted in 14 community pharmacies in Alberta.[13] Adults with uncontrolled dyslipidemia, as defined by the 2009 Canadian Dyslipidemia Guidelines, were enrolled and randomized to either usual care or intervention in a 1:1 ratio. The intervention entailed care to reduce dyslipidemia using behavioural and pharmacological approaches, including prescription of dyslipidemia therapies as indicated.

Pharmacist Follow-Up Interviews

As part of this study, interviews were conducted with two pharmacists to gain a greater understanding of the smoking cessation and advanced medication review and management interventions for CVD, and collect additional qualitative and quantitative information not captured in the study. The pharmacists interviewed represented pharmacy practices in lower and higher socioeconomic communities, and may not be representative of the experiences of the other pharmacists involved in the study. The interview questions focused on the pharmacological component of the interventions and included questions on prescribing practices for smoking cessation, types of medications prescribed, starting patients on new medication, and performing therapeutic substitutions.

12 Tsuyuki and others, “The Effectiveness of Pharmacist Interventions on Cardiovascular Risk.”

13 Tsuyuki, Rosenthal, and Pearson, “A Randomized Trial of a Community-Based Approach.”

Another goal of the interviews was to gain insights on the strengths and challenges of the study from the providers' standpoint, and assess the perceived acceptability, scalability, effectiveness, and cost-effectiveness of the interventions. The pharmacists also confirmed that the vast majority of interventions in the RxEACH study were eligible for reimbursement under Alberta's CACP/SMMA services. (See Appendix D for the interview guide.)

Smoking Cessation

The smoking cessation component of the RxEACH study included the elaboration of a quit plan, advising on nicotine replacement therapy such as Nicoderm, and prescribing drugs for smoking cessation such as varenicline or bupropion. Pharmacists also offered ongoing support in the form of regular communication with the patient's family physician after each contact and regular follow-ups with patients every three to four weeks for three months. However, this three-month follow-up period is considered short for smoking cessation given high rates of relapse over time. In order to calculate more realistic outcomes at 12 months, results from a U.K. study investigating the drop-off rates in smoking cessation between three and 12 months were applied as an adjustment factor.[14] The difference in drop-off rate was found to be 12 per cent, which translated to an absolute reduction in intervention effectiveness from a risk ratio of 0.74 at three months (from the RxEACH study) to 0.78 at 12 months after adjustment.

Advanced Medication Review and Management for CVD

Participants in the RxEACH study received a medication therapy management consultation, called a Comprehensive Annual Care Plan (CACP) or Standard Medication Management Assessment (SMMA) in Alberta. This consultation included a patient assessment (blood pressure, waist circumference, and weight and height measurements), a laboratory assessment (HbA1c, fasting cholesterol, glomerular filtration rate, and albumin-to-creatinine ratio), a CVD risk assessment, and

14 Information Services Division, *NHS Smoking Cessation Service Statistics*.

The majority of patients receiving the intervention were recommended a new prescription, and almost all received dosage adaptations.

education. Pharmacists also provided treatment recommendations, including adapting medications and prescribing new medications when necessary. Further, pharmacists offered ongoing support, including regular follow-ups with the participants every three to four weeks for three months and regular communication with the participants' family physicians.

Based on information gathered from pharmacist interviews, the majority of patients receiving the intervention were recommended a new prescription, and almost all received dosage adaptations. However, our interviews revealed that pharmacists may not be homogenous in their approach to medication review and management. For instance, some may recommend a new prescription through collaboration with the family physician, while other pharmacists prescribe directly. Once again, the measure of intervention effectiveness used in this study represents an average effect, reflecting variability in pharmacist practice.

Based on RxEACH study results, the relative risk reduction ratio of the intervention was estimated at 0.68 for hypertension and 0.65 for diabetes, while the RxACT study yielded a relative risk reduction of 0.70 for dyslipidemia. As with the smoking cessation component of the intervention, the follow-up period for patients receiving medication review and management for CVD in the RxEACH study was three months. The RxACT study used a six-month follow-up period, which is preferable to a three-month follow-up since the full effect of medication changes to address these risk factors are often not seen for several weeks or months. This modelling exercise might therefore be underestimating the effectiveness of this intervention on improving the risk factors, especially for hypertension and diabetes, over a longer period of time.

Pneumococcal Vaccination

The BoP model investigated the widespread administration of the pneumococcal vaccine in community pharmacies for individuals aged 65 and over. As explained above, the uptake rate of pneumococcal vaccination was modelled using newly published results from Buchan

and others on the impact of policies permitting pharmacists to administer the influenza vaccines in community pharmacies.[15]

The study found that introducing such policies resulted in a modest increase of 1.6 per cent in population coverage for individuals aged 65 and over, compared with provinces or influenza seasons without a pharmacist policy.

Public Coverage of Pneumococcal Vaccination in Pharmacy

As previously mentioned, all provinces (except Quebec) provide public remuneration for flu vaccines and vaccination in community pharmacies. Public coverage of pneumococcal vaccination in community pharmacies is not as universal.

In British Columbia, pharmacists authorized to administer immunizations are able to acquire and administer certain vaccines from the public supply in specific situations. The pneumococcal conjugate (PCV13) vaccine is publicly funded for children as part of their routine immunizations. These immunizations usually occur in primary care. The pneumococcal polysaccharide vaccine is publicly funded for people at high risk of getting sick from pneumococcal infections, including individuals aged 65 years and older, residents of any age living in residential care or assisted living facilities, and other high-risk individuals aged 2 years and older.[16] Since August 2012, residents of British Columbia may receive the pneumococcal (23-valent) vaccine (which is a pneumococcal polysaccharide vaccine) by a pharmacist at no charge.[17]

Since January 2014, pharmacists in Manitoba can access publicly funded pneumococcal polysaccharide vaccines for people who meet the eligibility criteria outlined by Manitoba Health and Healthy Living.[18] This includes those at high risk of getting sick from pneumococcal infections (including individuals aged 65 years and older), residents of any age living in residential care or assisted living facilities, all individuals who are homeless, all individuals who are illicit drug users, and other high-risk individuals aged 7 years and older.

15 Buchan and others, “Impact of Pharmacist Administration of Influenza Vaccines.”

16 ImmunizeBC, *Pneumococcal Disease*.

17 Pharmacist and Immunization Working Group, *Pharmacist Access to Publicly Funded Vaccine*.

18 PharmaNews, “Manitoba Pharmaceutical Act Regulations Enacted.”

As of December 15, 2016, Ontario pharmacists are authorized to administer the pneumococcal vaccine; however, the cost of the vaccine is not publicly funded as of yet.[19]

The effectiveness of the pneumococcal vaccination in reducing the risk of invasive pneumococcal disease, which usually requires hospitalization, varies by type of vaccine and time since vaccination. Effectiveness of the pneumococcal polysaccharides vaccine 23-valent (PPV23), by age and time since vaccination, was based on published data from Smith and others.[20] Effectiveness of the pneumococcal polysaccharides vaccine 13-valent (PPV13) was based on results from the CAPiTA randomized control trial published by Bonten, Bolkenbaas, and Huijts[21] and Hak and others.[22] Based on the studies mentioned, the range of effectiveness over a 20-year average for the PPV23 and PPV13 vaccines was estimated at 26–45 per cent for individuals aged 65 to 74 years old, 20–39 per cent for individuals aged 75 to 84 years old, and 16–28 per cent for the 85-and-over age group.

Estimating the Base Risk

The base risk is defined as the prevalence rate of a condition in the absence of any risk factors. It is important because the relative risk of each risk factor is added to the base risk in the model to forecast prevalence rates of each condition from 2016 to 2035. Since the base risk is not documented in the literature, it was estimated using data on the prevalence of risk factors combined with the relative risk information from the literature.

19 Ontario Pharmacists Association, *Pharmacists to Provide Travel Vaccinations*.

20 Smith and others, "Cost-Effectiveness of Adult Vaccination Strategies."

21 Bonten, Bolkenbaas, and Huijts, "Community-Acquired Pneumonia Immunization Trial in Adults."

22 Hak and others, "Rationale and Design of Capita."

Forecasting the Prevalence/Incidence of Chronic Conditions

Incidence data[23] for the selected chronic conditions were unavailable, except for lung cancer and secondary prevention of MI and stroke. For the other conditions, self-reported prevalence data corresponding to the main circulatory system categories in the 10th revision of the International Classification of Diseases (ICD-10) were derived from the CCHS. For the purpose of this analysis, seven chronic conditions are forecast:[24] ischaemic heart disease (I20–I25), myocardial infarction (I21.9;122.0–122.1), cerebrovascular diseases/stroke (I60–I69), chronic obstructive pulmonary disease (J4–44; J47), lung cancer (C33–34), and hospitalized pneumonia (J12–J18).

The relative risk estimates of each risk factor were assumed to remain unchanged from 2015 to 2035. The prevalence/incidence rate of each risk factor was also assumed to be constant from 2015 to 2035.

The forecast for the prevalence/incidence of each condition by age and sex was calculated using the base risk estimates combined with the relative risk estimates and the population and risk factor forecasts. Since the prevalence of the risk factors is constant, the prevalence/incidence rate of each condition remains constant in the model from 2016 to 2035.

Estimating the Case Fatality Rate

Data on the number of deaths for each condition in Canada were obtained from the World Health Organization's Mortality Database.[25] The mortality rate was calculated as the number of deaths in 2013 (the most recent year for which data were available) divided by the number of cases in 2013 for each condition. (See Appendix C for more details.)

23 The incidence of a chronic condition is a measure of the risk of developing it over a given period of time. By contrast, the prevalence measures the number (or proportion) of cases at a given time.

24 The characters inside the parentheses following each chronic condition represent the condition's ICD-10 code.

25 World Health Organization, *WHO Mortality Database*.

Direct costs are simply the spending incurred on drugs, hospitals, and physicians.

From Prevalence/Incidence to Economic Burden Estimates

Direct Costs

Using these prevalence/incidence forecasts and inflated disease cost data from the Economic Burden of Illness in Canada (EBIC) 2008, as well as the case fatality rates by disease, a forecast of the economic burden of each condition by age and sex was developed. Direct costs are simply the spending incurred on drugs, hospitals, and physicians. For secondary prevention, the average cost per hospitalization for MI and stroke were derived from a study by Goeree and others.[26] The average cost per hospitalization for hospitalized pneumonia was obtained from the Discharge Abstract Database 2014–2015 maintained by the Canadian Institute for Health Information (CIHI).[27]

The cost projections start in 2016 and finish with the end of the forecast period in 2035. All cost figures were converted to real 2016 dollars using price deflators that match, as closely as possible, the three cost components (hospitals, physicians, drugs).

Indirect Costs

For this report, the human capital approach was used to calculate indirect costs of the conditions, measured as the forgone earnings of Canadian workers in 2016, calculated over the lifetime of the patient. Under the human capital methodology, indirect costs are societal productivity losses, or the value of time lost from work due to premature mortality from stroke, heart disease, lung cancer, and chronic obstructive pulmonary disorder. Forgone earnings are calculated using the average earnings of Canadian workers, adjusted by the participation rate and unemployment rate, over the relevant period within the working life of an individual from 15 to 65 years of age inclusive.

In addition to these economic costs, there are certain intangible costs associated with cardiovascular disease, such as pain and suffering,

26 Goeree and others, “Prevalence, Total and Excess Costs of Diabetes.”

27 Canadian Institute for Health Information, *Discharge Abstract Database*.

economic dependence, and social isolation. While these costs are difficult to quantify in economic terms, they are costs nonetheless and should at least be identified. Too many people have their lives and those of their families irrevocably changed forever as a result of injury. However, this report did not attempt to quantify these costs, and so the indirect costs cited are considered conservative.

The mortality data for this report were collected from the Canadian Institute for Health Information. Measures of the participation rate, the unemployment rate, and average weekly earnings were accessed from Statistics Canada's CANSIM database. The present value of future earnings was discounted at an effective rate of 3 per cent per year, and a real wage growth rate of 1 per cent per year was assumed for this study.

Methodological Limitations

This study uses the best available information to forecast the prevalence and economic burden of seven conditions in Canada. While every effort was made to maximize the accuracy of these forecasts, certain limitations in the data sources and modelling assumptions are worth noting.

There are several limitations concerning the cost data. Given that the Public Health Agency of Canada had not yet released more recent data at the time of this writing, data on the costs by component (hospitals, physicians, drugs) and by disease were based on the Economic Burden of Illness in Canada for the year 2008. As this information is somewhat dated, certain assumptions had to be made about inflation to project the cost figures to the current year.

There are also limitations related to risk factors and their relative risks. First, while the relative risk assumptions were taken from systematic reviews, these reviews are in turn based on estimates from multiple studies that have large differences in their estimates. As the forecast for the prevalence of these chronic conditions is sensitive to these relative risks, its accuracy relies on their validity. Second, there was a lack of data on the relative risk in the case of an individual who is exposed to two or more risk factors. As a result, the relative risks were assumed to be additive. Further, because of uncertainty in relative risks and risk factor reduction estimates, we did not conduct sensitivity analyses based on the range of confidence intervals. Finally, not all possible risk factors of the

conditions were included in the model. For example, exposure to radon gas, a well-known risk factor for lung cancer, was excluded from the model. However, assuming that exposure to these omitted risk factors in Canada remains constant over time, their exclusion does not materially impact the results.

CHAPTER 4

Results

Chapter Summary

- Over the 20-year forecast period, the economic value of expanding three pharmacy services was estimated to range from $2.5 billion to $25.7 billion in health care system efficiency and productivity gains, depending on participation rates.
- Short-term economic benefits are also expected. In the first five years of the forecast period, cumulative savings ranging from $293 million to $2.8 billion were estimated under the highest-participation scenario.
- The incremental cumulative economic benefits by service type were estimated at $563 million to $5.6 billion for smoking cessation, $1.9 billion to $19.3 billion for advanced medication review and management for CVD, and $206 million to $761 million for pneumococcal vaccination.

