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Report January 2010

The Canadian Heart Health Strategy
Risk Factors and Future Cost Implications

HEALTH, HEALTH CARE AND WELLNESS

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The Canadian Heart Health Strategy: Risk Factors and Future Cost Implications
by *Louis Thériault, Carole Stonebridge,* and *Sabrina Browarski*

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Preface

The report of the Canadian Heart Health Strategy and Action Plan (CHHS-AP), *Building a Heart Healthy Canada*, released in 2009, seeks to reduce the growing disease and cost burdens due to cardiovascular diseases (CVDs) in Canada. Preventing, detecting, and managing risk factors associated with CVDs is a key area of focus within the strategy document. The Conference Board was contracted to investigate the potential impact on future national health expenditures if the CHHS-AP targets of reduction in risk factors are achieved. Achieving the risk factor targets will lead to a substantial reduction in CVD-related illnesses and cost savings for the health system, governments, and the Canadian economy. The analysis suggests a reduction in 2020 of about 450,000 cases of ischaemic heart disease and close to 150,000 cases of cerebrovascular diseases. The cumulative cost savings total $76.4 billion from 2005 to 2020, or about $5 billion per year. If the forecast was extended beyond 2020, significantly larger savings would be achieved.

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Acknowledgements

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The authors alone are responsible for the methodology, scope, and findings in this report, including any errors and omissions.

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EXECUTIVE SUMMARY

The Canadian Heart Health Strategy
Risk Factors and Future Cost Implications

At a Glance

- There is a significant relationship between modifiable risk factors contributing to cardiovascular diseases (CVDs) and future health-care expenditures.
- The Canadian Heart Health Strategy and Action Plan (CHHS-AP) asked The Conference Board of Canada to complete a national-level forecast of the direct and indirect costs of CVDs in Canada.
- Achieving the risk factor prevalence targets of the CHHS-AP will lead to substantial cost savings for the health system, governments, and the Canadian economy.

There is a significant relationship between modifiable risk factors contributing to cardiovascular diseases (CVDs) and future health-care expenditures. Recognizing the importance of understanding this dynamic, the Canadian Heart Health Strategy and Action Plan (CHHS-AP) Steering Committee decided to investigate the potential impact on future national health expenditures if the CHHS-AP targets of reduction in risk factors are achieved. As a result, the CHHS-AP requested The Conference Board of Canada to complete a national-level forecast of the direct and indirect costs of CVDs in Canada. The cost forecast period extends to 2020 and includes hypertension, ischaemic heart disease, and cerebrovascular diseases.

Based on the CHHS-AP target for five risk factors, and using relative risk ratios from expert opinion and an extensive literature review, the incidence of CVD was calculated in order to estimate prevalence rates. The risk factors were forecast by age and sex to 2020 based on past trends, available research, and consultation with experts. The specific CHHS-AP risk factor targets included in this analysis are as follows:

By 2020:

- Decrease the prevalence of hypertension in adult Canadians aged 18–74 years by 32 per cent (from 22 per cent in 1992 to 15 per cent).
- Work with others to reduce the overall smoking rate by 25 per cent.

By 2015, achieve the following targets by working with others who have set these targets:

- Increase the proportion of Canadian children and adults eating at least five servings of fruit and vegetables per day by 20 per cent.
- Increase the proportion of Canadian children and adults who are physically active by 20 per cent.
- Decrease the rate of Canadian adults who are overweight/obese by 20 per cent.[1]

1 Canadian Heart Health Strategy and Action Plan, *Building a Heart Healthy Canada*, p. 3.

To measure the cost savings from achieving the CHHS-AP targets, it was assumed that if no intervention occurred, approximately half of the CHHS-AP targets would be achieved by 2015 or 2020. The cost projections from this scenario (called the base-case scenario) were compared with the cost projections from a scenario (called the CHHS-AP scenario) including the achievement of the full CHHS-AP targets, in order to measure the cost savings from the Action Plan.

The analysis is anchored on a detailed population forecast for Canada. Capturing the aging of the Canadian population is crucial for any model of health-care expenditure, because changes in the demographic mix of the population are an important determinant of the disease burden placed upon the health-care system. Historical national prevalence data by age and sex for CVDs and CVD risk factors are based on Statistics Canada's Canadian Community Health Survey (CCHS). This cross-sectional survey "collects information related to health status, health care utilization and health determinants for the Canadian population."[2] The survey covers Canadians aged 12 and over. Certain individuals, such as those on Indian reserves and Crown lands, are excluded from the sampling frame.

Despite the lower overall prevalence rate of ischaemic heart disease in 2020 relative to 2005, the much larger prevalence of the disease in the older population cohorts contributes to the increasing number of cases of ischaemic heart disease. The impact of CHHS-AP targets on ischaemic heart disease is significant. By 2020, the lower prevalence rate in risk factors contributes to a reduction of 452,000 cases of ischaemic heart disease.

The reduction in cerebrovascular diseases is relatively more significant considering that prevalence is about 25 per cent of ischaemic heart disease and that the reduction in cases of about 150,000 is approximately one-third of the reduction seen in ischaemic heart disease. The large relative risk of developing the disease associated with lack of physical activity, hypertension, and obesity explains the important impact of these risk factors on the reduction of the prevalence rate of cerebrovascular diseases.

In 2005, total CVD costs were estimated at $20.9 billion (constant 2008 dollars), with the largest proportion of costs attributable to mortality costs at 43 per cent. Hospital (14 per cent), drug (12 per cent), and long-term disability (12 per cent) costs were the next largest cost categories. In 2020, total costs are expected to reach $28.3 billion, with the share of mortality costs increasing to 49 per cent.

The expected stream of income lost as a result of mortality at a relatively young age, and the value of lost productivity at the peak of the average income an individual is expected to earn, explain the growing importance of this indirect cost category.

Achieving the risk factor prevalence targets of the CHHS-AP will lead to substantial cost savings for the health system, governments, and the Canadian economy. The cumulative cost savings from CHHS-AP risk factor targets total $76.4 billion from 2005 to 2020, or about $5 billion per year. The impact increases over time, given the growing gap between the base case and CHHS-AP scenario prevalence figures and the higher value of indirect costs per CVD case.

It is important to underscore that the cost reduction from reduced risk factor prevalences increases dramatically over time compared with a scenario where only about half the improvement takes place. The cost savings between the two scenarios is under $2 billion per year in the first few years of the forecast period but increases to about $10 billion per year by 2020. The growing level of total savings indicates that reaching the CHHS-AP targets would lead to significantly larger savings if the forecast was extended beyond 2020. Finally, these projected cost savings result from addressing only five risk factors for CVDs. The CHHS-AP addresses other risk factors that could result in even greater cost reductions.

2 Statistics Canada, Canadian Community Health Survey, Description.

CHAPTER 1

Introduction

Chapter Summary

- Cardiovascular and cerebrovascular diseases (CVDs) are the leading cause of mortality in Canada. The economic costs associated with heart disease and stroke are significant and growing, and the need to address the human and financial costs of CVDs is imperative.
- In January 2009, the Canadian Heart Health Strategy and Action Plan (CHHS-AP) asked The Conference Board of Canada to complete a national-level forecast of the direct and indirect costs of CVDs in Canada. The forecast period extends to 2020.
- The project scope was limited to a selection of the CHHS-AP targets.
- This report summarizes the approach and methodology used and presents the final results from the work.

BACKGROUND

Cardiovascular and cerebrovascular diseases (CVDs) are the leading cause of mortality in Canada. The economic costs associated with heart disease and stroke—both health-care and lost productivity—are significant and growing. The need to address the human and financial costs of CVDs is imperative.

In the fall of 2006, with funding from the federal government, work began toward developing a heart health strategy for Canada. The Canadian Heart Health Strategy and Action Plan (CHHS-AP)—*Building a Heart Healthy Canada,* released in February 2009—was created to decrease the growing burden of cardiovascular diseases in Canada. And since "nine out of ten Canadians over age 20 have at least one risk factor for CV diseases, one-third has three or more factors—and the risks increase as we age,"[1] preventing, detecting, and managing major risk factors is a key area of focus within the CHHS-AP. The major risk factors associated with CVDs, such as smoking, obesity, diabetes, hypertension, abnormal cholesterol, poor eating habits, and a lack of physical activity, have the potential to be modified through prevention efforts and programs. Anti-smoking campaigns and taxation, for example, have been recognized as playing a role in the downward trend in the prevalence of smoking in Canada.

1 Canadian Heart Health Strategy and Action Plan, *Building a Heart Healthy Canada*, p. 1.

Governments are increasingly interested in setting goals and targets around the major risk factors in an effort to reduce the overall burden of CVDs among Canadians. The CHHS-AP provides guidance for these efforts. The CHHS-AP Steering Committee has worked with a wide range of stakeholders on the development of the strategy and has agreed to several recommendations around CVD risk factor targets.