Expanding selected pharmacy services would translate to direct cost savings.

Health and Economic Impact of Expanded Pharmacy Services

We observed differences in the health and economic impact of scaled-up pharmacy services in Canada through an incremental-benefits analysis comparing the status quo and alternative scenarios. By decreasing the prevalence of modifiable risk factors for CVD and increasing immunization rates for pneumococcal vaccination, the selected pharmacy services are modelled to yield health benefits. These will come in the form of averted cases of cardiovascular and respiratory diseases and hospitalized pneumonia, resulting in fewer premature deaths from these conditions. The decrease in disease prevalence and premature mortality resulting from expanded pharmacy services would translate to direct cost savings to the health care system and indirect cost savings from increased productivity.

For the year 2035, full participation in the three pharmacy services was estimated to yield total cost savings (including direct and indirect costs) of $2.03 billion, with proportionally inferior savings associated with the lower participation levels. Even under the lowest-participation scenario, savings of $194 million were estimated for 2035. When taking into account the entire forecast period, the cumulative cost savings are quite large, with $2.5 billion in total cost savings estimated under the lowest-participation scenario and up to $25.7 billion under the highest-participation scenario. (See Table 3.)

Table 3

The Incremental Economic Benefit of Expanded Pharmacy Services in Canada

(C$ millions)

	100% participation/ 1.6% uptake		75% participation/ 1.2% uptake		50% participation/ 0.8% uptake		25% participation/ 0.4% uptake		10% participation	
	2035	Cumulative	2035	Cumulative	2035	Cumulative	2035	Cumulative	2035	Cumulative
Direct	1,829	22,582	1,374	16,954	918	32,663	460	5,669	174	2,192
Indirect	201	3,075	150	2,307	100	1,539	50	770	20	309
Total	2,030	25,657	1,525	19,261	1,018	34,202	510	6,439	194	2,501

Source: The Conference Board of Canada.

Cost savings are also expected in the first five and 10 years following implementation of the services. In the first five years of the forecast period, cumulative savings ranging from $293 million under the lowest-participation scenario and $2.8 billion under the highest-participation scenario were estimated. Over the first 10 years of the forecast, cumulative savings are projected at between $884 million and $8.5 billion. (See Table 4.)

Table 4

The Incremental 5- and 10-year Economic Benefit of Expanded Pharmacy Services in Canada

(C$ millions)

		100% participation	10% participation
Cumulative first 5 years	Direct	2,326	248
	Indirect	427	45
	Total	2,753	293
Cumulative first 10 years	Direct	7,295	760
	Indirect	1,218	124
	Total	8,513	884

Source: The Conference Board of Canada.

The largest economic benefits of expanding the selected pharmacy services would result from scaling advanced medication review and management for CVD, followed by smoking cessation services, and, lastly, pneumococcal vaccination for individuals aged 65 years and over. (See Table 5.) The following range of cumulative savings over the forecast period was estimated between the lowest and highest participation/uptake levels:

- smoking cessation: $563 million to $5.6 billion
- advanced medication review and management: $1.9 billion to $19.3 billion
- pneumococcal vaccination: $206 million to $761 million

Table 5

The Cumulative Incremental Benefit of Expanded Pharmacy Services in Canada by Service

	100% participation		1.6% uptake	10% participation		0.4% uptake
	Smoking cessation	Advanced medication review and management	Pneumococcal vaccination	Smoking cessation	Advanced medication review and management	Pneumococcal vaccination
Cases averted	651,681	2,543,638	41,315	28,575	255,852	11,161
Deaths averted	48,054	104,640	3,874	4,827	10,524	1,047
Total cost savings (C$ millions)	5,607	19,290	761	563	1,938	206
Direct health care cost (C$ millions)	3,715	18,106	761	373	1,819	206
Indirect cost (productivity gains) (C$ millions)	1,892	1,184	n.a.	190	119	n.a.

n.a. = not applicable
Source: The Conference Board of Canada.

Table 6 provides a summary of the incremental benefits of expanding pharmacy services for advanced medication review and management for CVD, smoking cessation, and pneumococcal vaccination. Under the full-participation scenario, the largest incremental cost savings of the three services combined are expected to be in primary prevention of CeVD ($714 million) and IHD ($676 million) in 2035, which would amount to almost $10 billion in savings over the forecast period for each condition. (See Table 6.)

In terms of secondary prevention, the advanced medication review and management for CVD and smoking cessation services, at full participation, were estimated to yield cumulative savings of $2.1 billion for MI and $1.4 billion for stroke by 2035. Full participation in smoking cessation services was estimated to have an economic impact of $2.5 billion in savings for lung cancer and $1.2 billion for COPD over the forecast period.

The highest-uptake scenario in a pharmacy-administered pneumococcal vaccination program was estimated to yield total cost savings to the health care system of $761 million over the forecast period. Although the gains for pneumococcal vaccination in pharmacy were small for 2016, the relative increase in potential cost savings as a result of reduced cases of pneumonia over the next 20 years is large.

A detailed breakdown of direct costs by hospital, physician, and drug costs, by service, is available in Appendix E.

Table 6

The Incremental Economic Benefit of Expanded Pharmacy Services in Canada by Service

(100% participation, C$ millions)

Year	Cost	CeVD (primary prevention)	Stroke (secondary prevention)	IHD (primary prevention)	MI (secondary prevention)	Lung cancer	COPD	Hospitalized pneumonia
2035	Direct health care cost	693	102	629	144	84	86	89
	Indirect cost (productivity gains)	21	6	47	22	97	7	n.a.
	Total cost savings	714	108	676	166	181	93	89
Cumulative over forecast period	Direct health care cost	8,745	1,275	7,917	1,794	1,023	1,068	761
	Indirect cost (productivity gains)	329	94	742	347	1,454	110	n.a.
	Total cost savings	9,074	1,369	8,659	2,141	2,477	1,178	761

n.a. = not applicable
Source: The Conference Board of Canada.

These findings suggest that the decreased prevalence of costly conditions and premature deaths from expanding just three community pharmacy services could lead to important economic gains for the health care system (in the form of direct costs) and to society (in the form of indirect costs). In the context of changes such as the aging population and increased constraints on government budgets, finding cost-effective and scalable interventions to manage risk factors and offering preventative measures such as immunization for vulnerable groups are important strategies to help ensure the financial viability

Community pharmacies have the capacity to deliver other services.

of the health care system and strengthen the Canadian economy. Community pharmacies are regarded as accessible and convenient primary care providers. By capitalizing on pharmacists' medication expertise—potentially broadening their scope of practice and, as a result, expanding services—they could play an even greater role in ensuring the sustainability of the health care system. Despite the need for more evidence on effectiveness, this research used the best evidence available to model the potential value of expanded services in community pharmacies. Since this work only looks at three services, and knowing that community pharmacies have the capacity to deliver other services, the estimates provided here should be considered conservative.

Like any health care delivery model, articulating the population health, health care systems, and societal value proposition of expanded community pharmacy services is challenging, especially in the face of missing or incomplete data on the effectiveness of pharmacy interventions. For example, the effectiveness estimates used in this modelling study were based on outcomes measured from either a three- or six-month follow-up period, with a 12-month adjustment factor applied to the rate of smoking to account for the potential for lower sustained quit rates over the longer term, as experienced with many smoking cessation programs. The reliability of using results from a short follow-up period and applying them to a forecast over many years is difficult to measure, and assumes that CVD risk reductions resulting from the intervention would be sustained over time. The implications of this assumption as it relates to each service are discussed in more detail below.

The effectiveness of the smoking cessation and advanced medication review and management services for CVD also depended on the compensation scheme of the Alberta program—for example, which services were publicly covered for individuals and reimbursed to pharmacies. In general, Alberta is more comprehensive in its public reimbursement for the services examined in this modelling study. Since this analysis shows results for Canada as a whole, the policy environment of Alberta was used as an assumption across the board due to its comprehensiveness. Therefore, developing province-specific models would increase the precision of results from a pan-Canadian point of view, for example by allowing the effectiveness, uptake rates,

and fees (government reimbursement) of services to be adjusted based on real jurisdictional experiences.

Smoking Cessation

The smoking cessation intervention applies to current smokers at high risk for CVD who want to quit but are having difficulty. Table 7 presents the overall number of cases for each condition in 2016 and 2035 under the base-case scenario, as well as the number of cases averted in 2035 and the cumulative number of cases averted over the forecast period. It is estimated that, under the full-participation scenario, the smoking cessation intervention could prevent up to 651,681 cases of the chronic conditions examined in this analysis over the course of the forecast period. Almost half of the cases averted would be of COPD (367,258), followed by cases of IHD (176,807), and lung cancer (60,930). Because smoking is a major risk factor for COPD, heart disease, and lung cancer, the smoking cessation service is modelled to have a large impact on the prevalence of these conditions.

Table 7
Cases Averted From Expanded Smoking Cessation Services
(number of cases)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
	Number of cases		Cases averted									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	367,468	534,683	1,754	25,077	1,315	18,811	877	12,545	438	6,279	175	2,520
Stroke	22,766	35,333	219	3,053	164	2,290	110	1,527	55	764	22	307
IHD	1,620,028	2,378,930	12,418	176,807	9,313	132,629	6,209	88,450	3,104	44,271	1,242	17,764
MI	33,631	49,628	1,319	18,557	989	13,920	659	9,283	330	4,646	132	1,864
Lung cancer	46,947	71,404	4,334	60,930	3,251	45,705	2,167	30,480	1,084	15,255	433	6,121
COPD	914,642	1,272,674	25,443	367,258	19,082	275,494	12,721	183,729	6,361	91,964	2,544	36,905
Total	**2,090,839**	**3,069,978**	**20,044**	**651,681**	**15,033**	**213,354**	**10,022**	**142,285**	**5,011**	**71,217**	**2,004**	**28,575**

Sources: Statistics Canada; The Conference Board of Canada.

The smoking cessation service could save between 5,196 and 51,735 lives over the forecast period, depending on patient participation. Full patient participation (100 per cent) could reduce the cumulative number

of deaths from IHD by 4,128, deaths from lung cancer by 30,053, and deaths from COPD by 6,134. These numbers decline steadily when fewer patients are modelled to participate in the service, down to 415 lives saved from IHD, 3,019 lives saved from lung cancer, and 616 lives saved from COPD under the lowest participation level (10 per cent). (See Table 8.)

Table 8

Lives Saved From Expanded Smoking Cessation Services

(number of lives)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
	Number of deaths		Lives saved									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	12,020	19,319	63	870	47	653	31	435	16	218	6	87
Stroke	10,586	17,372	114	1,569	85	1,177	57	785	28	393	11	158
IHD	34,292	55,304	297	4,128	223	3,096	148	2,065	74	1,033	30	415
MI	8,941	14,229	382	5,300	287	3,976	191	2,651	96	1,327	38	532
Lung cancer	22,139	34,720	2,150	30,053	1,612	22,544	1,075	15,034	537	7,525	215	3,019
COPD	12,198	20,324	445	6,134	334	4,601	223	3,068	111	1,536	45	616
Total	**100,176**	**161,269**	**3,451**	**48,054**	**2,588**	**36,047**	**1,725**	**24,039**	**863**	**12,031**	**345**	**4,827**

Sources: Statistics Canada; The Conference Board of Canada.

Across all conditions and for both primary and secondary prevention, implementing smoking cessation services could lead to cumulative direct health care cost savings of up to $3.72 billion under the full-participation scenario. These cost savings decline under lower participation scenarios. The largest contributors to direct health care costs in 2016 were IHD ($5.11 billion), CeVD ($3.67 billion), and COPD ($2.1 billion). Under the lowest- and highest-participation scenarios, the smoking cessation service is estimated to produce cumulative savings of between $107 million and $1.01 billion for COPD, $103 million and $1.02 billion for lung cancer, $71 million and $711 million for IHD, and $32 million and $311 million for CeVD. (See Table 9.)

Table 9

Direct Cost Savings From the Expanded Smoking Cessation Services

(C$ millions)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
			Cost savings									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	3,674	7,908	26	319	19	239	13	160	6	80	3	32
Stroke	864	1,983	12	148	9	111	6	74	3	37	1	15
IHD	5,114	11,109	58	711	43	533	29	356	14	178	6	71
MI	635	1,386	37	447	28	335	18	223	9	112	4	45
Lung cancer	618	1,390	84	1,023	63	767	42	512	21	256	8	103
COPD	2,091	4,303	86	1,068	65	801	43	534	22	267	9	107
Total	**12,996**	**28,081**	**303**	**3,715**	**228**	**2,787**	**152**	**1,858**	**76**	**930**	**30**	**373**

Sources: The Conference Board of Canada.

Table 10 shows total indirect costs and the breakdown by level of participation. In the base-case scenario, indirect costs totalled $4.2 billion in 2016 and are forecast to increase to $5.1 billion by 2035. Lung cancer and MI are the largest contributors to indirect costs, mostly because of the large number of deaths before the age of 65. Smoking cessation services are modelled to yield cumulative cost savings over the forecast period of between $190 million for the 10 per cent patient participation scenario and $1.89 billion for the 100 per cent patient participation scenario.

Table 10

Indirect Cost Savings From the Expanded Smoking Cessation Services

(C$ millions)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
			Cost savings									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	440	540	2	29	1	21	1	14	0	7	0	3
Stroke	299	369	1	20	1	15	1	10	0	5	0	2
IHD	1,416	1,713	9	131	7	99	4	66	2	33	1	13
MI	423	511	10	147	7	110	5	74	2	37	1	15
Lung cancer	1,405	1,707	97	1,454	73	1,091	49	728	24	364	10	146
COPD	274	333	7	110	6	83	4	55	2	28	1	11
Total	**4,257**	**5,173**	**126**	**1,892**	**95**	**1,419**	**63**	**946**	**32**	**474**	**13**	**190**

Sources: The Conference Board of Canada.

Prescribing new medications such as varenicline and buropion was central to the smoking cessation intervention.

The results of the modelling suggest that scaling up smoking cessation services in community pharmacies could lead to important health benefits in the form of averted cases of and fewer premature deaths from CVD (including both primary and secondary prevention), lung cancer, and COPD. These averted cases and deaths would in turn lead to direct cost savings for the health care system and indirect cost savings from increased productivity. Still, these results must be considered within the limitations of the analysis, such as the short three-month follow-up period used in the RxEACH study, which provides the best Canadian data available at this time on pharmacy-based smoking cessation interventions. As a reminder, the effectiveness of the intervention was based on three-month quit rates, which we adjusted downward to estimate 12-month quit rates. Still, the model assumes no additional drop-off, meaning that smoking cessation would be sustained past 12 months and throughout the whole forecast period, which could lead to an overestimation of the intervention's impact in later years if a portion of participants resume smoking after 12 months.

The available evidence is also lacking in detail around the separate effect of education/counselling and prescribing activities for smoking cessation, as these data were not captured in the RxEACH study. The number of patients who were started on a new prescription was also unavailable. This information is important because pharmacists in most provinces can provide education, adapt medication dosage, or make therapeutic substitutions, but only pharmacists in Alberta (with additional prescribing authorization) can independently and freely prescribe Schedule 1 drugs. Delineating the effect of the intervention attributable to pharmacists prescribing new drugs for smoking cessation is central to the analysis of whether or not these community pharmacy services should be scaled up. In an effort to fill this knowledge gap, a few pharmacists enrolled in the RxEACH study were interviewed. They confirmed that prescribing new medications such as varenicline and bupropion was in fact central to the smoking cessation intervention, although differences in prescribing habits varied based on the patient's ability to pay or their insurance coverage. Prescribing variability

according to a patient's ability to pay occurs in other health professions with prescribing authority, including physicians.[1]

Pharmacists in the RxEACH study considered a number of factors when writing prescriptions to help people stop smoking, including the socioeconomic profile of patient populations. According to a 2013 Cochrane review, varenicline is the most effective medication for tobacco cessation, and patients on this drug were found to be three times more likely to quit than those on bupropion.[2] In Alberta, for individuals on government-sponsored supplementary health plans, varenicline is covered as a restricted benefit. The initial prescription must be combined with enrolment in smoking cessation counselling, and subsequent prescriptions require special authorization.[3] For individuals without a drug plan, the cost of varenicline (including markup and dispensing fee) is estimated at $370 for a 90-day supply.[4] Conversely, bupropion is covered as a regular benefit for government-sponsored supplementary health plans and costs a fraction of the price of varenicline.[5]

In the RxEACH study, some pharmacists were therefore experiencing a financial barrier to prescribing the highly effective varenicline to some patient populations, such as those of lower socioeconomic status. In those instances, bupropion was often prescribed, or patients were started on over-the-counter nicotine replacement therapy such as Nicoderm.[6] When financial barriers to prescribing varenicline are present, the education and support provided by pharmacists was identified as the largest contributor to intervention effectiveness. In the absence of financial barriers associated with prescribing varenicline, a pharmacist interview revealed an 80 per cent prescribing rate of this medication to patients enrolled in the smoking cessation intervention.[7] The estimate of intervention effectiveness used in this modelling study represents an average, derived from a range of clinical approaches taken by

1 Kratzer and others, "The Impact of Private Insurance Coverage."
2 Cahill and others, "Pharmacological Interventions for Smoking Cessation."
3 AlbertaQuits, *Tobacco Cessation Toolkit*.
4 Kolber, Nickonchuk, and Lee, *Price Comparison of Commonly Prescribed Pharmaceuticals*.
5 Ibid.
6 Information collected as part of the pharmacist interviews.
7 Ibid.

pharmacists to provide smoking cessation services to varied patient populations within financial or other barriers. Therefore, the impact of scaling up community pharmacy smoking cessation services would likely be moderated by public and private coverage of effective medications, which could also influence uptake from pharmacists and patients and vary by province and socioeconomic group.

Advanced Medication Review and Management for CVD

The advanced medication review service has the potential to prevent up to 2.5 million cases of chronic conditions by 2035 under the full-participation scenario. The largest number of cases averted would be for primary prevention of IHD and CeVD. Over the forecast period, between 181,011 and 1.8 million cumulative cases of IHD could be averted under the lowest- and highest-participation scenarios. The number of averted cases of CeVD would range between 4,510 and 45,101. In terms of secondary prevention, the service could prevent between 5,653 and 56,215 cases of MI over the forecast period, along with 2,352 to 23,384 cases of stroke, varying with the participation level. (See Table 11.)

Table 11

Cases Averted From Expanded Advanced Medication Review and Management for CVD Services

(number of cases)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
	Number of cases		Cases averted									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	367,467	534,683	45,101	664,448	33,825	498,445	22,550	332,441	11,275	166,438	4,510	66,836
Stroke	22,766	35,333	1,605	23,384	1,204	17,542	803	11,700	401	5,857	161	2,352
IHD	1,620,028	2,378,930	122,387	1,799,590	91,790	1,349,985	61,193	900,380	30,597	450,775	12,239	181,011
MI	33,631	49,628	3,851	56,215	2,888	42,170	1,925	28,125	963	14,080	385	5,653
Total	**2,043,891**	**2,998,574**	**172,943**	**2,543,638**	**129,707**	**1,908,142**	**86,471**	**1,272,646**	**43,236**	**637,150**	**17,294**	**255,852**

Sources: Statistics Canada; The Conference Board of Canada.

Implementing advanced medication review and management services could save between 11,956 and 118,878 lives over the forecast period,

when comparing the lowest- and highest-participation scenarios. IHD patients account for the greatest number of lives saved, ranging from 4,803 lives saved under the 10 per cent participation scenario to 47,754 lives under the 100 per cent participation scenario. In terms of secondary prevention, the service could prevent between 2,904 and 28,878 deaths caused by MI, depending on patient participation. (See Table 12.)

Table 12

Lives Saved from Expanded Advanced Medication Review and Management for CVD Services

(number of lives)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
			Lives saved									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	12,020	19,319	1,851	26,960	1,388	20,225	925	13,489	463	6,753	185	2,712
Stroke	10,586	17,372	837	12,144	627	9,110	418	6,076	209	3,042	84	1,221
IHD	34,292	55,304	3,282	47,754	2,461	35,823	1,641	23,892	820	11,961	328	4,803
MI	8,941	14,229	1,227	17,783	920	13,340	614	8,897	307	4,454	123	1,788
Total	**65,839**	**106,224**	**7,196**	**104,640**	**5,397**	**78,497**	**3,598**	**52,353**	**1,799**	**26,210**	**720**	**10,524**

Sources: Statistics Canada; The Conference Board of Canada.

Total direct health care costs under the base-case scenario were $10.3 billion in 2016 and are forecast to increase to $22.3 billion in 2035. The service could save between $1.8 billion and $18.1 billion over the forecast period, depending on participation level. The highest cost savings over the forecast period would be realized for CeVD, ranging from $846 million under the 10 per cent participation scenario to $8.4 billion under the 100 per cent participation scenario. IHD would account for cumulative cost savings between $724 million under the lowest-participation scenario and $7.2 billion under the full-participation scenario. Although they are responsible for a much smaller portion of direct costs, MI and stroke could also yield significant cost savings over the forecast period. (See Table 13.)

Table 13

Direct Cost Savings From Expanded Advanced Medication Review and Management for CVD Services

(C$ millions)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
			Cost savings									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	3,674	7,908	667	8,426	500	6,320	334	4,215	167	2,110	67	846
Stroke	864	1,983	90	1,127	68	845	45	564	23	282	9	113
IHD	5,114	11,109	572	7,206	429	5,405	286	3,605	143	1,804	57	724
MI	635	1,386	108	1,347	81	1,011	54	674	27	337	11	135
Total	**10,287**	**22,387**	**1,436**	**18,106**	**1,077**	**13,582**	**718**	**9,057**	**359**	**4,533**	**144**	**1,819**

Source: The Conference Board of Canada.

Table 14 shows total indirect costs and the breakdown by level of participation. The advanced medication review and management service could lead to indirect cost savings ranging from $119 million under the 10 per cent participation level to $1.2 billion under the 100 per cent participation level. The largest indirect costs savings are expected for primary and secondary prevention of heart conditions/complications. Cumulative indirect cost savings over the forecast period are modelled at $610 million for IHD under the full-participation scenario and $199 million for MI.

Table 14

Indirect Cost Savings From Expanded Advanced Medication Review and Management for CVD Services

(C$ millions)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
			Cost savings									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	440	540	19	300	14	225	9	150	5	75	2	30
Stroke	299	369	5	74	4	56	2	37	1	19	0	7
IHD	1,416	1,713	38	610	29	458	19	305	10	153	4	61
MI	423	511	13	199	9	150	6	100	3	50	1	20
Total	**2,578**	**3,133**	**74**	**1,184**	**56**	**888**	**37**	**592**	**19**	**297**	**7**	**119**

Source: The Conference Board of Canada.

The modelling results suggest that scaling up advanced medication review and management for CVD within community pharmacies could

lead to important health benefits in the form of averted cases, including both primary and secondary prevention, and premature deaths from these conditions. These averted cases and deaths would in turn lead to direct cost savings for the health care system and indirect cost savings from increased productivity. Again, the forecast of the health and economic impact of expanding pharmacy services is based on a number of assumptions, including estimates of intervention effectiveness derived from the RxEACH and RxACT studies. These two studies host the best Canadian data available at this time on advanced medication review and management for CVD in community pharmacies.

Still, data collected as part of the RxEACH and RxACT studies did not include information on the proportion of participants that started a new prescription. This information is important because pharmacists in most provinces can provide education, adapt medication dosage, or make therapeutic substitutions, but only pharmacists in Alberta (with additional prescribing authorization) can independently prescribe Schedule 1 drugs. Based on information gathered from pharmacist interviews, the majority of patients receiving this intervention were recommended a new prescription, and almost all received dosage adaptations. However, the interviews revealed that pharmacists may not be homogenous in their approach to medication review and management. For instance, some may prefer to recommend a new prescription through collaboration with the family physician, while other pharmacists prescribe directly. Once again, the measure of service effectiveness used in this modelling study represents an average effect, reflecting variability in pharmacist practice. It should be noted that provider behaviours vary within all health care disciplines and professions for many different reasons.

Pneumococcal Vaccination

The pneumococcal vaccination service modelled in this study targets individuals aged 65 years and over. The Conference Board of Canada approach to estimating productivity as a measure of indirect cost assumes that the vast majority of Canadians retire at the age of 65, and therefore they are not included in our indirect costing. This is a limitation, however, as we know that there are Canadians over 65 who

Pharmacists-administered pneumococcal vaccinations could lead to cumulative cost savings.

continue to work, and there are also Canadians under 65 who are retired. The economic impact of pneumococcal vaccination in community pharmacies for the population aged 65 and older therefore consists only of the direct health care costs of avoidable disease cases in hospital. Table 15 shows the number of cases, deaths, and total direct costs of hospitalized pneumonia under the base-case scenario, as well as the number of cases averted, lives saved, and cost savings in 2035 and over the forecast period for each uptake scenario. Under the base case, there were 59,174 hospitalized cases of pneumonia in 2016, which is forecast to increase to 102,130 cases in 2035. Hospitalized pneumonia caused 5,562 deaths among seniors in 2016, which is forecast to increase to 9,572 in 2035 without any intervention. Total direct health care costs attributable to hospitalized pneumonia were $828 million in 2016, forecast to increase to $2.1 billion in 2035 under the base-case scenario.

Increasing access to pneumococcal vaccination for seniors could prevent between 1,199 and 4,292 cases of hospitalized pneumonia in 2035, based on the low- and high-participation scenarios. Cumulatively, between 11,161 and 41,315 cases of hospitalized pneumonia could be averted over the forecast period. Further, increased access to pneumococcal vaccination could save between 1,047 and 3,874 lives over the forecast period, again depending on the level of patient participation. Finally, pharmacist-administered pneumococcal vaccinations could lead to cumulative cost savings of between $206 million under the lowest-participation scenario and $761 million under the highest-participation scenario. (See Table 15.)

Table 15

Benefits From Expanded Pneumococcal Vaccination Services

	Base case		1.6% uptake		1.2% uptake		0.8% uptake		0.4% uptake	
	Number/cost		Cases/deaths averted and cost savings							
	2016	2035	2035	2016–35	2035	2016–35	2035	2016–35	2035	2016–35
Cases	59,174	102,130	4,292	41,315	3,339	31,789	2,310	21,747	1,199	11,161
Deaths	5,562	9,572	402	3,874	313	2,981	216	2,039	112	1,047
Direct health care cost ($ million)	828	2,115	89	761	69	586	48	401	25	206

Source: The Conference Board of Canada.

Modelling the impact of pharmacist-administered pneumococcal vaccination for individuals aged 65 years and over suggests that health and economic benefits could result from averted hospitalized pneumonia cases and premature deaths. However, the modest anticipated uptake in pharmacy-administered pneumococcal vaccinations for the 65-and-over population, which was modelled on the flu vaccination experience for that age group,[8] limits the magnitude of impact. Low uptake of pharmacy-administered flu vaccination for older age groups has also been reported in Ontario, where an analysis of physician and pharmacy billing claims for the 2012–13 and 2013–14 influenza seasons suggests that the majority of patients vaccinated in Ontario pharmacies were part of a younger population, while older patients and those with comorbidities were more likely to receive influenza vaccination from their regular physician.[9]

By including other vulnerable populations for which the pneumococcal vaccination is indicated, such as children and the immunocompromised, a larger uptake could be expected and lead to greater health and economic benefits of scaling up pneumococcal vaccinations in pharmacies. The uptake of community pharmacy services is also influenced by the acceptability of these services by the Canadian population, and can vary between groups based on demographic factors such as age. For example, the experience of the flu vaccination administered in pharmacies has been well received by the general population, but it is unclear if similar uptake would be possible for pneumococcal vaccination. It is for this reason that a range of uptake levels were considered in the analysis.