Governments are also very interested in understanding the relationship between the targets and future health-care expenditures. The CHHS-AP Steering Committee recognized this interest and decided to investigate the potential impact on future national health expenditures if the CHHS-AP targets of reduction in risk factors are achieved.

OVERVIEW OF PROJECT

In January 2009, the CHHS-AP requested The Conference Board of Canada to complete a national-level forecast of the direct and indirect costs of CVDs in Canada. The forecast period extends to 2020. The Board has completed this project using techniques developed for a physician-demand forecasting tool created for the Ontario Ministry of Health and Long-Term Care and the Ontario Medical Association. This report summarizes the approach and methodology used and presents the final results from the work.

It is important to note that the project scope was limited to a selection of the CHHS-AP targets, including the following:

By 2020:

- Decrease the prevalence of hypertension in adult Canadians aged 18–74 years by 32 per cent (from 22 per cent in 1992 to 15 per cent).
- Work with others to reduce the overall smoking rate by 25 per cent.

By 2015, achieve the following targets by working with others who have set these targets:

- Increase the proportion of Canadian children and adults eating at least five servings of fruit and vegetables per day by 20 per cent.
- Increase the proportion of Canadian children and adults who are physically active by 20 per cent.
- Decrease the rate of Canadian adults who are overweight/obese by 20 per cent.[2]

There are a wide range of other targets in the CHHS-AP, but they have not been modelled in this project and are not included in the health-care expenditure estimates we provide.

2 Canadian Heart Health Strategy and Action Plan, *Building a Heart Healthy Canada*, p. 3.

CHAPTER 2

Methodology and Assumptions

Chapter Summary

- The Board coupled the CHHS-AP disease forecasts with its own population model and used the Public Health Agency of Canada's economic burden of illness techniques to create a forecast of CVD expenditures.
- Two diseases of the circulatory system are forecast: ischaemic heart disease and cerebrovascular diseases.
- The Board forecast looked at five risk factors: lack of physical activity, smoking, obesity, hypertension, and lack of fruit and vegetable consumption.
- The results of this project represent a "first approximation" of the potential impact of CVD risk factor changes arising from reduction targets/prevention efforts on CVD disease burden and, ultimately, health-care expenditures.

The CHHS-AP project used population health risk factors (prevalence and trends) and relative risks for these factors to forecast disease burden in the population. The Board has coupled these disease forecasts with its own population model and used the Public Health Agency of Canada's economic burden of illness techniques to create a forecast of CVD expenditures.[1] The results of this project represent a "first approximation" of the potential impact of CVD risk factor changes arising from reduction targets/prevention efforts on CVD disease burden and, ultimately, health-care expenditures. The work required that we first develop a base-case expenditure forecast and then create a second scenario based on the CHHS-AP targets. We assumed a short-term lag period for an effect on outcomes as a result of interventions.

METHODOLOGY

CALCULATING CVD PREVALENCE

In Canada, other than for cancer, disease incidence data are largely unavailable. However, self-reported prevalence data are available from the Canadian Community Health Survey corresponding to the main ICD-10 circulatory system categories. For the purpose of this analysis, two diseases of the circulatory system are forecast: ischaemic heart disease (I20–I25) and cerebrovascular diseases (I60–I69). It should be noted that a projection of hypertensive disease (I10–I15) is also part of this analysis, but it is considered a risk factor. As a result, a specific target based on the CHHS-AP is calculated, which is then used with the other factors to calculate ischaemic heart disease and cerebrovascular disease projections.

1 Public Health Agency of Canada, *Economic Burden of Illness in Canada, 1998*.

Based on the CHHS-AP target for five risk factors, and using relative risk ratios from expert opinion and an extensive literature review, the incidence of CVD was calculated. These risk factors were forecast by age and sex to 2020 based on past trends, available research, and consultation with experts. Using these risk factors and projected trends, as well as CVD death rates, a forecast of the prevalence of CVD by age and sex was developed.

Data from the 2005 Statistics Canada Canadian Community Health Survey are the latest historical figures used before CVD prevalence becomes a forecast.

When an individual suffers from disability or dies prematurely, this represents a tangible and measurable loss of productive capacity.

FROM PREVALENCE TO CVD COSTS

In order to forecast the cost of CVDs and the cost savings attributable to the reduction in the risk factors included in the CHHS-AP, the *Economic Burden of Illnesses in Canada* (EBIC) estimates for 2000 were used as the starting point. Note that hypertension was retained in the calculation of costs since it is also considered a CVD. It was possible to complete a projection of costs by age and sex for the following categories:

Direct Costs

- Drugs
- Hospitals
- Physicians

Indirect Costs

- Mortality from loss of future income
- Long-term disability from lower productivity
- Short-term disability from lower productivity
- Fiscal costs (federal and average provincial taxes from loss of future fiscal revenues as a result of premature death and lower productivity)

Given that the EBIC 2000 cost estimates are for one year only, the cost projections start in 2001 with the end of the forecast period in 2020. The direct costs are calculated using the 2000 ratio of the cost categories over CVD prevalence multiplied by the CVD prevalence forecast. All cost figures were converted in real 2008 dollars using price deflators that match, as closely as possible, these cost components.

Economic analyses typically include indirect costs such as forgone income, since an individual is always expected to have an "economic value" measured in terms of the lifetime stream of salary/income, which is a component of gross domestic product, the measure of all goods and services produced in the economy. When an individual suffers from disability or dies prematurely, this represents a tangible and measurable loss of productive capacity. As a result, indirect cost projections are included in this analysis. Using the 2000 average income by age cohort and sex and historical and the Conference Board's long-term wage and demographic forecast, an estimate of the future stream of indirect costs from 2001 until 2020 arising from the CVD prevalence was converted into 2008 dollars using an annual real discount rate of 4 per cent.

The discounting approach is a technique for measuring the stream of future costs as a one value in a specified year in current dollars and is a standard practice for this type of analysis. The long-term forecast used in this analysis takes into consideration the weak economic context of 2008–09 and the expected recovery in 2010 and beyond.

A key element in discounting the future stream of costs is the assumption regarding the appropriate discount rate. For this analysis we used a medium-term maturity bond, which offers a good proxy for a composite discount rate as it reflects the expected macroeconomic potential over the long run and normally influences businesses' and individuals' consumption and investment decisions. The annual real discount rate of 4 per cent was used in line with the Conference Board's long-term economic forecast of the real interest rate on a medium-term federal government bond.

For premature mortality cost projections, the probable life expectancy at the time of death was used as an estimate for the number of years of forgone income. For the long-term disability cost projection, the EBIC estimate of 11 months of reduced activity at 47 per cent of normal earnings was used as an assumption going forward, while a three-month period of reduced activity was used in the case of short-term disability costs.

By 2020, the share of Canada's population 65 years and over is expected to increase by more than 30 per cent.

Finally, the fiscal costs were projected using the Conference Board's long-term provincial and national fiscal forecast. To produce the forecast of fiscal losses, a calculation of the average income and sales tax rate at the federal and provincial levels was applied on the estimate of lost income streams by the indirect cost categories.

The cost implication of achieving CHHS-AP targets is the difference between two forecast scenarios based on the same methodology, with one exception: the first scenario, a base case, used the risk factor prevalence targets that are considered to be the expected or normal improvements until 2020, while the second used the CHHS-AP risk factor targets.

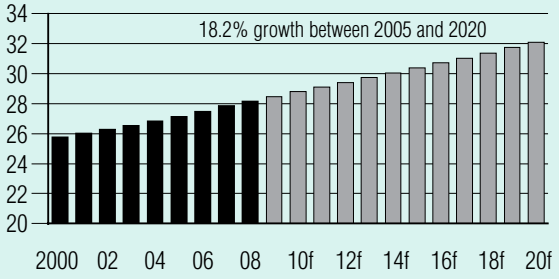
ASSUMPTIONS

POPULATION MODEL

The Conference Board began the project by building a detailed population model and forecast for Canada. This population model takes account of recent trends in fertility rates; death rates; immigration and emigration, including foreign immigration and emigration; provincial inter- and intra-immigration; returns; and temporary workers. Capturing the aging of the Canadian population is crucial for any model of health-care expenditure because changes in the demographic mix of the population are an important determinant of the disease burden placed upon the health-care system.

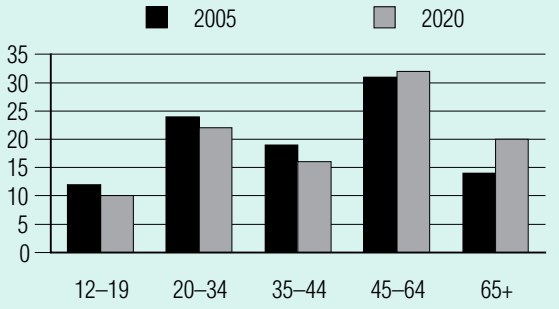
The Conference Board's *Long-Term Economic Forecast 2008* highlights that the aging of Canadian baby boomers will result in a lower birth rate and higher death rate, leading to a decline in the natural rate of increase in the population. (See Chart 1.) Although immigration is expected to boost population growth, the Canadian population will age significantly over the next two decades. By 2020, the share of Canada's population 65 years and over is expected to increase by more than 30 per cent. (See Chart 2.) Considering that cardiovascular and cerebrovascular diseases are most prevalent in this age cohort, this population aging will be a significant factor in the disease burden and, ultimately, in health system expenditures.