8 Buchan and others, “Impact of Pharmacist Administration of Influenza Vaccines.”

9 Kwong and others, “Community Pharmacies Providing Influenza Vaccines.”

CHAPTER 5

Measuring Return on Investment

Chapter Summary

- Decision-makers must consider the cost of investing in expanded services versus the health and economic returns within the context of governments' desire for balanced budgets.
- This study took a government-payer perspective to estimate the investment as a function of administrative costs compared with the returns as estimated in the previous section.
- By 2035, the direct cost (health care system) return for every dollar invested could reach up to $9.10 for the smoking cessation services, $2.30 for advanced medication review and management for CVD, and $72.00 for pneumococcal vaccination.

Decision-makers must consider the "investment" side of the equation.

An important issue of concern for governments is whether there would be a return on investment (ROI) with the wide-scale implementation of any one or more community pharmacy practice models. Return on investment is dependent on the cost of administration and any related economic spinoff, including the following:

- opportunity costs such as the ability to re-invest in other priority services (e.g., expanding public health, drug coverage, mental health);
- potential increases in out-of-pocket and insurance costs;
- potential for duplication of services when patients see more than one provider for the same care, thus increasing system costs;
- the downstream economic benefits related to improved population health, associated health care system savings, and productivity gains in the economy.

It is much easier to discern the "return" side of the equation, which is how high stakeholder interest (system cost savings) is converged with the evidence. Decision-makers must consider the "investment" side of the equation and its impact on governments' desire for balanced budgets. In this section, we attempt to measure the return on investment from the public-funder perspective using a relatively simplified approach that takes into account the potential cost of administration only.

The Investment

When it comes to implementing community pharmacy services, the majority of costs incurred by provincial governments are associated with reimbursing services rendered by pharmacists in cases where governments choose to provide reimbursement. The reimbursement fees are set by each province and can vary widely across the country. This variation likely stems from many reasons, including economic factors (ability to pay), opportunity costs, limited evidence of impact and value, and reimbursement for service by other providers with similar scope. The ROI analysis includes scenarios from three provinces with different fees:

Alberta, Ontario, and Nova Scotia. (See Table 16.) In Alberta, services provided by pharmacists with additional prescribing authorization (APA) are reimbursed at a higher rate than services provided by pharmacists without APA. This was taken into account in the ROI analysis by weighting the fees for Alberta by the volume of services provided by APA and non-APA pharmacists.[1] Current pharmacist-administered flu vaccination rates were used for the pneumococcal vaccination rates, as they would not be expected to differ.

Table 16
Community Pharmacy Reimbursement Fees

Service type	Province	Program	Fee ($)	Limits (per year)
Smoking cessation	Alberta	Standard Medication Management Assessment	Initial: $75 (APA), $60	1
			Follow-up: $25 (APA), $20	4
	Ontario	ODB smoking cessation program	Initial: $40	1
			Primary follow-up: $15	3
			Secondary follow-up: $10	4
Advanced medication review and management*	Alberta	Comprehensive Annual Care Plan	Initial: $125 (APA), $100	1
			Follow-up: $25 (APA), $20	No limit
	Nova Scotia	Advanced Medication Review Service	Initial: $150	1
			Follow-up: $20	2
Administration of flu vaccination	Alberta	Public injections	$20	Per provincial public flu program
	Nova Scotia		$15	
	Ontario		$7.50	

*includes medication reviews identified by the government as being "advanced" or "comprehensive," as well as the development of a full care plan for complex patients; does not include "standard" medication reviews available in most provinces.
Sources: Shoppers Drug Mart; The Conference Board of Canada.

The reimbursement scenarios included in the ROI analyses represent the sum of the initial service fee and the follow-up fee (if any). For consistency, we used the lowest number of services when they varied by province. For example, Alberta reimburses up to four follow-up visits for smoking cessation, while Ontario reimburses up to seven. Therefore, the cost per smoking cessation service in the analysis is composed of the initial visit and four follow-up visits per patient, totalling $95[2] under

1 Fee volumes for Alberta for 2015–16 were provided by the Alberta Pharmacists' Association.

2 Calculated by summing the fee for the initial visit ($40) and the fee for a follow-up visit ($15 for primary and $10 for secondary), the latter of which was multiplied by four visits (the maximum three primary visits and one secondary, $55), for a total of $95 per service.

It is expected that pharmacy fees for the administration of the pneumococcal vaccine would be similar to fees for flu vaccination.

the Ontario pricing model and $153[3] under the Alberta pricing model. The cost of the advanced medication review and management service included the initial visit and two follow-up visits (as per the Nova Scotia limit), totalling $154[4] under the Alberta pricing model and $190[5] under the Nova Scotia pricing model.

There is a limitation associated with using the restrictions on follow-up visits stated above since they may not match perfectly with the intervention protocol from the Tsuyuki studies, from which estimates of effectiveness were derived for the modelling. The smoking cessation intervention and most of the advanced medication review and management intervention used a three-month follow-up period, with the exception of control of hyperlipidemia, which used a six-month follow-up period. Therefore, the investments modelled in the ROI analysis may be overestimated for the smoking cessation intervention and underestimated for the advanced medication review and management intervention. Still, this is not expected to change the direction or magnitude of the ROI results, and pricing the interventions at a realistic cost given follow-up limits set by governments was considered an acceptable trade-off.

As for the pneumococcal vaccination service, the fees of $20 per pharmacist-administered flu vaccination in Alberta, $15 in Nova Scotia, and $7.50 in Ontario were used in the analysis. It is expected that pharmacy fees for the administration of the pneumococcal vaccine would be the same or similar to the fees for flu vaccination.

For each of the three interventions, the total investment by pricing scenario was calculated by multiplying the intervention fees by the number of patients receiving the intervention for each of the uptake/participation levels.

3 Calculated by summing the weighted APA/non-APA fee for the initial visit ($65.55) and the weighted fee for a follow-up visit ($21.85), the latter of which is multiplied by four visits ($87.40), for a total of $153 per service.

4 Calculated by summing the weighted APA/non-APA fee for the initial visit ($109.62) and the weighted fee for a follow-up visit ($22.33), the latter of which is multiplied by two visits ($44.66), for a total of $154 per service.

5 Calculated by summing the fee for the initial visit ($150) by the fee for a follow-up visit ($20), the latter of which is multiplied by two visits ($40), for a total of $190 per service.

The Impact of Funding on Services Delivery Behaviours

In our analysis, we applied a range of uptake rates for each of the services modelled. We also discussed the variability of fees across different jurisdictions for each service category. One of the challenges of this report was deciphering the nuances across services by jurisdiction and how each of the different fees account for these differences. For example, Alberta's approach to advanced medication review and management may differ in some aspects to the review and management services delivered in other jurisdictions. Further, the relationship between pharmacist services fees and uptake rates is not yet well understood. In our previous research, we discussed the role of funding models (who pays the provider, how they are paid, how much they are paid, and for what) and financial incentives in predicting health provider behaviours. It has been found that, depending on the remuneration model (e.g., fee-for-service, salary, blending payment, pay-for-performance, rates of pay), health providers can be motivated to provide more services or different types of services.[6,7] How and how much a physician is paid for specific services has been found to influence those services' provision. This observation is likely to hold true with other independent service providers, including pharmacists. More data on the relationship between funding models and uptake rates across different jurisdictions will need to be collected and analyzed to better understand this relationship for the pharmacy context.

The Return

The "return" side of the ROI equation corresponds to the direct and indirect costs savings estimated from the modelling exercise. These cost savings represent the downstream economic benefits related to improved population health and health care system savings, as well as productivity gains in the economy. In our model, the pneumococcal vaccination service focused on the population 65 years old and over, for which indirect costs were not calculated. For smoking cessation and

6 Goldfarb, *Family Doctor Incentives*.

7 Dinh, Stonebridge, and Thériault, *Getting the Most out of Health Care Teams*.

The direct cost ROI was calculated by subtracting the investment costs from the forecast direct cost returns of scaling up the services.

advanced medication review and management, both direct and indirect cost savings were considered.

The direct cost ROI was calculated by subtracting the investment costs from the forecast direct cost returns of scaling up the services. The indirect cost ROI simply represents the indirect cost savings calculated from the modelling. The cumulative ROI over the forecast period of 2016–35 for direct costs, indirect costs, and total costs by services are presented in charts 1 to 3 below.

ROI of the Smoking Cessation Service

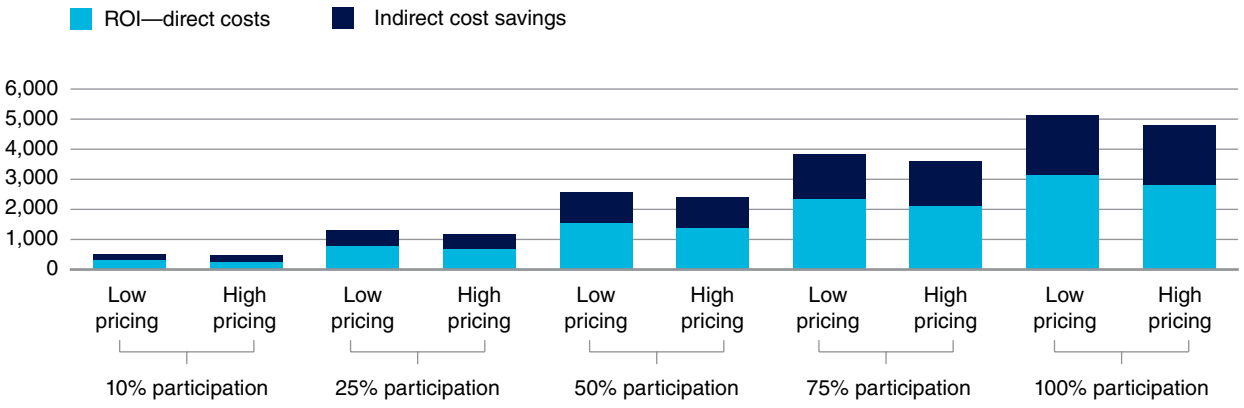
Chart 1 shows the estimated ROI over the forecast period for the smoking cessation service based on the pricing models for Ontario (low) and Alberta (high). The Ontario model, with a cost per service (initial visit and four follow-up visits) of $95, yields a slightly greater ROI than the Alberta model, at $153 per service. In the scenario that assumes 50 per cent participation from the eligible population, the smoking cessation service is estimated to produce $1.58 billion in cumulative direct-cost ROI over the forecast period under the low-pricing model, compared with $1.41 billion under the high-pricing model. In the 100 per cent participation scenario, the low-pricing model is estimated to produce $3.14 billion in cumulative direct cost ROI compared with $2.18 billion under the high-pricing model. This represents a difference of $342 million in direct cost ROI between the two pricing models over the forecast period.

For both models, direct cost savings represent around 60 per cent of the overall ROI, while indirect costs are estimated to range between $190 million and $1.89 billion in cumulative savings depending on the participation scenario. The break-even point for governments, meaning the year in which the direct cost returns would become equal to or greater than the investment, would occur at year two (in 2017) for the most expansive Alberta pricing model and at year one (in 2016) for the less costly Ontario pricing model. In 2035, the direct cost returns of the smoking cessation service are estimated to yield $5.60 for every dollar invested under the high-pricing scenario, and $9.10 for every dollar invested under the low-pricing scenario, at all uptake levels.

Chart 1

Cumulative Direct Cost ROI and Indirect Cost Savings From Smoking Cessation, by Pricing Scenario, 2016–35

(C$ millions)



Notes: Smoking cessation intervention includes initial visit and four follow-up visits. Average low-pricing scenario is $95; average high-pricing scenario is $153.
Source: The Conference Board of Canada.

ROI of the Advanced Medication Review and Management for CVD Service

Chart 2 presents the estimated ROI over the forecast period for the advanced medication review and management service based on pricing from Alberta (low) and Nova Scotia (high). These two provinces are the only ones in Canada to offer “advanced” or “comprehensive” medication review services that go beyond the standard medication reviews available in most provinces. In the ROI analysis, Alberta offers a less expensive service ($154, defined as the initial visit and two follow-up visits) compared with Nova Scotia ($190). Under the 50 per cent participation scenario, over the forecast period the low-pricing model is estimated to yield a slightly greater direct cost ROI, $1.61 billion, than the high-pricing model, $1.48 billion. Under the 100 per cent participation scenario, the cumulative direct cost ROI is estimated at $3.21 billion in the low-pricing model and $2.95 billion using the high-pricing model. This

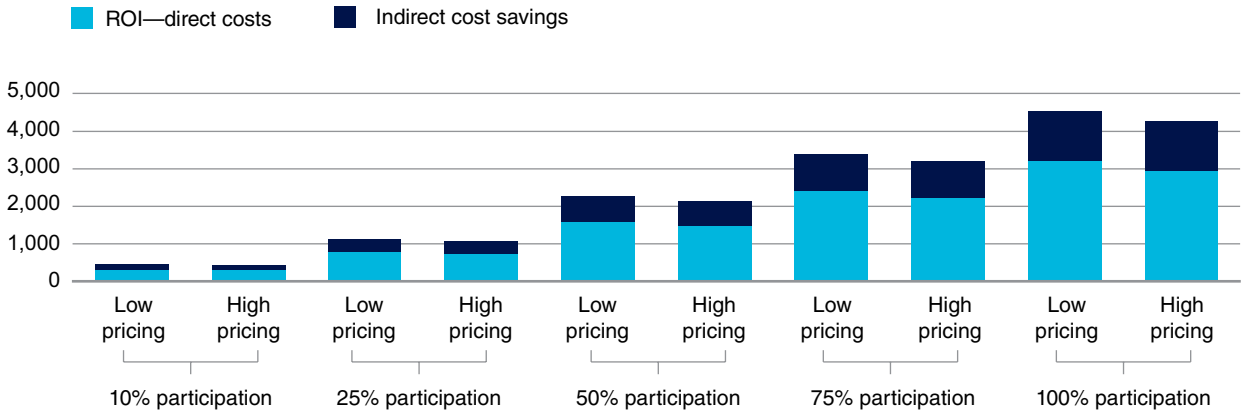
represents a difference in direct cost ROI of $262 million between the two pricing models over the forecast period.

For both models, direct cost savings represent around 70 per cent of the overall ROI, while indirect costs are modelled to contribute between $119 million and $1.18 billion in cumulative savings depending on the participation scenario. The break-even point for governments, in this case the year in which the returns in direct costs would become equal to or greater than the investment, would occur at year six (in 2021) for the most expansive model, and at year four (in 2019) for the less costly pricing model. In 2035, the direct cost returns of advanced medication review and management for CVD are estimated at $1.90 for every dollar invested under the high-pricing scenario and $2.30 for every dollar invested under the low-pricing scenario, at all uptake levels.

Chart 2

Cumulative Direct Cost ROI and Indirect Cost Savings From Advanced Medication Review and Management for CVD, by Pricing Scenario, 2016–35

(C$ millions)



Notes: Advanced medication review and management for CVD intervention is defined as an initial visit and two follow-up visits. Average low-pricing scenario is $154; average high-pricing scenario is $190.
Source: The Conference Board of Canada.

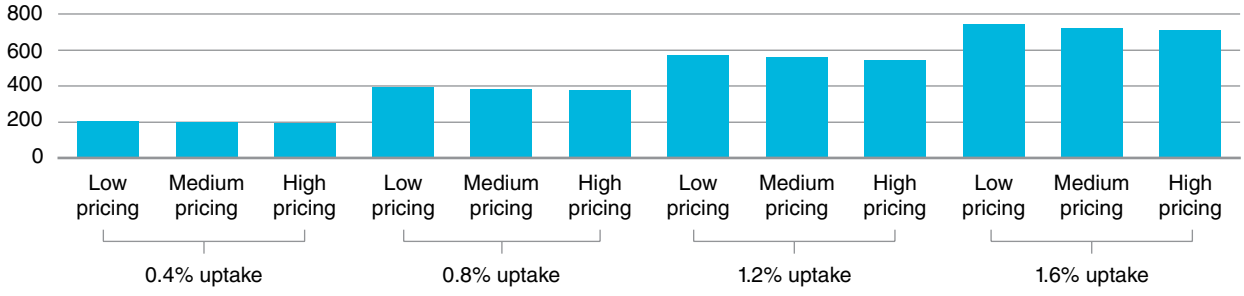
ROI of the Pneumococcal Vaccination Service

Chart 3 presents the estimated ROI over the forecast period for the pneumococcal vaccination service based on a range of flu vaccine pricing from Ontario (low, $7.50), Nova Scotia (medium, $15), and Alberta (high, $20). All three pricing scenarios were modelled to yield significant net returns for each of the vaccination uptake scenarios. The lower uptake level of 0.4 per cent of the adult population aged 65 years and over receiving the pneumococcal vaccination is estimated to yield a cumulative direct cost ROI of between $193 million under the more expensive pricing, and $201 million under the less expansive pricing model. At the higher vaccination uptake level of 1.6 per cent of adults aged 65 and older, the cumulative direct cost ROI over the forecast period is estimated at $741 million for the low model, $721 million for the medium, and $708 million for the high-pricing model. The difference between the least and most expensive pricing models is $8 million under the 0.4 per cent vaccination uptake scenario and $33 million under the 1.6 per cent uptake scenario.

Chart 3

Cumulative Direct Cost ROI From Pneumococcal Vaccination, by Pricing Scenario, 2016–35

(C$ millions)



Note: Average low-pricing scenario is $7.50/vaccincation; average medium-pricing scenario, $15/vaccination; average high-pricing scenario, $20/vaccination.
Source: The Conference Board of Canada.

Financial considerations would likely play a role in the uptake of community pharmacy services.

The break-even point for governments, in this case the year in which the returns in direct costs would become equal to or greater than the investment, would occur at year one (in 2016) for all three levels of pricing modelled. In 2035, the direct cost returns of the pneumococcal vaccination service at the highest uptake level of 1.6 per cent are estimated to yield $27 for every dollar invested under the high-pricing scenario, $36 under the medium-pricing scenario, and $72 under the low-pricing scenario.

Potential Moderators of Pharmacy Services Uptake

As expected, the direct cost ROI of all three services is sensitive to the reimbursement fees set by provinces, as well as the hypothetical participation/uptake levels of community pharmacy services that were modelled. A number of factors at the patient and pharmacist/pharmacy level can impact the uptake of these services. At the patient level, an individual may choose to seek and access smoking cessation or immunization services from another health care provider or in another health care setting, which would also incur a cost to the public health system. The presence or absence of an established and trusting relationship with a primary care provider other than a pharmacist can therefore influence the patient's decision of where to seek care.

Age is another factor that might influence a person's decision to access care from pharmacists, as younger age groups have typically been more receptive to accessing some services, such as immunization, from pharmacists. Age is also associated with having access to a regular medical doctor. Aside from personal preference and circumstantial factors, financial considerations would likely play a role in the uptake of community pharmacy services. For example, cost-sharing of pharmacy services, such as in the form of co-pays, could be a potential financial barrier to access, especially for individuals of lower socioeconomic status.

Other accessibility factors, such as those related to convenience of accessing services (e.g., travel time and distance to provider, flexibility and wait times to get an appointment, opening hours) would also

Pricing of pharmacy services needs to be sustainable and reflective of the value of expanding pharmacy services.

influence uptake. In this regard, community pharmacy may prove advantageous compared with other primary care providers, especially for working or rural demographics, but these convenience factors could be overridden by personal preference or the other factors discussed above.

As mentioned previously, uptake of community pharmacy services can also be moderated by factors that directly or indirectly influence pharmacists or pharmacies, such as pricing of services in terms of reimbursement fees set by provincial drug plans. It is hypothesized that pricing could impact pharmacists' ability and willingness to offer new services. For example, if fees are set too low, it may not be feasible for pharmacists to widely offer these services while maintaining their base responsibilities, such as dispensing or advising on medications, especially if additional pharmacists need to be hired to cover the added demand from expended services.

Pricing of pharmacy services needs to be sustainable and in line with pricing offered to other providers of the same service, while considering the opportunity costs in an era of constrained budgets. More importantly, pricing should be reflective of the impact and value of expanding pharmacy services. Some pharmacists may not feel comfortable or adequately trained to provide new types of services, such as counselling for lifestyle modifications, or may simply prefer not to do so, which could influence uptake from the provider's stand point. Other factors that could drive or incentivize uptake include service targets set in pharmacies, or the business decision to offer these services widely within the context of the corporate for-profit environment in which pharmacies operate.

Community Pharmacists as Cost-Effective Primary Care Providers

As previously mentioned, the pharmacy services modelled in this report can be implemented in various primary care settings, such as a family physician or nurse practitioner's office or in public health, as well as in community pharmacy. We define primary care as "linked to and often provide[ing] referring

or coordinating function for specialized health care … services."[8] Primary care is also "the medical model of response to illness [and] is part of the broader concept of primary health care."[9] Primary care is critical for individuals, as it is often the first and most common point of contact for patients with the health care system.

From a public payer perspective, value of investment takes into account not only the population health impact of decisions and their downstream effects on the health care system and society, but also the cost to government for any publicly funded program. Therefore, in order to show value to the public payer, the cost of implementation must be at the same cost or less cost than in other settings, and as effective or more effective than in the other settings.

As an example, many stakeholders, including government, have singled out influenza vaccination in community pharmacies as highly successful. Using Ontario as an example, we found that the cost of administration in pharmacy is potentially less expensive than in primary care, but more expensive compared with public health. In the 2013–14 fiscal year, the Ministry of Health and Long-Term Care in Ontario paid $25 million in total to various providers for administering the influenza vaccine. This includes $18 million paid to physicians, $6 million to pharmacies, and $1 million to public health units. The health care provider reimbursement rates varied: $5 per dose for public health units, $7.50 per dose for pharmacies, and $9.60 per dose for physicians if the influenza vaccine is all the patient comes in for or $4.50 per dose to physicians if otherwise. The report does not differentiate the proportion of influenza vaccinations in physician offices, which were billed at the $9.60 versus $4.50 per dose fee.

Preliminary analyses of physician and pharmacy billing data showed that pharmacists administered more than 750,000 influenza vaccinations in 2013–14.[10] Compared with 2011–12, this represented a net increase of 467,000 influenza vaccinations administered to individuals who had not previously received the vaccine from any provider, suggesting that pharmacists are contributing to increasing the overall population immunization rate. In Alberta, a universal influenza immunization program was implemented in the fall of 2010, allowing pharmacists to administer the influenza vaccine to individuals aged 9 or older. Over 475,000 influenza vaccinations were administered by Alberta

8 Mable and Marriott, *Sharing the Learning.*

9 Ibid.

10 Ontario Pharmacy Evidence Network, *A New Scope of Practice*.

pharmacists in 2015–16, which represents a 42 per cent increase in vaccination volume by pharmacists compared with 2013–14.[11]

Based on both the Ontario and Alberta analyses, in addition to net new vaccinations at the population level, there was also a significant shift away from other service settings. In Alberta, the distribution of influenza vaccinations administered by various providers has changed significantly in the past five years. Based on the overall volume of immunizations from all providers, the proportion of vaccinations administered by pharmacists increased from 10 per cent in 2011–12 to 41 per cent in 2015–16, while the proportion of vaccinations given by public health care staff decreased from 63 per cent to 39 per cent in the same time frame.[12] In 2015–16, pharmacists delivered over 31,000 more doses of the influenza vaccination compared with public health care workers.[13] Reasons for this shift may be explained by clients' perception and/or experience with convenience, trust in the provider, and awareness (i.e., retail pharmacy's investment in marketing these services). Taken together, the Ontario government sees the relative costs of administering vaccinations in pharmacies and the improvement in uptake rates as a positive.[14]

Measuring ROI is valuable, as both the "investment" and the "return" need to be taken into consideration to estimate the potential net impact of wide-scale implementation of community pharmacy services. This is particularly important for decision-makers and governments' desire for balanced budgets. The results of the analysis showed a large cumulative direct cost ROI for all three pharmacy services and across all uptake scenarios and pricing models. Still, the ROI for some services is only expected to become positive after a few years of implementation, specifically between one and two for smoking cessation and four to six for advanced medication review and management for CVD, depending on the pricing model. A positive ROI is estimated for the first year of implementation of the pneumococcal vaccination service.

11 Claims volume obtained from Alberta Health.

12 Alberta Health, *Health Trends Alberta*.

13 Ibid.

14 The Conference Board of Canada, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence*.

The limitations inherent to modelling the economic impact of scaling up the three community pharmacy services, such as limited evidence supporting the effectiveness of the smoking cessation and advanced medication review for CVD services and low expected uptake of pharmacy-administered pneumococcal vaccination among those 65 years and over, also apply to the results of the ROI analysis. Further, a number of factors, some related to the patient and others to the pharmacist/pharmacy, can impact the uptake of community pharmacy services. These include patient preference and characteristics such as age, financial and other accessibility barriers, pricing of pharmacy services, and the fact that pharmacies operate in a corporate, for-profit environment that may be driving uptake.

Lastly, there is still a lack of economic evidence that suggests pharmacy services provide better value for money than similar services from other providers, such as public health or primary care providers. While it is clear that pharmacists provide equal care for the services examined in this modelling study, and in the case of vaccination potentially higher uptake rates than in other settings (e.g., public health), the unknown is the ROI of providing these services in a community pharmacy by a pharmacist compared with other service providers in other settings. A comparative ROI analysis of different service delivery models across the system using a variety of modelling scenarios, as mentioned previously, may shed light on this issue.

CHAPTER 6

Conclusion and Next Steps

Chapter Summary

- Decision-makers in all jurisdictions are concerned about the value-for-money achieved for funding health care decisions.
- Canadians are concerned about the implications of health care policies for their own individual health. What this work has also uncovered is the value from a productivity perspective whereby being healthy and avoiding disease also results in greater workforce participation, which is good for individuals, families, and the economy.
- Although this research shows the potential health and economic benefits and value for money that expanding community pharmacy services could generate over the short to long term, future research should explore other services that could be expanded, the broader policy and practice considerations (including funding models), multidisciplinary care delivery, and quality-of-care frameworks within the context of the larger health care system.

Increased participation in the three services could yield total cost savings to the health care system and economic gains for society, ranging from $194 million to $2.03 billion.

The analyses conducted in this research examined the health and economic impact of scaled-up selected community pharmacy services in Canada using an incremental benefits analysis approach (the difference between an estimated status quo scenario and alternative interventions scenarios), forecast from 2016 out to 2035. The services were chosen based on the quality of effectiveness evidence available, the likelihood of their impacts improving population health, and their potential for creating added value to the Canadian health care system by alleviating burden from a health and economic perspective. These pharmacy-based, pharmacist-delivered services included advanced medication review and management for CVD, smoking cessation, and pneumococcal vaccination for seniors.

It was estimated that increased participation in the three services could yield total cost savings to the health care system and economic gains for society (productivity improvements) ranging from $194 million to $2.03 billion, depending on the level of uptake of these services in the population. The largest economic benefits of expanding the selected pharmacy services would result from scaling the advanced medication review and management for CVD service (economic value of $1.93 billion to $19.29 billion), followed by the smoking cessation service (economic value of $563 million to $5.6 billion) and then pneumococcal vaccination for individuals aged 65 years and over (economic value of $206 million to $761 million). When comparing the benefits of these services from a population health perspective, the largest value would result from avoidable cases of chronic disease and premature deaths from the primary prevention of cerebrovascular disease and ischaemic heart disease, followed by avoidable cases of lung cancer, the secondary prevention of myocardial infarction, chronic obstructive

pulmonary disease, the secondary prevention of stroke, and then hospitalized pneumonia.