Chart 1
Total Population
(pop. 12 years and over; millions)



f = forecast
Sources: The Conference Board of Canada; Statistics Canada.

Chart 2
Total Population, by Age
(pop. 12 years and over; per cent)



Sources: The Conference Board of Canada; Statistics Canada.

CVD RISK FACTORS

The World Health Organization describes a number of "global health risks" responsible for much of the burden of disease in developed and developing nations. There is a large body of research on CVD risk factors and our work was informed by a literature review completed by CHHS-AP experts and researchers at the Board and the results from a risk factor/disease expert panel session conducted for the Ontario Ministry of Health and Long-Term Care and Ontario Medical Association. Finally, for the CHHS-AP project, the inclusion of particular factors was also guided by the following:

1. **Data Availability**—We required readily available, national prevalence data by age and sex with multiple measurement cycles to provide a historical trend. Data from Statistics Canada's Canadian Community Health Survey, cycles 2000–01, 2003, and 2005, met this requirement for all risk factors included in the CHHS-AP.
2. **CHHS-AP Targets**—As this project was centred on the impact of the CHHS-AP targets on CVD expenditures, we excluded risk factors where there was no such target.

A number of key risk factors (see Table 1) were included in the project, as they are known to impact the development of CVDs and the required national prevalence data were available.

The Canadian Community Health Survey

The Canadian Community Health Survey is a cross-sectional survey that collects information related to health status, health-care utilization, and health determinants for the Canadian population. It relies upon a large sample of respondents and is designed to provide reliable estimates down to the health region level. The target population of the survey is all Canadians aged 12 and over. Excluded from the sampling frame are individuals living on Indian reserves and Crown lands, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions.

Source: Statistics Canada, Canadian Community Health Survey.

Table 1
CVD Risk Factors

Risk factor	Definition
Lack of fruit and vegetable consumption	Consumes fewer than 5–10 servings of fruit and vegetables in one day
Obesity	Body mass index (BMI) is 30 or greater
Lack of physical activity	Energy expenditure is less than 1.5 kcal/kg/day
Smoking	Daily smoker
Hypertension	Has high blood pressure

Source: Statistics Canada, Canadian Community Health Survey, cycles 2000–01, 2003, 2005.

To create the base-case forecast, these risk factors were then forecast at the national level by age and sex until 2020. There were limited historical data on which to build a forecast and so in all cases, except for obesity, the CHHS-AP targets were reduced by 50 per cent.

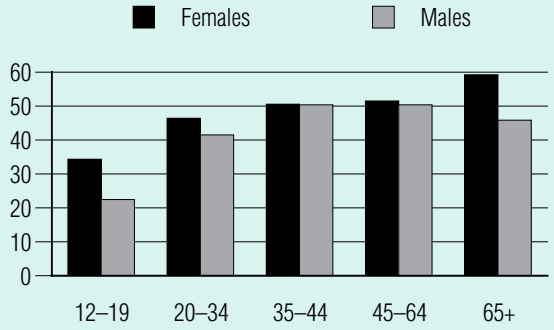
For males, the 35–44 and 45–64 age cohorts are the most inactive, while the 65-and-over age cohort for females is the least likely to exercise regularly.

Lack of Physical Activity

A lack of physical activity has been identified as a risk factor in the development of heart disease. The criterion used to assess the lack of physical activity for Canadians is the number of times in the previous three months that an individual participated in some form of physical activity lasting longer than 15 minutes and leading to an energy expenditure of at least 1.5 kcal/kg/day.[2] The prevalence of this risk factor for Canadians in 2005 is shown in Chart 3. Almost one in two Canadians aged 12 and older

2 Statistics Canada, Canadian Community Health Survey.

Chart 3
Lack of Physical Activity, by Age and Sex
(2005; per cent)

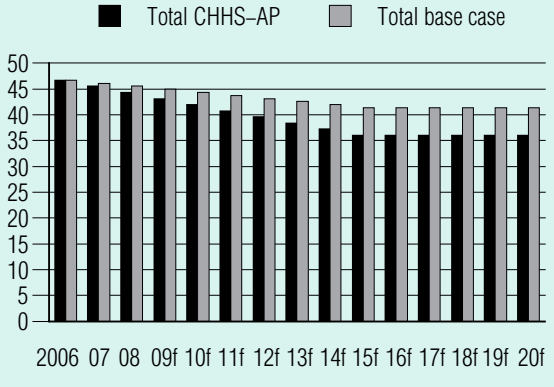


Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

is physically inactive. For males, the 35–44 and 45–64 age cohorts are the most inactive, while the 65-and-over age cohort for females is the least likely to exercise regularly.

Chart 4 shows both the base-case forecast and the CHHS-AP alternative scenario for physical activity. The alternative scenario is based on the successful achievement of the CHHS-AP target: by 2015, increase the proportion of Canadian children and adults who are physically active by 20 per cent. The base-case forecast assumes that 50 per cent of the CHHS-AP target will be achieved.

Chart 4
Lack of Physical Activity, by Scenario
(aged 12 and over; per cent)



f = forecast
Sources: The Conference Board of Canada; Canadian Heart Health Strategy and Action Plan.

In the base-case scenario, 46.7 per cent of the population lacked physical activity. By 2015 this figure improves to 41.4 per cent, with males continuing to be more physically active than females.

In the CHHS-AP alternative scenario, the percentage of the population with a lack of physical activity goes from 46.7 per cent in 2005 to 36.1 per cent in 2015. For males the change is significant—from 44.1 per cent in 2005 to 32.9 per cent in 2015. For females the improvement is about 20 per cent, from 49.3 per cent in 2005 to 39.2 per cent in 2015.

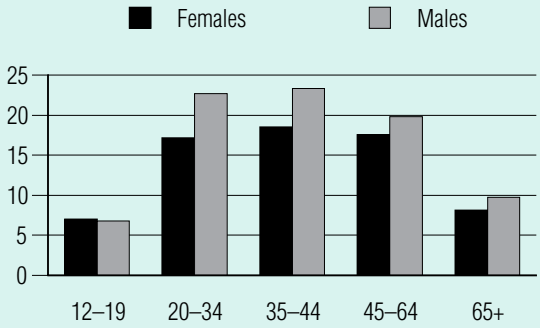
Smoking

Smoking is one of the major risk factors related to the development of cardiovascular and cerebrovascular diseases. In this analysis we have used the indicator "daily smoker" to measure this risk. Chart 5 provides the figures for smoking prevalence in 2005.

In 2005, 14.9 per cent of females smoked on a daily basis in Canada. The percentage for males was higher, at 18.2 per cent. The highest prevalence for males is in the 20–34 and 35–44 age cohorts, after which daily smoking declines. Females in the 12–19 age cohort have a slightly higher smoking rate than males in the same category.

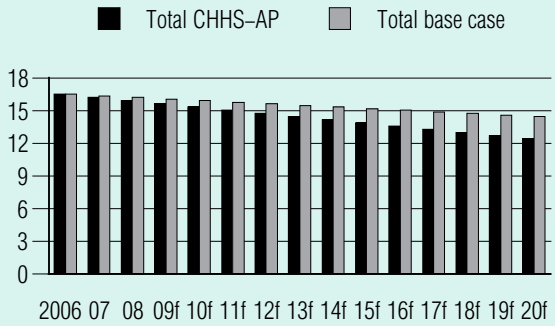
Chart 6 provides the base-case and alternative forecasts. The alternative scenario is based on the successful achievement of the CHHS-AP target: by 2020, work

Chart 5
Smoking Rate, by Age and Sex
(2005; per cent)



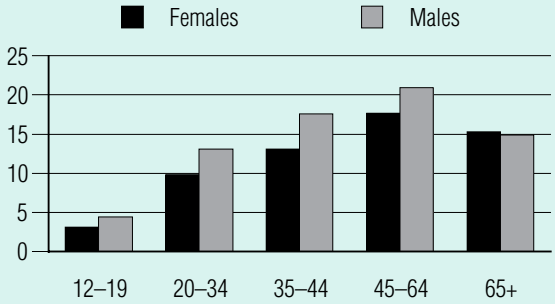
Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

Chart 6
Smoking Rate, by Scenario
(aged 12 and over; per cent)



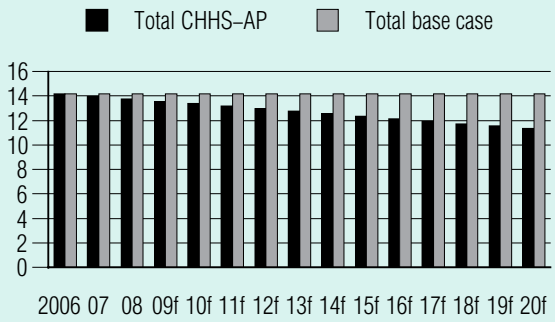
f = forecast
Sources: The Conference Board of Canada; Canadian Heart Health Strategy and Action Plan.

Chart 7
Obesity Rate, by Age and Sex
(2005; per cent)



Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

Chart 8
Obesity Rate, by Scenario
(aged 12 and over; per cent)



f = forecast
Sources: The Conference Board of Canada; Canadian Heart Health Strategy and Action Plan.

with others to reduce the overall smoking rate by 25 per cent. The base-case forecast assumes that 50 per cent of this target will be achieved.

In the base-case forecast, the overall smoking rate goes from 16.5 per cent in 2006 to 14.4 per cent in 2020. The male rate in 2020 is 15.9 per cent, while the female rate is 13 per cent. With the achievement of the full target, these figures improve even more. The overall prevalence is reduced to 12.4 per cent in 2020, with the rate for males at 13.6 per cent and the rate for females at 11.2 per cent.

Obesity

Obesity is a major risk factor for stroke and heart disease. This analysis assumes that individuals are classified as obese if their body mass index (BMI) is 30 or greater. Chart 7 shows the 2005 obesity figures; the overall prevalence of obesity in Canada was 14.2 per cent. This figure was up from 11.7 per cent in 2001.

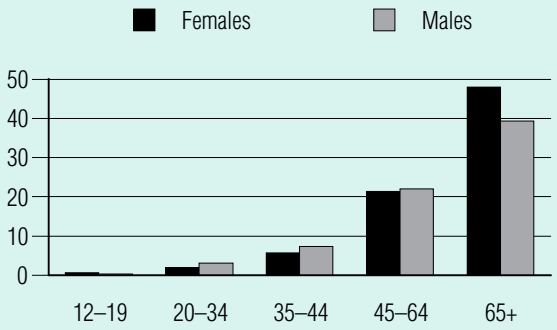
Chart 8 shows the base-case and alternative scenario forecasts for obesity. The CHHS-AP target for obesity is: by 2015, decrease the rate of Canadian adults who are overweight/obese by 20 per cent. For the base-case forecast we left the obesity rate flat going out to 2015. We believed that setting the base case at 50 per cent of the CHHS-AP target would be too ambitious, given that obesity rates have been increasing in recent years.

Thus, in the base-case forecast the overall obesity rate remains stable at 14.2 per cent by 2015. With the full achievement of the CHHS-AP target, this figure falls to 12.4 per cent.

Hypertension

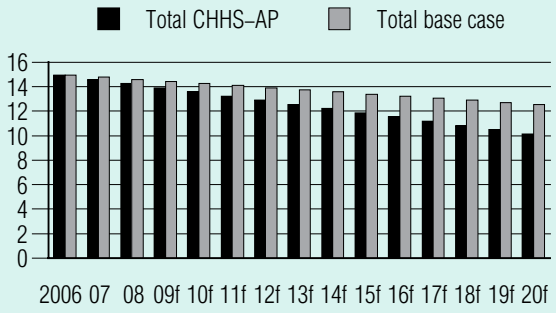
Hypertension is a major risk factor for ischaemic heart disease and, in particular, stroke. Results from the 2005 Canadian Community Health Survey (CCHS) show that the overall prevalence for hypertension is 14.9 per cent, with males at 14.1 per cent and females at 15.7 per cent. In the 35–44 age group, females have a lower rate (5.8 per cent) than males (7.3 per cent). However, as females age the rate of hypertension increases

Chart 9
Hypertension Rate, by Age and Sex
(2005; per cent)



Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

Chart 10
Hypertension Rate, by Scenario
(aged 12 and over; per cent)



f = forecast
Sources: The Conference Board of Canada; Canadian Heart Health Strategy and Action Plan.

dramatically—up to 47.9 per cent for the 65-and-over age cohort. (See Chart 9.) The male rate also increases, to 39.4 per cent. These results may underestimate the prevalence of hypertension in the population, as the CCHS measures only those who have received a diagnosis; it is believed that many people do not know they have hypertension.

It is assumed that individuals who consume fewer than 5 to 10 servings of fruit and vegetables per day are placing their health at greater risk.

Chart 10 provides the base-case and alternative scenarios. The CHHS-AP target is: by 2020, decrease the prevalence of hypertension in adult Canadians aged 18 to 74 by 32 per cent. This 32 per cent reduction target is based on an average prevalence rate of 22 per cent in 1992.[3] This prevalence rate was calculated based on a representative sample for the entire population, with blood pressure measured by clinicians. Given that there is no equivalent measure of hypertension prevalence available after 1992, self-reported hypertension prevalence rates by age and gender from the CCHS 2005 survey are used as the starting point in this analysis. This is an acceptable alternative, despite the fact that it is recognized that self-reported measures of hypertension underestimate the prevalence of this risk factor. The CCHS data provide a reasonably close approximation of hypertension prevalence, since they include a broader population group of 12 years and older and are not far off the clinician-measured hypertension.[4]

Achieving this target fully means that in 2020 the total prevalence rate of hypertension would be 10.2 per cent. For males the figure would be 9.6 per cent, and for females the prevalence would be 10.7 per cent. Again, these are very ambitious targets that would inevitably have a significant impact on reducing heart disease and stroke among Canadians.

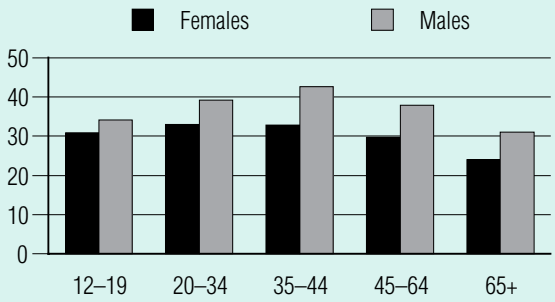
Lack of Fruit and Vegetable Consumption

A lack of fruit and vegetables has been cited as a risk factor for a wide range of diseases, including heart disease. It is assumed that individuals who consume fewer than 5 to 10 servings of fruit and vegetables per day are placing their health at greater risk. The 2005 CCHS results for this risk factor are presented in Chart 11. Thirty-four per cent of the population is categorized as

3 Joffres et al., "Awareness, Treatment and Control," 1997.

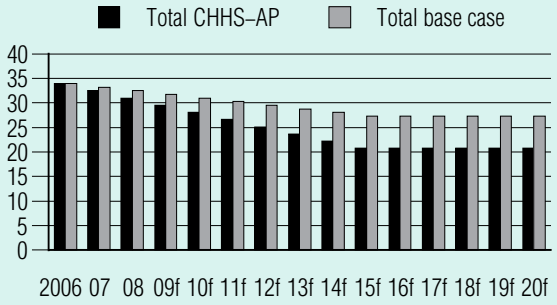
4 By using a definition closer to Joffres et al., 1997, the average hypertension prevalence from the CCHS survey for the adult population is 18.3 per cent, which is not far off the level measured in 1992. In other words, given that only a minimal improvement is expected to have taken place since 1992, the 32 per cent reduction target in the CHHS-AP is consistent with the CCHS 2005 prevalence rates used as the starting point in this analysis.

Chart 11
Lack of Fruit and Vegetable Consumption, by Age and Sex
(2005; per cent)



Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

Chart 12
Lack of Fruit and Vegetable Consumption, by Scenario
(aged 12 and over; per cent)



f = forecast
Sources: The Conference Board of Canada; Canadian Heart Health Strategy and Action Plan.

having a lack of fruit and vegetables in their daily diet. This figure is an improvement from previous CCHS cycles: in 2001, the figure stood at 59.5 per cent. Among females, 30.3 per cent fail to meet the recommended guidelines for the consumption of fruit and vegetables. The figure for males is worse, at 37.7 per cent.

With a full achievement of the target, by 2015 only 20.7 per cent of Canadians will not meet the recommendations for daily consumption of fruit and vegetables.

Overall though, these figures are fairly promising and suggest that a large percentage of Canadians do meet the recommended daily requirements for fruit and vegetables.

The CHHS-AP target for healthy eating is: by 2015, increase the proportion of Canadian children and adults eating at least five servings of fruit and vegetables per day by 20 per cent. Chart 12 presents the base-case and CHHS-AP forecasts.

With a full achievement of the target, by 2015 only 20.7 per cent of Canadians will not meet the recommendations for daily consumption of fruit and vegetables. For females the figure is as low as 16.3 per cent, while for males it is 25.3 per cent.