An important issue of concern for "payers" (i.e., public and private insurers) is whether there would be a return on investment (ROI) with the wide-scale implementation of any one or more community pharmacy practice models, and from whose perspective. The ROI analysis conducted in this study showed a large return for all three services examined and across all population uptake scenarios and pricing (cost) models. In the first year of the forecast (2016), the direct cost return for every dollar invested could reach up to $1.20 for smoking cessation services and $2.80 for pneumococcal vaccination, while a small negative return of $0.40 is expected for advanced medication review and management for CVD services in that first year. By 2025, smoking cessation services could yield up to $6.50 in direct cost savings for every dollar invested, compared with $31.60 for pneumococcal vaccination and $1.70 for advanced medication review and management for CVD. In 2035, the direct (health care system) return for every dollar invested in scaled-up community pharmacy services could be as high as $9.10 with smoking cessation, $72.00 with pneumococcal vaccination, and $2.30 with advanced medication review and management for CVD.

From the public perspective, Canadians are concerned about what the implications would be for their own individual health. What this work has also uncovered is the value from a productivity perspective, whereby being healthy and avoiding disease also results in greater workforce participation, which is good for individuals, families, and the economy.

The pharmacy services that were modelled in this report can be implemented in various care settings, including community pharmacy, family physician, or a nurse practitioner's office, as well as in public health. From a public payer perspective, the value of investment takes into account not only the population health impact of decisions and their downstream effects on the health care system and society, but also the cost to government for any publicly funded program. Therefore, in order to show value to the public payer, the cost of implementation must be at the same or less cost than in other settings, and as effective or more effective than in the other settings. An important next step would

therefore be to consider the competitive environment of health care services delivery as it relates to cost and quality in order to assess the global value for money of expanded pharmacy services in Canada. With regard to vaccinations, another interesting analysis would be to model the health and economic impact of scaling pharmacist-administered vaccines against the herpes zoster virus, commonly known as shingles.

Next steps in this research involve a final report on the implications for policy, practice, and research. Some of these issues include funding considerations, the need to limit the possibility of services duplication in the health care system to ensure optimal cost savings, quality-of-care frameworks, and the need for more and better-quality research in the area of expanded pharmacy services, as well as the value, from a health and economic perspective, to all Canadians.

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APPENDIX A

Pharmacists' Key Competencies

The National Association of Pharmacy Regulatory Authorities' *Professional Competencies for Canadian Pharmacists at Entry to Practice* provides details on the competencies expected of pharmacists as they enter practice.

The competencies are:

1. **Ethical, legal, and professional responsibilities** Pharmacists practise within legal requirements, demonstrate professionalism, and uphold professional standards of practice, codes of ethics, and policies.
2. **Patient care** Pharmacists, in partnership with the patient and in collaboration with other health professionals, meet the patient's health and drug-related needs to achieve the patient's health goals.
3. **Product distribution** Pharmacists ensure accurate product distribution that is safe and appropriate for the patient.
4. **Practice setting** Pharmacists oversee the practice setting with the goal of ensuring safe, effective, and efficient patient care.
5. **Health promotion** Pharmacists use their expertise to advance the health and wellness of patients, communities, and populations.
6. **Knowledge and research application** Pharmacists access, retrieve, critically analyze, and apply relevant information to make evidence-informed decisions within their practice with the goal of ensuring safe and effective patient care.
7. **Communication and education** Pharmacists communicate effectively with patients, the pharmacy team, other health professionals, and the public, providing education when required.
8. **Intra- and Interprofessional Collaboration** Pharmacists work in collaboration with the pharmacy team and other health professionals to deliver comprehensive services, make best use of resources, and ensure continuity of care in order to achieve the patient's health goals.
9. **Quality and safety** Pharmacists collaborate in developing, implementing, and evaluating policies, procedures, and activities that promote quality and safety.

APPENDIX B

Findings of Evidence Review

+ denotes weak evidence
++ moderate evidence
+++ strong evidence

Clinical Effectiveness

Cardiovascular disease ++
Hypertension +++
HbA1c ++
LDL-cholesterol +
Asthma and COPD +
Tobacco cessation +
Vaccinations +
Medication review and management ++
Minor ailments and prescribing +

Efficiency Gains

Cardiovascular disease +
Hypertension +
Tobacco cessation +
Vaccinations +
Medication review and management +
Minor ailments and prescribing +

Source: The Conference Board of Canada, *A Review of Pharmacy Services in Canada and the Health and Economic Evidence.*

APPENDIX C

Technical Appendix

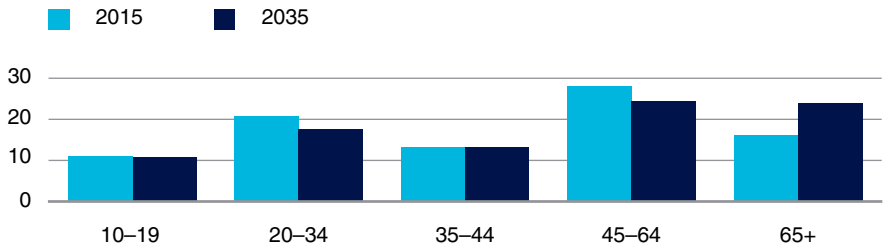
Population Model

The Canadian population will age significantly over the next two decades. By 2035, the share of Canada's population 65 years and over is expected to increase by more than 48 per cent, from 16.1 per cent in 2016 to 23.9 per cent of the overall population by 2035. (See Chart 1.) Considering that the majority of chronic conditions are most prevalent in this age cohort, an increase of disease prevalence and health system expenditures is expected.

Chart 1

Canadian Population, by Age Group

(percentage of total population)



Sources: Statistics Canada; The Conference Board of Canada.

Target Populations

The RxEACH study sought to evaluate the effectiveness of a community-based pharmacy intervention on reducing cardiovascular risk. In the current modelling study, the target population was limited to available

prevalence data from the Canadian Community Health Survey (CCHS) to allow for appropriate identification of the target population using cross-tabulations. For secondary prevention, individuals with chronic kidney disease (CKD), peripheral arterial disease (PAD), or some complications of CVD were therefore excluded. (See Table 1.)

Table 2
Eligibility Criteria of RxEACH Study and CBoC CVD-RD Model

	RxEACH study (18+)	CBoC CVD-RD model (18+)
Secondary prevention	Diabetes or chronic kidney disease (CKD)	CKD not included
	Established atherosclerotic vascular disease	Established atherosclerotic vascular disease
	Cerebrovascular disease: prior stroke or transient ischaemic attack	Cerebrovascular disease: history of prior stroke
	Cardiovascular disease: myocardial infarction, acute coronary syndrome, stable angina, or revascularization	Cardiovascular disease: history of heart disease
	Peripheral arterial disease (PAD): symptomatic and/or ankle brachial index < 0.9	PAD not included
Primary prevention	Multiple risk factors and Framingham Risk Score (FRS) > 20%	Multiple risk factors and Framingham Risk Score (FRS) > 20%
Both	All patients must have at least one uncontrolled risk factor: blood pressure, LDL-cholesterol, HbA1c, or current smoking	All patients must have at least one uncontrolled risk factor: blood pressure, LDL-cholesterol, HbA1c, or current smoking

Source: The Conference Board of Canada.

Data Sources—Prevalence of Chronic Conditions and Risk Factors

To determine the prevalence of conditions and risk factors, we used the following categories based on responses to the Canadian Community Health Survey (CCHS) and Canadian Health Measures Survey (CHMS).

Prevalence estimates for ischaemic heart disease (IHD) were derived from the CCHS question “Do you have heart disease?” and prevalence of cerebrovascular disease (CeVD) from the question “Do you suffer from the effects of a stroke?” Prevalence of lung cancer and chronic obstructive pulmonary disease (COPD) were obtained from the Statistics

Canada tables 103-0550 and 105-0501, respectively. Incidence rates for myocardial infarction (MI) and stroke hospitalizations (used to model secondary prevention in the cardiovascular disease and respiratory disease [CVD-RD] model) were derived from the Canadian Institute for Health Information (CIHI) Discharge Abstract Database 2014–15.[1] Incidence rates for pneumococcal hospitalizations were also derived from CIHI's Discharge Abstract Database 2014–15.[2]

Type 2 diabetes and hypertension prevalence estimates were derived from the CCHS questions "Do you have diabetes?" and "Do you have high blood pressure?" Smoking status was estimated using the question "At the present time, do you smoke cigarettes, daily, occasionally, or not at all?" Body mass index (BMI) was estimated using responses to the questions "How tall are you without shoes on?" and "How much do you weigh?" We used the BMI thresholds for overweight and obesity of BMI > 25 and < 30, and BMI ≥ 30, respectively. The prevalence of dyslipidemia, defined as having unhealthy blood concentrations of low-density lipoprotein cholesterol (LDL-C) of ≥ 3.5 mmol/L or a triglyceride (TC)/ high-density lipoprotein cholesterol (HDL-C) ratio ≥ 5.0, or self-reported use of a lipid-modifying medication, was derived from the CHMS.

For smokers, only the proportion of those who tried to quit in the past year but were unsuccessful, as captured in the CCHS, were included in the study. The prevalence of uncontrolled risk factors for blood pressure, diabetes, and dyslipidemia was drawn from the literature. The rate of uncontrolled blood pressure (defined as blood pressure ≥ 140/90 mm Hg) for Canadians with hypertension was derived from a study by Padwal and others.[3] The rate of uncontrolled diabetes, defined as A1C blood sugar levels ≤ 7 per cent, was derived from a study published by the Canadian Diabetes Association.[4] The prevalence of uncontrolled dyslipidemia, defined as individuals with a high 10-year risk of a cardiovascular event and not reaching LDL-C targets (≤ 2.0 mmol/L), was obtained from a study by Aref-Eshghi and others.[5]

1 Canadian Institute for Health Information, *National Physician Database*.
2 Ibid.
3 Padwal and others, "Epidemiology of Hypertension in Canada."
4 Canadian Diabetes Association and University of Western Ontario, *Diabetes in Canada Evaluation,* 3.
5 Aref-Eshghi and others, "Low Density Lipoprotein Cholesterol Control Status."

The prevalence of Canadians aged 65 and older who have not received the pneumococcal vaccination was published by the Public Health Agency of Canada.[6]

Data Sources—Relative Risk of Chronic Conditions

The reference studies and relative risk estimates used in this report are summarized in Table 2.

Table 2
Summary of Reference Studies

Reference	Study design	Risk factor(s)	Condition (outcome)
Bond, Stonebridge, and Thériault, *The Canadian Heart Health Strategy*	Individual study (modelling)	Hypertension status is defined as high blood pressure (> 120 mm Hg systolic or > 80 mm Hg diastolic) compared with no hypertension.	Stroke (ischaemic or hemorrhagic) risk: risk of stroke according to hypertension status estimated based on expert opinion and a review of the literature
Forey, Thornton, and Lee, "Systematic Review"	Systematic review (meta-analysis)	Smoking status is defined as "ever smoker," "current smoker," or "ex-smoker" compared with "never smoker" or dose-related indexes (amount smoked, duration of smoking, or duration of quitting).	Chronic obstructive pulmonary disorder risk: based on the International Classification of Disease (ICD) codes, lung function criteria, a combination of lung function criteria and symptoms, or on combinations of diagnosed conditions such as chronic bronchitis, emphysema, or asthma
Gandini and others, "Tobacco Smoking and Cancer"	Systematic review (meta-analysis)	(Tobacco) smoking status is defined as "former smoker" and "current smoker," compared with "never smoker."	Lung cancer risk
Guh and others, "The Incidence of Co-Morbidities"	Systematic review (meta-analysis)	Overweight status is defined as having a body mass index (BMI) ≥ 25 kg/m^2 and below 30 kg/m^2 compared with a BMI < 25 kg/m^2. Obesity status is defined as having a BMI ≥ 30 kg/m2 compared with BMI < 30 kg/m^2. Or, abdominally overweight or obesity status is defined as a waist circumference ≥ 80 cm and 88 cm, respectively, for females, and ≥ 94 cm and 102 cm, respectively, for males.	Coronary artery disease risk
Mainous and others, "A Coronary Heart Disease Risk Score"	Individual study (cohort)	Previous diagnosis of hypertension status is defined as a blood pressure measurement at the time of assessment or self-reported hypertension based on whether a doctor has ever told the individual that he/she has high blood pressure or hypertension.	Coronary heart disease (CHD) risk, defined as myocardial infarction, fatal CHD, or cardiac procedure
Shinton and Beevers, "Meta-Analysis of Relation Between Cigarette and Stroke"	Systematic review (meta-analysis)	Cigarette smoking status is defined as a cigarette smoker compared with non-smokers. Cigarette smokers are defined as those currently smoking only cigarettes. Non-smokers are those who had never smoked. Ex-smokers were investigated separately.	Stroke (cerebral thrombosis, cerebral embolism, cerebral hemorrhage) risk

(continued …)

6 Public Health Agency of Canada, *Vaccine Coverage Amongst Adult Canadians*.

Table 2 (cont'd)

Summary of Reference Studies

Reference	Study design	Risk factor(s)	Condition (outcome)
Stratton and others, "Association of Glycaemia"	Individual study (cohort)	Type 2 diabetes status is defined as a glycemic (HbA1c) level ≥ 9% (uncontrolled) compared with HbA1c (< 9%) (controlled).	Stroke (fatal or non-fatal) and myocardial infarction (fatal or non-fatal) risk
Strazzullo and others, "Excess Body Weight"	Systematic review (meta-analysis)	Overweight and obesity status is defined as being overweight or obese compared with normal weight. Overweight, obesity, and normal weight are not further defined.	Stroke (total, ischaemic, hemorrhagic) (fatal or non-fatal) risk
Tirschwell and others, "Association of Cholesterol With Stroke Risk"	Individual study (case-control)	LDL-C levels are categorized based on quintiles, and the lowest and highest quintiles were compared.	Ischaemic stroke (fatal or non-fatal) risk
Mainous and others, "A Coronary Heart Disease Risk Score"	Individual study (cohort)	Previous diagnosis of hypercholesterolemia status is defined as laboratory assessment of lipids at the time of assessment or self-reported hypercholesterolemia based on whether a doctor has ever told the individual that he/she has high cholesterol.	Coronary heart disease (CHD) risk, defined as myocardial infarction, fatal CHD, or cardiac procedure
Secondary prevention of myocardial infarction			
Saito and others, "Risk Factors Indicating Recurrent Myocardial Infarction"	Individual study (cohort)	Dyslipidemia was diagnosed when any of the laboratory-documented serum lipid concentrations on admission met the following criteria: TC ≥ 220mg/dl, LDL-C ≥ 140mg/dl, triglyceride ≥ 150mg/dl, or HDL-C ≤ 35mg/dl.	Recurrent myocardial infarction after recovery from acute myocardial infarction
Kaplan and others, "Predictors of Subsequent Coronary Events"	Individual study (cohort)	Diabetes is defined as drug-treated diabetes mellitus.	Recurrent myocardial infarction or fatal coronary heart disease (CHD)
Serrano and others, "Smoking Cessation"	Individual study (case-control)	Smoking status included non-smokers before and after the first infarction, ceased smoking after the first infarction, and continued smoking after first infarction	Recurrent myocardial infarction
Fresco and others, "Prognostic Value of a History of Hypertension."	Individual study (retrospective cohort)	Hypertension was classified as present if a patient was receiving antihypertensive therapy at the time of the myocardial infarction	Recurrent myocardial infarction

Source: The Conference Board of Canada, 2017.