RELATIVE RISKS FOR CVDs

The CCHS data were analyzed to determine the relative risks associated with each risk factor for each of these diseases. The findings from this exercise were vetted through an extensive literature review and the Chair of the CHHS-AP. Concerns were raised about the use of cross-sectional, self-reported CCHS data to determine the relative risks. After further discussion and an additional literature search, it was agreed that for ischaemic heart disease, the relative risks would be drawn from work by Mainous et al., "A Coronary Heart Disease Risk Score Based on Patient-Reported Information."[5] This U.S. research uses the "Atherosclerosis Risk in Communities (ARIC) Study"[6] public use data. These data are based on a large-scale prospective cohort that is somewhat more diverse than that of the Framingham research,[7] although clearly not fully representative of the Canadian population of today. However, the risks are based on self-reported data, which aligns with our use of self-reported data for the risk factors.

5 Mainous et al., "Coronary Heart Disease Risk Score," p. 1238.

6 Ibid.

7 National Heart, Lung and Blood Institute, and Boston University, "Framingham Heart Study."

The work by Mainous et al. does not include the consumption of fruit and vegetables as a risk factor. Based on the Board's own calculations from the CCHS and the results of other available research, it was decided to adopt a relative risk of 1.4 for the fruit and vegetables risk factor for both CVDs.

In terms of relative risks associated with developing cerebrovascular disease, it was agreed that we would use figures published by Goldstein et al. in *Stroke: Journal of the American Heart Association*.[8]

Table 2 provides the relative risks that were used. These numbers should be interpreted as the risk of developing the disease if an individual lives with the risk factor versus the risk of developing the disease if an individual lives without the risk factor. For example, a relative risk of developing ischaemic heart disease of 1.6 for male smokers means that a male smoker has 60 per cent more chance of developing this heart disease than a non-smoker.

8 Goldstein et al., "Primary Prevention of Ischaemic Stroke," p. 1587.

Table 2
Summary of Relative Risks Associated With CVDs

Relative risk of developing ischaemic heart disease	Males	Females
If obese (BMI>30)	1.47*	1.47
If consume fewer than 5–10 servings of fruit and vegetables per day	1.4**	1.4**
If physically inactive	1.39	1.39***
If daily smoker	1.6	3.22
If hypertension	1.44	2.43

Relative risk of developing cerebrovascular disease	Males	Females
If obese (BMI>30)	1.75	1.75
If consume fewer than 5–10 servings of fruit and vegetables per day	1.4**	1.4**
If physically inactive	2.7	2.7
If daily smoker	1.9	1.9
If hypertension	3.0	3.0

*data for women
**figure not from sources
***data for men
Sources: Mainous et al., "A Coronary Heart Disease Risk Score Based on Patient-Reported Information"; Goldstein et al., "Primary Prevention of Ischaemic Stroke."

CHAPTER 3

Results

Chapter Summary

- Females historically have had a significantly lower prevalence of ischaemic heart disease than males—in 2005, 4.1 per cent of females in Canada had the disease compared with 5.4 per cent of males.
- CHHS-AP targets have a significant impact on ischaemic heart disease. By 2020, the lower prevalence rate in risk factors contributes to a reduction of 452,000 cases of this type of heart disease.
- Females historically have had a prevalence of cerebrovascular diseases comparable with males, but the prevalence rate of this type of disease is much lower than for ischaemic heart disease. In 2005, about 1 per cent of females and 1.1 per cent of males in Canada had this type of circulatory disease.
- CHHS-AP risk factor targets have an important impact on reducing the prevalence rate of cerebrovascular diseases.

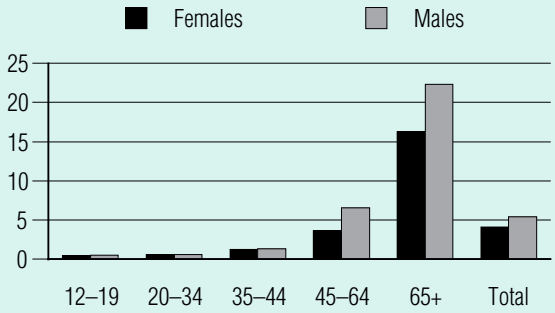
The prevalence of CVDs is assumed to be a function of the risk factors listed in Table 1. For each disease, different relative risks were attached to each risk factor. As indicated in the methodology section, the base-case and CHHS-AP forecasts for ischaemic heart disease and cerebrovascular diseases were created by applying the relative risks to the respective CVD risk factors.

ISCHAEMIC HEART DISEASE PREVALENCE

Historically, females have had a significantly lower prevalence of ischaemic heart disease than males. In 2005, 4.1 per cent of females in Canada had this type of heart disease compared with 5.4 per cent of males. In the 65-and-older age cohort not only was the prevalence of the disease much higher in males, but the gap between males and females widened to almost 40 per cent. Sixteen per cent of females and more than 22 per cent of males developed this illness in the oldest age cohort. (See Chart 13.)

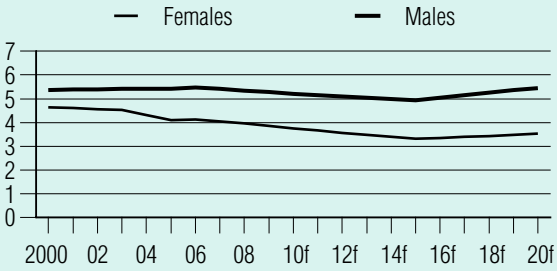
In terms of the impact of the relative risks on developing ischaemic heart disease over time, it is worth noting that female smokers and females with hypertension have a significantly higher chance of developing the disease. But given the lower prevalence rate of this CVD, particularly in the older population groups, the overall prevalence rate for females remains lower than for males over the entire forecast period. (See Chart 14.)

Chart 13
Ischaemic Heart Disease, by Age and Sex
(2005; per cent)



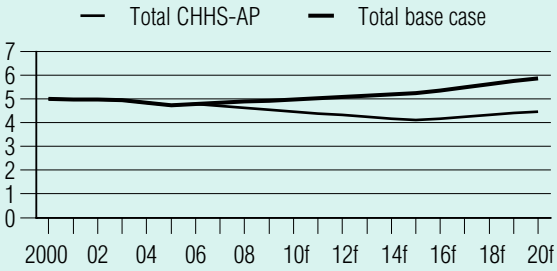
Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

Chart 14
Ischaemic Heart Disease Prevalence Rate
(CHHS-AP scenario; per cent)



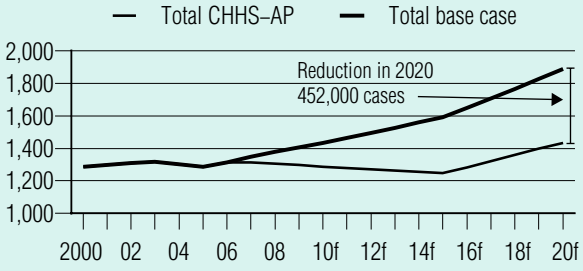
f = forecast
Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2000–05.

Chart 15
Ischaemic Heart Disease Prevalence Rate
(per cent)



f = forecast
Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2000–05.

Chart 16
Ischaemic Heart Disease Prevalence
(000s)



f = forecast
Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

Chart 15 provides the impact of the CHHS-AP risk factor targets on the prevalence of the CVD. The base case is provided for comparison. Despite the lower overall prevalence rate in 2020 relative to 2005, the much larger prevalence of the disease in the older population cohorts contributes to the increasing number of cases of ischaemic heart disease. The total prevalence grows from 1.29 million in 2005 to 1.43 million in 2020, in large part due to the aging of the population.

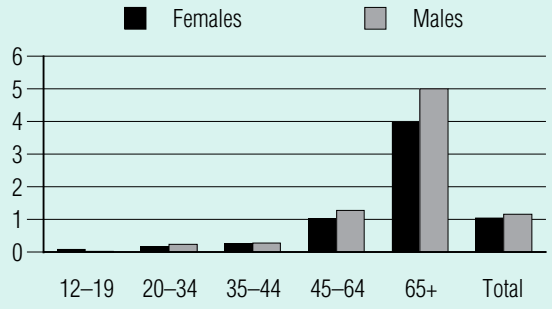
The impact of CHHS-AP targets on ischaemic heart disease is significant. By 2020, the lower prevalence rate in risk factors contributes to a reduction of 452,000 cases of ischaemic heart disease. (See Chart 16.)

CEREBROVASCULAR DISEASE PREVALENCE

In contrast with the prevalence of ischaemic heart disease, females historically have had a prevalence of cerebrovascular diseases comparable with males. However, the prevalence rate of this type of circulatory system disease is much lower than for ischaemic heart disease. In 2005, about 1 per cent of females and 1.1 per cent of males in Canada had this type of circulatory disease. In the 65-and-older age cohort, not only was the prevalence of the disease much higher for males, but the gap between males and females widened significantly to almost 25 per cent. Close to 4 per cent of females and about 5 per cent of males developed this illness in the oldest age cohort. (See Chart 17.)

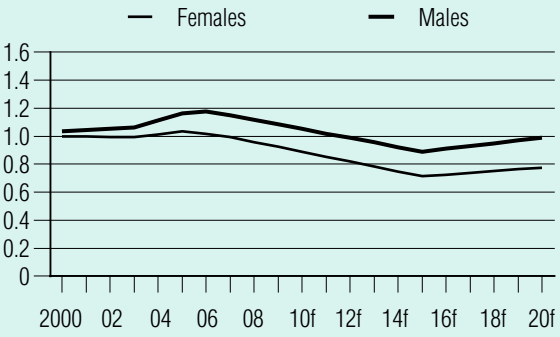
Charts 18 and 19 show the impact of the CHHS-AP risk factor targets on the prevalence of the CVDs. Note that the prevalence rate declines significantly in the CHHS-AP scenario. The large relative risk of 2.7 associated with lack of physical activity—3.0 for hypertension and 1.75 for obesity—explains the important impact these risk factors have on reducing the prevalence rate of cerebrovascular diseases.

Chart 17
Cerebrovascular Diseases, by Age and Sex
(2005; per cent)



Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

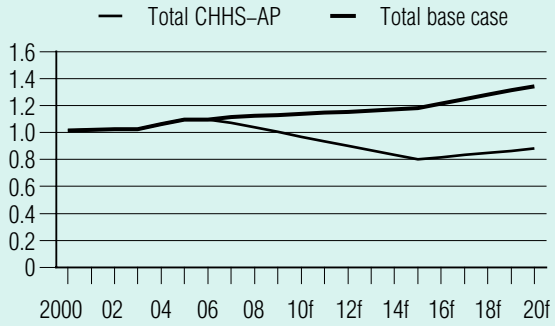
Chart 18
Cerebrovascular Disease Prevalence Rate
(CHHS-AP scenario; per cent)



f = forecast
Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2000–05.

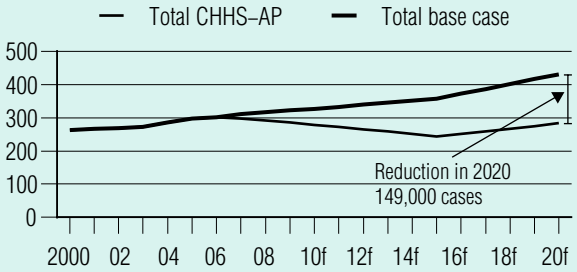
The reduction in cerebrovascular diseases is even more significant considering that prevalence is about 25 per cent of ischaemic heart disease and that the reduction in cases of about 150,000 is about one-third of the reduction seen in ischaemic heart disease. (See Chart 20.)

Chart 19
Cerebrovascular Disease Prevalence Rate
(per cent)



f = forecast
Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2000–05.

Chart 20
Cerebrovascular Disease Prevalence
(000s)



f = forecast
Sources: The Conference Board of Canada; Statistics Canada, Canadian Community Health Survey, 2005.

CHAPTER 4

Costs of CVDs

Chapter Summary

- For each type of CVD, cost estimates were calculated in constant 2008 dollars for direct costs (drugs, hospitals, physicians) and indirect costs (mortality, short- and long-term disability, federal and provincial average fiscal losses resulting from premature cardiovascular mortality).
- In 2005, total CVD costs were estimated at $20.9 billion, with the largest proportion attributable to mortality costs at 43 per cent. In 2020, total costs are expected to reach $28.3 billion, with the share of mortality costs increasing to 49 per cent.
- The difference in the cost distribution between males and females is particularly striking—less than 40 per cent of costs are attributable to females.
- Achieving the CHHS-AP's risk factor prevalence targets will lead to substantial cost savings for the health system, governments, and the Canadian economy—overall cumulative savings of $76.4 billion are expected. The annual savings increase over time to $10 billion for the year 2020.

OVERVIEW

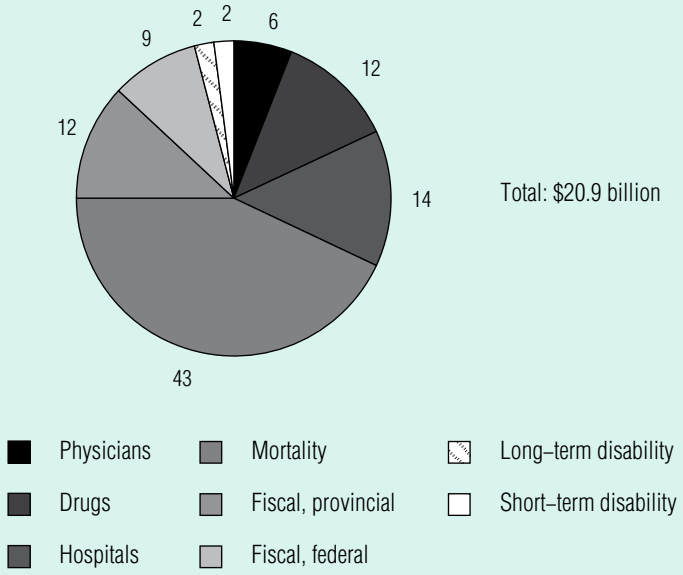
As indicated in the methodology section, the forecast of costs is calculated for three types of CVDs: ischaemic heart disease, cerebrovascular diseases, and hypertensive heart disease.[1] For each type of CVD, cost estimates were calculated for the following categories:

- Direct costs (drugs, hospitals, physicians);
- Indirect costs
  - Mortality costs (i.e., costs associated with forgone income);
  - Long-term disability costs;
  - Short-term disability costs;
  - Federal average fiscal losses resulting from premature cardiovascular mortality; and
  - Provincial average fiscal losses due to premature cardiovascular mortality.

The EBIC 2000 cost figures—inflated in 2008 dollars by category and calculated on a per CVD case basis—were used as the starting point to forecast costs by the prevalence scenarios. It was assumed that costs per CVD case would remain constant in real 2008 dollars, which means that the direct cost components for drugs and hospital costs changed only as a result of higher prevalence and not because of a change in prices. For the other cost components, it was also assumed that

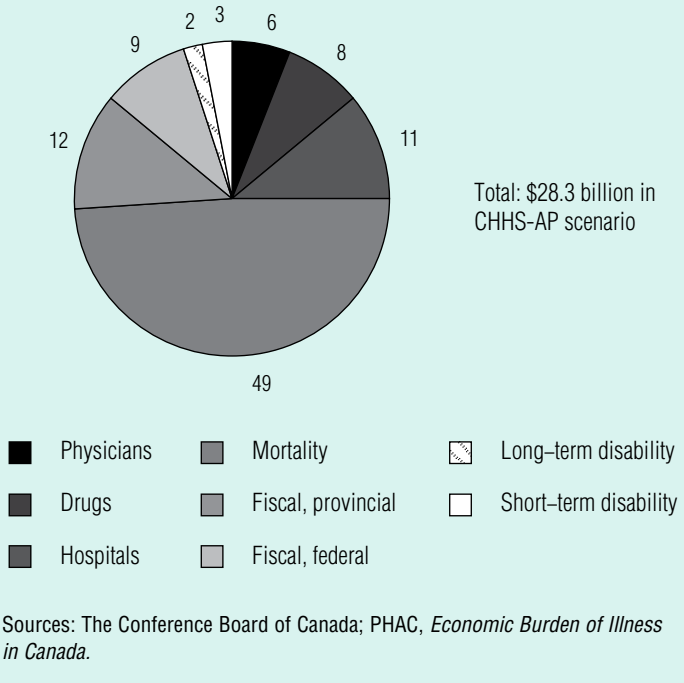
1 Note that hypertension is both a risk factor and a CVD, thus explaining why cost savings from the reduction in hypertension prevalence are included.

Chart 21
Costs per Component, 2005
(per cent)



Sources: The Conference Board of Canada; Public Health Agency of Canada (PHAC), *Economic Burden of Illness in Canada.*

Chart 22
Costs per Component, 2020
(per cent)



Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

costs would remain constant in real dollar terms but real wage gains generated as a result of higher productivity would raise both the costs for physicians and the losses of future income from mortality and disability. Finally, using the Conference Board's *Long-Term Economic Forecast 2008*, the federal and average provincial fiscal costs associated with the lost tax revenue resulting from mortality and disability were calculated based on an average implicit personal income tax rate of 6.25 per cent at the provincial level and 10.24 per cent at the federal level.[2] In addition, implicit average provincial and federal indirect tax rates of 7.43 per cent and 3.97 per cent, respectively, were calculated in the same manner.

In 2005, total CVD costs were estimated at $20.9 billion,[3] with the largest proportion of costs attributable to mortality costs at 43 per cent. (See Chart 21.) Hospital (14 per cent), drug (12 per cent), and long-term disability (12 per cent) costs were the next largest cost categories. In 2020, total costs are expected to reach $28.3 billion, with the share of mortality costs increasing to 49 per cent. (See Chart 22.)