What Is an "Additive Model"?

The additive model used in this report is as described by Checkoway, Pearce, and Kriebel in *Research Methods in Occupational Epidemiology*.[7] It implies that, in the prevalence of several concurring risk factors, the relative risk is assumed to be:

$$R = \left(\sum_{i=0}^{n} R_i \right) - (n - 1)$$

where *n* is the total number of concurrent risk factors.

The additive model assumes that when an individual has two or more risk factors, his or her increased risk (beyond the base risk) of developing a chronic condition is the sum of the increased risks of each of the risk factors he or she has. For example, if smoking raises the chance of developing cancer by 10 percentage points and lack of physical activity by 5 percentage points, then the additive model assumes that a person who both smokes and is physically inactive will have a 15-percentage-point increased risk of developing cancer.

Data Sources—Estimating the Case Fatality Rate

Data on number of deaths for each condition were obtained from the World Health Organization's Mortality Database.[8] The mortality rate is calculated as the number of deaths in 2013 (the most recent year for which data were available) divided by the number of cases in 2013 for each condition. (See Table 3.)

7 Checkoway, Pearce, and Kriebel, *Research Methods in Occupational Epidemiology*.

8 World Health Organization, *WHO Mortality Database*.

Table 3
Case Fatality Rate, by Condition

		Males	Females
Condition	**Age group**	**(per cent)**	
IHD	12–19	0.02	0.01
	20–34	0.14	0.03
	35–44	0.91	0.12
	45–64	1.16	0.55
	65+	2.82	3.10
CeVD	12–19	0.01	0.00
	20–34	0.12	0.04
	35–44	0.63	0.52
	45–64	1.50	0.95
	65+	3.99	5.54
COPD	12–19	0.00	0.00
	20–34	0.00	0.00
	35–44	0.03	0.02
	45–64	0.33	0.21
	65+	2.67	2.28
Lung cancer	12–19	0.00	0.00
	20–34	10.19	5.77
	35–44	14.69	7.20
	45–64	44.17	33.72
	65+	51.69	52.68
MI	12–19	0.00	0.00
	20–34	2.17	1.10
	35–44	15.59	7.79
	45–64	14.65	7.56
	65+	28.48	49.92
Stroke	12–19	0.00	0.00
	20–34	5.28	4.88
	35–44	20.77	18.93
	45–64	19.49	15.93
	65+	40.82	75.86

Source: The Conference Board of Canada.

APPENDIX D

Pharmacist Interview Guide

1. What OTC and prescription medications were most recommended/prescribed for smoking cessation, and in what combination?
2. Were switches for smoking cessation medications made and why?
3. In general, what proportion of patients were started on a new smoking cessation prescription drug vs. OTC nicotine replacement therapy vs. only receiving smoking cessation education?
4. In general, what proportion of patients were started on a new prescription drug to control one or more CVD risk factors (diabetes, hypertension, dyslipidemia)?
5. What proportion of pharmacists involved in the study have additional prescribing authorization?
6. What proportion of patients would have been eligible for government reimbursement for the advanced medication review?
7. Can you please share your perception of the acceptability of the intervention?
8. Can you please share your perception of the scalability of the intervention?
9. Are there any challenges with the intervention in terms of uptake, effectiveness, and cost-effectiveness that you can identify?

APPENDIX E

Detailed Results From Modelling

Tables 4 and 5 detail the share of direct costs between hospitals, physicians, and drug costs, while tables 6 to 8 show overall results of prevalence rates by condition (all interventions).

Table 4
Direct Costs, All Interventions, 2035

	Hospital	Physician	Drugs	Total
CeVD	462.5	187.2	43.2	693
IHD	385.6	152.3	91.1	629
Lung cancer	68.7	9.3	6.0	84
COPD	54.1	11.0	20.9	86
Hospitalized pneumonia	71.2	12.5	5.3	89

Source: The Conference Board of Canada.

Table 5
Direct Costs, by Intervention, 2035

	Smoking cessation				Advanced med. review and mgmt.				Pneumococcal vaccination			
	Hospital	Physician	Drugs	Total	Hospital	Physician	Drugs	Total	Hospital	Physician	Drugs	Total
CeVD	17.3	7.0	1.6	25.9	445.2	180.2	41.6	667.1	–	–	–	–
IHD	35.5	14.0	8.4	58.0	350.3	138.4	82.8	571.5	–	–	–	–
Lung cancer	69.0	9.3	6.1	84.4	–	–	–	–	–	–	–	–
COPD	54.1	20.9	20.9	95.9	–	–	–	–	–	–	–	–
Hospitalized pneumonia	–	–	–	–	–	–	–	–	71.2	12.5	5.3	89.0

Source: The Conference Board of Canada.

Table 6

Prevalence Rate, by Condition and Participation Level, Combined Smoking Cessation and Advanced Medication Review and Management for CVD Interventions

(per cent)

	Base case		100% participation/ 1.6% uptake		75% participation/ 1.2% uptake		50% participation/ 0.8% uptake		25% participation/ 0.4% uptake		10% participation	
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	1.016	1.245	1.015	1.136	1.015	1.163	1.015	1.191	1.015	1.218	1.015	1.234
Stroke	0.063	0.082	0.063	0.078	0.063	0.079	0.063	0.080	0.063	0.081	0.063	0.082
IHD	4.478	5.540	4.475	5.226	4.475	5.305	4.475	5.383	4.475	5.461	4.475	5.509
MI	0.093	0.116	0.093	0.104	0.093	0.107	0.093	0.110	0.093	0.113	0.093	0.114
Lung cancer	0.130	0.166	0.130	0.156	0.130	0.159	0.130	0.161	0.130	0.164	0.130	0.165
COPD	2.528	2.964	2.528	2.905	2.528	2.919	2.528	2.934	2.528	2.949	2.528	2.958
Hospitalized pneumonia	0.991	0.994	0.989	0.952	0.989	0.962	0.990	0.972	0.991	0.982	n.a.	n.a.

Source: The Conference Board of Canada.

Table 7

Prevalence Rate, by Condition and Participation Level, Smoking Cessation Intervention

(per cent)

	Base case		100% participation/ 1.6% uptake		75% participation/ 1.2% uptake		50% participation/ 0.8% uptake		25% participation/ 0.4% uptake		10% participation	
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	1.016	1.245	1.016	1.244	1.016	1.244	1.016	1.245	1.016	1.245	1.016	1.245
Stroke	0.063	0.082	0.063	0.082	0.063	0.082	0.063	0.082	0.063	0.082	0.063	0.082
IHD	4.478	5.540	4.478	5.534	4.478	5.535	4.478	5.537	4.478	5.538	4.478	5.539
MI	0.093	0.116	0.093	0.115	0.093	0.115	0.093	0.115	0.093	0.115	0.093	0.116
Lung cancer	0.130	0.166	0.130	0.164	0.130	0.165	0.130	0.165	0.130	0.166	0.130	0.166
COPD	2.528	2.964	2.528	2.951	2.528	2.954	2.528	2.957	2.528	2.960	2.528	2.962
Hospitalized pneumonia	0.991	0.994	0.989	0.952	0.989	0.962	0.990	0.972	0.991	0.982	n.a.	n.a.

Source: The Conference Board of Canada.

Table 8

Prevalence Rate, by Condition and Participation Level, Advanced Medication Review and Management for CVD Intervention

(per cent)

	Base case		100% participation/ 1.6% uptake		75% participation/ 1.2% uptake		50% participation/ 0.8% uptake		25% participation/ 0.4% uptake		10% participation	
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	1.016	1.245	1.016	1.212	1.016	1.220	1.016	1.229	1.016	1.237	1.016	1.242
Stroke	0.063	0.082	0.063	0.081	0.063	0.081	0.063	0.082	0.063	0.082	0.063	0.082

(continued …)

Table 8 (cont'd)

Prevalence Rate, by Condition and Participation Level, Advanced Medication Review and Management for CVD Intervention

(per cent)

	Base case		100% participation/ 1.6% uptake		75% participation/ 1.2% uptake		50% participation/ 0.8% uptake		25% participation/ 0.4% uptake		10% participation	
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
IHD	4.478	5.540	4.478	5.451	4.478	5.473	4.478	5.495	4.478	5.518	4.478	5.531
MI	0.093	0.116	0.093	0.113	0.093	0.114	0.093	0.114	0.093	0.115	0.093	0.115
Lung cancer	0.130	0.166	0.130	0.166	0.130	0.166	0.130	0.166	0.130	0.166	0.130	0.166
COPD	2.528	2.964	2.528	2.964	2.528	2.964	2.528	2.964	2.528	2.964	2.528	2.964
Hospitalized pneumonia	0.991	0.994	0.989	0.952	0.989	0.962	0.990	0.972	0.991	0.982	n.a.	n.a.

Source: The Conference Board of Canada.

Combined Intervention—Smoking Cessation and Advanced Medication Review and Management for CVD

Implementing both the smoking cessation and the advanced medication review and management interventions can lead to significant cases averted, lives saved, and both direct and indirect cost savings. (See Table 9.) The combined interventions can avert up to 3.1 million cases of disease, save up to 170,613 lives, and lead to $21.8 billion in direct health care cost savings and $3.1 billion in indirect cost savings.

Table 9

Prevalence and Cases Averted From Combined Interventions

(number of cases)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
	Number of cases		Cases averted									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	367,467	534,683	46,854	689,525	35,141	517,255	23,427	344,986	11,714	172,717	4,685	69,356
Stroke	22,766	35,333	1,824	26,437	1,368	19,832	912	13,227	456	6,621	182	2,658
IHD	1,620,028	2,378,930	134,805	1,976,398	101,103	1,482,614	67,402	988,830	33,701	495,046	13,480	198,776
MI	33,631	49,628	5,170	74,772	3,877	56,090	2,585	37,408	1,292	18,726	517	7,517
Lung cancer	46,947	71,404	4,334	60,930	3,251	45,705	2,167	30,480	1,084	15,255	433	6,121
COPD	914,642	1,272,674	25,443	367,258	19,082	275,494	12,721	183,729	6,361	91,964	2,544	36,905
Total	**3,005,480**	**4,342,652**	**218,429**	**3,195,319**	**163,822**	**2,396,990**	**109,215**	**1,598,660**	**54,607**	**800,331**	**21,843**	**321,333**

Source: The Conference Board of Canada.

There were 3 million cases of cardiovascular and respiratory conditions examined in 2016, and this number is forecast to increase to 4.3 million cases by 2035 under the base-case scenario. (See Table 10.) Implementing both the smoking cessation and the advanced medication review interventions could avert up to 218,429 cases in 2035, and up to 3.1 million cases with full target-population reach over the forecast period. The highest number of cases averted would be for ischaemic heart disease, with 13,480 to 134,805 cases averted in 2035 and 198,776 to 1.9 million cases averted over the forecast period.

Table 10
Lives Saved From Combined Interventions

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
	Number of deaths		Number of lives saved									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	12,020	19,319	1,914	27,831	1,435	20,878	957	13,924	478	6,971	191	2,799
Stroke	13,379	21,777	950	13,713	713	10,287	475	6,861	238	3,434	95	1,379
IHD	34,292	55,304	3,579	51,882	2,684	38,919	1,789	25,957	895	12,995	358	5,217
MI	14,426	23,030	1,609	23,083	1,207	17,315	805	11,548	402	5,781	161	2,321
Lung cancer	22,139	34,720	2,150	30,053	1,612	22,544	1,075	15,034	537	7,525	215	3,019
COPD	12,198	20,324	445	6,134	334	4,601	223	3,068	111	1,536	45	616
Total	**108,453**	**174,475**	**10,647**	**152,695**	**7,985**	**114,544**	**5,324**	**76,392**	**2,662**	**38,241**	**1,065**	**15,351**

Source: The Conference Board of Canada.

As with the number of cases, ischaemic heart disease was responsible for the highest number of deaths, at 34,292 in 2016, which is forecast to increase to 55,304 by 2035 under the base-case scenario. The combined interventions could save between 17,152 lives under 10 per cent patient participation and 170,613 lives under 100 per cent patient participation. Ischaemic heart disease and myocardial infarction combined would account for almost half the lives saved, while the interventions could reduce deaths due to lung cancer by 3,019 to 30,053 over the forecast period, depending on patient participation.