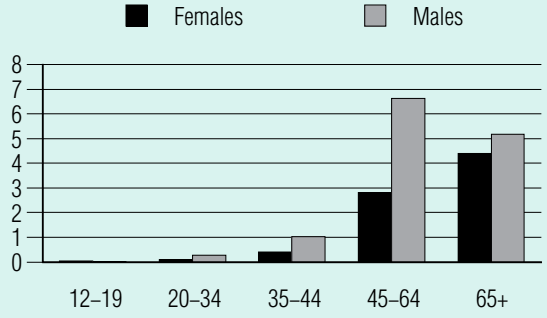
The expected stream of income lost as a result of mortality at a relatively young age, and the value of lost productivity at the peak of the average income an individual is expected to earn, explain the growing importance of this indirect cost category. The distribution of costs by age cohort illustrates this trend. (See Chart 23.)

The difference in the cost distribution between males and females is particularly striking. (See Chart 24.) Less than 40 per cent of costs are attributable to females, despite a proportion of disease prevalence for females of higher than 40 per cent on average. The lower indirect costs

2 The provincial and federal income tax rates are calculated based on the population 12 years and older. They include both income and non-income earners, thus explaining the low average tax rates.

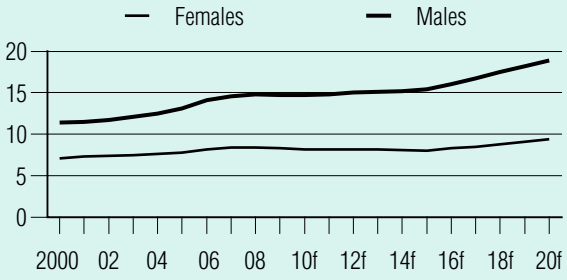
3 Total CVD costs of $20.9 billion in 2005 refer to the sum of the three CVDs included in the analysis inflated in 2008 dollars. The CHHS-AP document refers to total CVD costs of $22.2 billion in 2000 and includes all CVDs and a portion of non-attributable health-care costs based on the EBIC 2000 calculations. As a result, total costs in this report are not directly comparable with the CHHS-AP total costs.

Chart 23
CVD Costs, by Age and Sex
(2005; 2008 $ billions)



Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

Chart 24
Cost of CVDs, by Sex
(CHHS-AP scenario; 2008 $ billions)

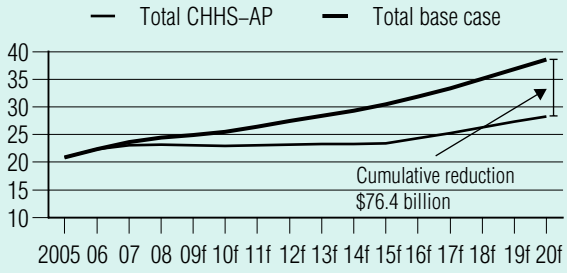


f = forecast
Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

related to lower average incomes is the main explanation for the lower weights from females in total CVD costs. Only hypertension could push the proportion of costs for females upward, given the higher prevalence rate, but the share of mortality and disability costs is much lower for this disease. Overall, females are responsible for 37 per cent of CVD costs in 2005, decreasing to 33 per cent by 2020.

Chart 25 illustrates the impact of CHHS-AP targets on lower prevalence and the resulting savings in costs. Consistent with the CHHS-AP statement that "we believe that the current estimate of savings of $1 billion per year in direct costs and $2 billion per year in

Chart 25
Cost of CVDs, by Scenario
(2008 $ billions)



f = forecast
Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

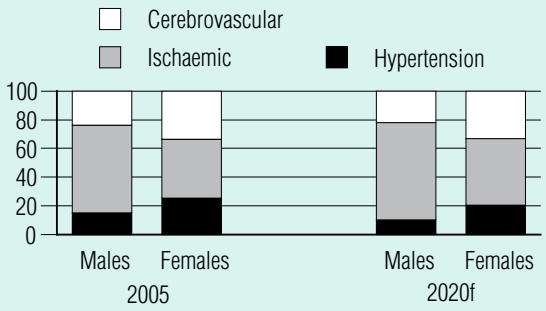
indirect costs are conservative estimates,"[4] the cumulative cost savings from CHHS-AP risk factor targets total $76.4 billion from 2005 to 2020, or about $5 billion per year. The distribution of savings is 26 per cent direct costs and 74 per cent indirect costs in the first few years of the forecast; by 2020 those numbers change to 23 per cent direct and 77 per cent indirect costs. Again, the impact increases over time given the growing gap between the base-case and CHHS-AP scenario prevalence figures and the higher value of indirect costs per CVD case.

COSTS PER DISEASE

The main reason for the steady growth in CVD costs, despite the significant reduction in the prevalence rates of risk factors, is the growing importance of ischaemic heart disease, where mortality costs are dominant. In 2005, the cost proportions associated with this CVD are estimated at 61 per cent for males and 41 per cent for females, growing to 67 per cent and 46 per cent, respectively, by 2020. (See Chart 26.) Cerebrovascular diseases are the second most important cost components for both groups, while hypertension is third. Particularly worth noting is the small proportion of hypertension costs for males by 2020. This is due to both the significantly reduced prevalence of this disease (and risk factor) and

4 Canadian Heart Health Strategy and Action Plan, *Building a Heart Healthy Canada*, p. 4.

Chart 26
Cost of CVDs, by Disease
(CHHS-AP scenario; shares)



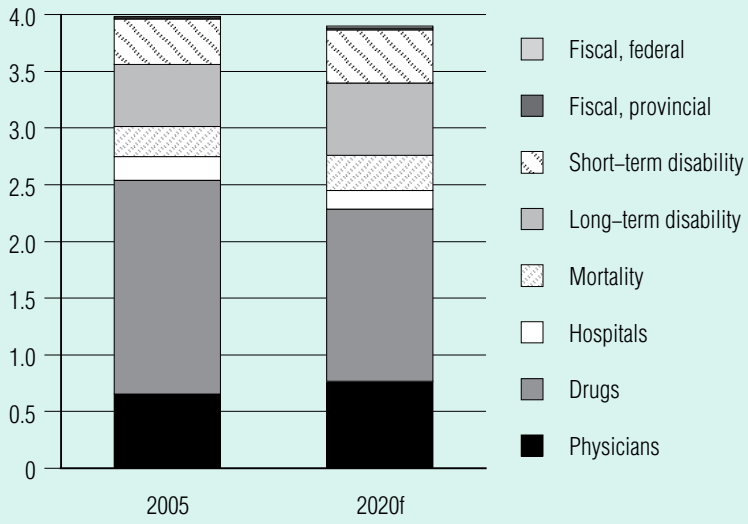
f = forecast
Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

its relatively minor contribution to indirect costs, since hypertension is rarely fatal on its own and does not create disability to the same extent as the other two CVDs.

HYPERTENSION

The breakdown of costs for hypertension is largely dominated by drugs and physician costs. (See Chart 27.) Drugs represented an estimated 47 per cent of total hypertension costs in 2005, decreasing to 38 per cent by 2020, and physician costs rose from 16 per cent to 19 per cent. This trend is largely explained by the fact that the cost of drugs per case is expected to remain flat in constant 2008 dollars, while the cost of physicians per case is expected to grow with real wage gains due to increased productivity. Also, long-term disability costs remain the third-largest cost component for hypertension at 14 per cent of the total in 2005, growing to 16 per cent by 2020. Again, real wage gains explain this change over time. Finally, total hypertension costs are lower under the CHHS-AP scenario by the end of the forecast period. The fact that hypertension prevalence was targeted as a risk factor and not forecast based on the relative risk factors impacting hypertension largely contributes to reducing the overall cost level of this CVD.

Chart 27
Cost of Hypertension, by Component
(CHHS-AP Scenario; 2008 $ billions)



f = forecast
Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

ISCHAEMIC HEART DISEASE

The growing number of people in the 45–64 age group of the population, over the forecast horizon, is an important driver of mortality cost for ischaemic heart disease. This cost component grows from an already dominant position of about 60 per cent of total ischaemic heart disease costs to 64 per cent by 2020. (See Chart 28). Because the mortality associated with this disease is high, the value of future income lost remains high over the forecast period. The share of hospital costs decreases from about 13 per cent to 10 per cent because of the expected flat growth in real hospital costs over the next 15 years.

More specifically, indirect costs (mortality, short- and long-term disability), excluding fiscal costs, grow from 71 per cent to 75 per cent of the total for this CVD by 2020. It is important to note that fiscal costs on their own make up a significant portion of total costs at more than 6 per cent of the total, representing $650 million (provincial and federal in roughly equal proportion) in 2005 and growing to more than $1 billion in 2020.

Overall, ischaemic heart disease costs jump to more than $17 billion in 2020, an increase of close to 55 per cent over 2005. Again, this CVD remains the most costly per case from both a historical and a forecast perspective.

CEREBROVASCULAR DISEASES

Of the three CVDs, cerebrovascular diseases are the second most costly for Canadians, representing about half the cost of ischaemic heart disease and about a quarter of total CVD costs in 2005. Although indirect costs—excluding the fiscal component—make up more than 70 per cent of total costs, the mortality component is not as dominant as for ischaemic heart disease. (See Chart 29.) The consequence of cerebrovascular diseases, such as a stroke, on lost income is clearly demonstrated by the large share of both long-term disability (22 per cent) and short-term disability (16 per cent) of total costs in 2005. At 34 per cent of the total, mortality costs are still high but not as significantly. In terms of direct costs, the hospital component stands at 22 per cent of the total in 2005. As a result fiscal costs, estimated at 3.2 per cent of the total, represent a larger share than the combined physician and drug costs.