The conditions examined in this report accounted for almost $13 billion in direct health care costs in 2016, which is forecast to increase to $28 billion by 2035 under the base-case scenario. IHD would account

for $11.1 billion in 2035, followed by cerebrovascular disease at $7.9 billion, COPD at $4.3 billion, and hospitalized stroke at almost $2 billion. Lung cancer and myocardial infarction are forecast to account for almost $1.4 billion each by 2035. The combined interventions could lead to cost savings of up to $693 million for cerebrovascular disease and $629 million for ischaemic heart disease in 2035. This is followed by more modest cost savings of $144 million for myocardial infarction, $102 million for hospitalized stroke, $86 million for COPD, and $84 million for lung cancer. (See Table 11.)

Table 11

Direct Cost Savings From Combined Interventions

(C$ millions)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
	Total cost		Cost savings									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	3,674	7,908	693	8,745	520	6,560	347	4,375	173	2,190	69	878
Stroke	864	1,983	102	1,275	77	956	51	638	26	319	10	128
IHD	5,114	11,109	629	7,917	472	5,939	315	3,960	157	1,982	63	795
MI	635	1,386	144	1,794	108	1,346	72	898	36	449	14	180
Lung cancer	618	1,390	84	1,023	63	767	42	512	21	256	8	103
COPD	2,091	4,303	86	1,068	65	801	43	534	22	267	9	107
Total	**12,996**	**28,081**	**1,740**	**21,821**	**1,305**	**16,368**	**870**	**10,916**	**435**	**5,463**	**174**	**2,192**

Source: The Conference Board of Canada.

Over the forecast period, cumulative cost savings are forecast between $2.1 billion under the 10 per cent patient participation scenario to $21.8 billion under the 100 per cent patient participation scenario. The cumulative savings would be $8.7 billion for cerebrovascular disease and $7.9 billion for ischaemic heart disease, which is consistent with the highest number of cases averted being from these two conditions.

Indirect costs accounted for $4.5 billion in 2016, and this is forecast to increase to $5.5 billion by 2035. IHD and lung cancer were the largest contributors to indirect cost at approximately $1.7 billion each in 2035 under the base case. This is due to the higher mortality rate of IHD and lung cancer. MI ($511 million), cerebrovascular disease ($540 million),

and hospitalized stroke ($476 million) followed in 2035 under the base case. (See Table 12.)

Table 12
Indirect Cost Savings From Combined Interventions
(C$ millions)

	Base case		100% participation		75% participation		50% participation		25% participation		10% participation	
	Total cost		Cost savings									
Condition	**2016**	**2035**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**	**2035**	**2016–35**
CeVD	440	540	21	329	16	246	10	164	5	82	2	33
Stroke	299	369	6	94	4	70	3	47	1	24	1	9
IHD	1,416	1,713	47	742	35	556	24	371	12	186	5	75
MI	423	511	22	347	17	260	11	173	6	87	2	35
Lung cancer	1,405	1,707	97	1,454	73	1,091	49	728	24	364	10	146
COPD	274	333	7	110	6	83	4	55	2	28	1	11
Total	**4,579**	**5,562**	**201**	**3,075**	**150**	**2,307**	**100**	**1,539**	**50**	**770**	**20**	**309**

Sources: Statistics Canada; The Conference Board of Canada.

The total indirect cost savings from the combined interventions in Canada is dependent on the level of patient participation. If 100 per cent of patients participate in each intervention, the cumulative indirect cost savings would be $3.1 billion over the forecast period. Meanwhile, if only 10 per cent of patients participate in the intervention, the cost savings would be significantly lower, at $309 million over the forecast period.

Prevalence Rates

Ischaemic Heart Disease

The most important risk factors for ischaemic heart disease are smoking, hypertension, type 2 diabetes, and hyperlipidemia. In 2015, 5.7 per cent of males had ischaemic heart disease, compared with 4.1 per cent of females. Females are less likely to have the disease risk factors, which, combined with a significantly lower base risk for developing heart disease, means females have a lower prevalence rate of heart disease across all age groups. (See Chart 2.)

Chronic obstructive pulmonary disease is more common in females.

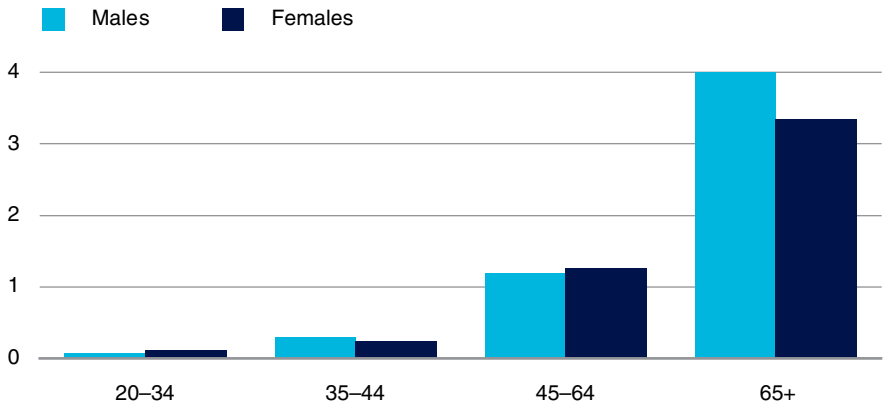
Cerebrovascular Disease

Cerebrovascular disease shares many of the same risk factors as heart disease, including hypertension, hyperlipidemia, smoking, and type 2 diabetes. Also similar to heart disease, cerebrovascular disease is most prevalent among males aged 65 years or older. However, this disease is far less prevalent than ischaemic heart disease. In 2015, about 1 per cent of the Canadian population was affected by this condition. The prevalence rate was highest in the 65-and-older age cohort, where 4.0 per cent of males and 3.3 per cent of females were affected by the disease. (See Chart 3.)

Chart 3

Cerebrovascular Disease Prevalence Rate, 2015

(per cent)



Source: The Conference Board of Canada.

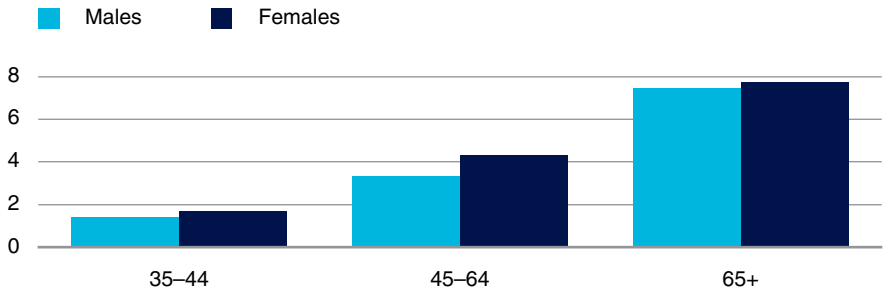
Chronic Obstructive Pulmonary Disease

Smoking is the main risk factor for chronic obstructive pulmonary disease (COPD). The disease is more common in females and in the older age groups. In 2015, 7.4 per cent of males and 7.7 per cent of females aged 65 years and older suffered from COPD. (See Chart 4.)

Chart 4

COPD Prevalence Rate, 2015

COPD Prevalence Rate, 2015



Source: The Conference Board of Canada.

Lung Cancer

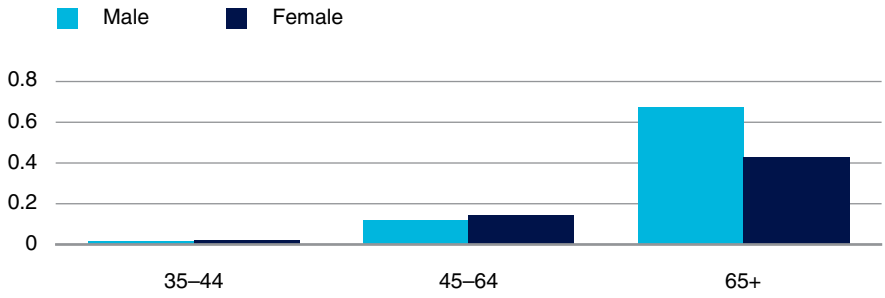
Tobacco smoking is the most important risk factor for lung cancer and is estimated to be responsible for the majority of lung cancer cases in Canada. However, despite the reduction in smoking that has occurred over the past decades, the prevalence of lung cancer is forecast to increase over the next 20 years.

As with the other diseases forecast in this report, the prevalence rate of lung cancer increases with age. (See Chart 5.) The majority of Canadians living with lung cancer are over 65 years old. Among the younger age groups, females are more likely to have lung cancer than males, but males are more likely to have lung cancer than females in the 65-and-over age group. As a result, the aging of the population means the prevalence rate of lung cancer among males is forecast to exceed that of females.

Chart 5

Lung Cancer Prevalence Rate, 2015

(per cent)



Source: The Conference Board of Canada.

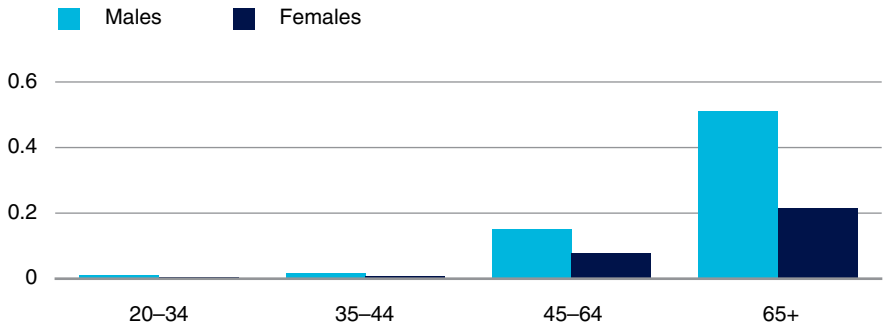
Myocardial Infarction

The most important risk factors for myocardial infarction (MI) are smoking, hyperlipidemia, type 2 diabetes, and hypertension. As with the broader category, ischaemic heart disease, MI is more prevalent among males and the older age groups. In the over-65 age group, 0.2 per cent of females suffered from MI in 2015, compared with 0.5 per cent of males. (See Chart 6.)

Chart 6

Myocardial Infarction Prevalence Rate, 2015

(per cent)



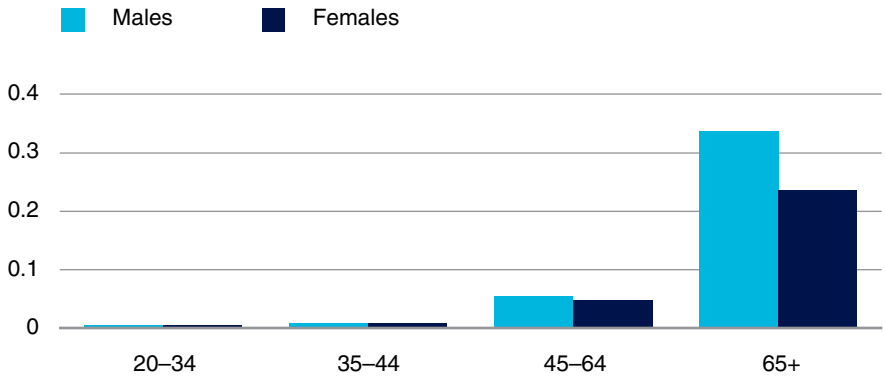
Source: The Conference Board of Canada.

Stroke

Stroke and cerebrovascular disease are defined as the same condition (ICD-10 codes I60–I69), but stroke is used in this section to differentiate between the primary and secondary prevention of the condition. The number of hospitalized cases is used to determine the incidence rate of stroke.

Similar to CeVD, the most important risk factors for stroke are hypertension, hyperlipidemia, smoking, and type 2 diabetes. Also similar, the incidence is higher among males and among the older age groups. The majority of new stroke cases occur in those aged 65 and over. In 2015, 0.2 per cent of females and 0.3 per cent of males over 65 years old were hospitalized for a stroke event. Conversely, the incidence rate is extremely small in the 20–34 and 35–44 age groups. (See Chart 7.)

Chart 7
Incidence Rate of Stroke, 2015
(per cent)



Source: The Conference Board of Canada.

Hospitalized Pneumonia

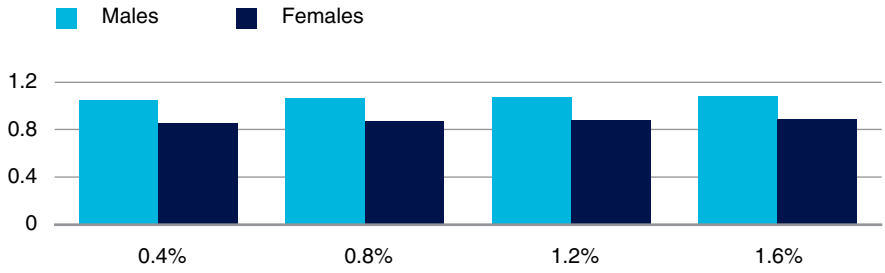
The only risk factor examined for pneumonia was pneumococcal vaccination for seniors aged 65 years and older. The prevalence rate for hospitalized pneumonia for the base-case scenario is assumed to stay constant throughout the forecast period at 1.09 per cent for males and 0.9 per cent for females.

A sensitivity analysis around pneumococcal vaccination uptake rates shows there would be marginal differences in the prevalence rate of hospitalized pneumonia between the different participation scenarios in 2035. Four scenarios were modelled: declines of 0.4, 0.8, 1.2, and 1.6 per cent during any given year in the unvaccinated population. Unsurprisingly, the largest decline in the prevalence rate of hospitalized pneumonia occurs with the largest decrease in the unvaccinated population. Under the 1.6 per cent scenario, the prevalence rate of pneumonia decreases to 1.08 per cent among males and 0.88 per cent among females. (See Chart 8.)

Chart 8

Prevalence Rate of Hospitalized Pneumonia, 2035

(per cent)



Source: The Conference Board of Canada.

APPENDIX F

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