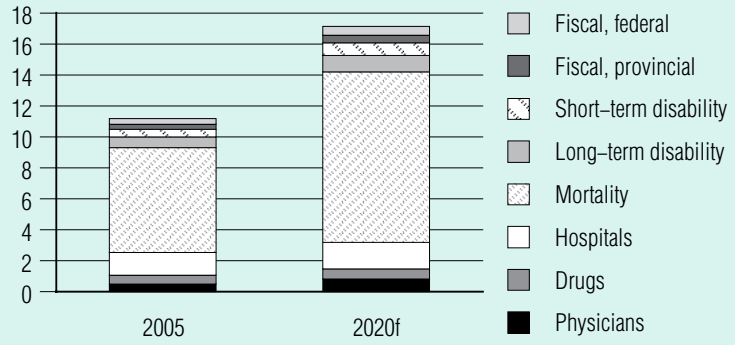
From 2005 to 2020 these shares remain similar, with the exception of hospital costs, which are expected to decrease to about 16 per cent of the total.

IMPACT OF CHHS ACTION PLAN

As seen in Chart 30, achieving the CHHS-AP's risk factor prevalence targets will lead to substantial cost savings for the health system, governments, and the Canadian economy. As mentioned above, overall cumulative savings of $76.4 billion are expected. The annual savings increase over time to $10 billion for the year 2020.

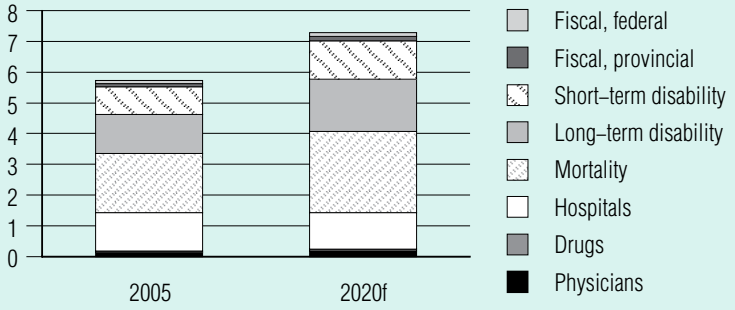
In terms of the contribution of each disease to the total savings, it is important to highlight that the contribution of cerebrovascular diseases, at 40 per cent of total cumulative savings, represents a much larger value than might be expected given its relative share of the total CVD cases. As was indicated previously, the large impact of the CHHS-AP targets on cerebrovascular diseases is related to the high relative risk of developing cerebrovascular disease from a lack of physical activity, obesity, and hypertension.

Chart 28
Cost of Ischaemic Heart Disease, by Component
(CHHS-AP scenario; 2008 $ billions)



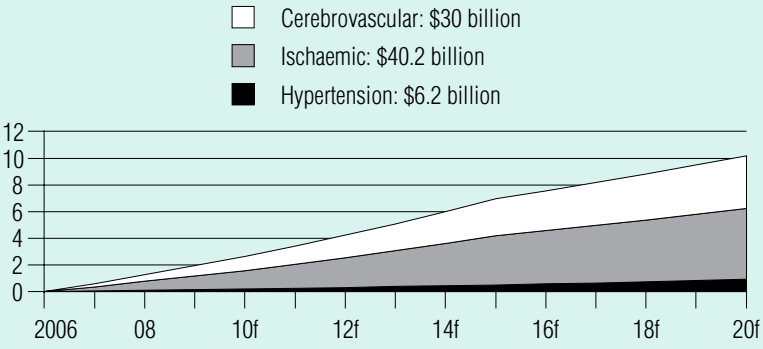
f = forecast
Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

Chart 29
Cost of Cerebrovascular Diseases, by Component
(CHHS-AP scenario; 2008 $ billions)



f = forecast
Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

Chart 30
Cost Savings From CHHS-AP Scenario
(cumulative cost savings, 2008 billions)



f = forecast
Sources: The Conference Board of Canada; PHAC, *Economic Burden of Illness in Canada.*

CHAPTER 5

Limitations

Chapter Summary

- Certain assumptions and exclusions were made in order to provide a good "first approximation" of the expected benefits from significantly reducing CVD risk factors over a short period of time.
- An important assumption relates to the lag response to changes in risk factor prevalence and their impact on CVDs—addressing the issue of the lag responses would improve the forecast accuracy.
- Another assumption concerns comorbidities and their impact on CVD cases. In this report, each risk factor and its impact on CVDs was modelled independently from other risk factors.
- An important exclusion is the expected reduction in CVDs resulting from reductions in high levels of blood cholesterol and other lipids.
- In the end, changing these assumptions and exclusions would not alter the order of magnitude of the expected cost reductions from reducing the prevalence of key CVD risk factors.

Forecasting costs associated with diseases as complex as CVDs requires assumptions. In this report, certain assumptions and exclusions were made in order to provide a good "first approximation" of the expected benefits from significantly reducing CVD risk factors over a short period of time.

Addressing the issue of the lag response to changes would change the results in the short term only.

The first assumption relates to the lag response to changes in risk factor prevalence and their impact on CVDs. Addressing the issue of the lag response would improve the forecast accuracy. However, these lags are not clearly established. It should be noted that this would change the results in the short term only, given that reductions in risk factors decline over time at a constant rate. Over the medium term, the results would not be altered significantly. On the other hand, if it is believed that the lag response is extended (10 to 20 years), a large share of the benefits from the lower risk factors would start to be observed toward the end of the forecast period. For example, in an extreme scenario, if reducing smoking today leads to a reduction in CVDs only after 10 years, no benefit at all would be observed from the reduction in this risk factor over the next 10-year period.

The other important assumption relates to the issue of comorbidities and their impact on CVD cases. In this report, each risk factor and its impact on CVDs was modelled independently from other risk factors. Measuring the risk of developing a CVD when an individual presents with more than one risk factor would be possible if more detailed information on relative risks by sex, age cohort, and combinations of risk factors was available. Similarly, costs are incremental in the presence of more than one disease.

As mentioned earlier in this report, the CHHS-AP includes a wide range of other targets, but they have not been modelled in this project. An important exclusion is the expected reduction in CVDs as a result of reductions in high levels of blood cholesterol and other lipids. As the CHHS-AP states:

> Abnormal levels of blood cholesterol and other lipids remain a major risk factor for CV diseases. Unfortunately, no population-based measures of lipids are yet available in Canada, so a target cannot be set at this time. However, they are expected soon, and once available a target can be set.[1]

Given the important impact of abnormal levels of blood cholesterol on CVD risk factors and the development of CVDs, including this risk factor in a future update of this forecast would be desirable. The inclusion of other risk factors such as diabetes, alcohol consumption, and stress would also be appropriate. In these cases, the development of causality relationships between risk factors and CVDs would be necessary in addition to more refined relative risk ratios. Also, the probability of developing other diseases or of premature death from other diseases as a result of surviving a CVD could be factored into the forecast if the pertinent relative risk ratios were available.

Consideration could also be given to the impact of reductions in CVD risk factors for various segments of the population living in Canada. For example, risk factors and CVD prevalence rates for Aboriginal people are known to be higher than for the rest of the population. Strategies aimed at reducing risk factors in this group would lead to proportionally higher cost savings. Analyzing cost savings by immigrants' country of origin is another example where the results would differ proportionally. The lack of detailed Canadian statistics and research on relative risks is currently limiting the possibility of modelling CVD costs by this type of population segment.

An important exclusion from this report are reduction targets in levels of blood cholesterol and other lipids.

In the end, these areas of improvement would not alter the order of magnitude of the expected cost reductions from reducing the prevalence of key CVD risk factors. As indicated, these results are a good "first approximation" of the expected benefits from achieving the CHHS-AP risk factor targets and can serve the policy mandate proposed in the Action Plan.

It should be noted that alternative approaches, including some that would result in much larger potential cost savings, were excluded from this analysis in order to present a conservative estimate of the potential impact of some of the initiatives included in the CHHS-AP. Large additional cost savings that were purposely excluded from this analysis include disability adjusted life years (DALYs) or quality adjusted life years (QALYs), family provision of care, insurance costs, and disability payments.

1 Canadian Heart Health Strategy and Action Plan, *Building a Heart Healthy Canada*, p. 96.

CHAPTER 6

Conclusion

Chapter Summary

- This analysis confirms that growth in the number of older Canadians will contribute to the rising economic costs associated with heart disease and stroke. One way to address the human and financial costs of CVDs is to reduce the risk factors associated with CVDs.
- Over the next 10 years, a cumulative reduction of more than $76 billion is anticipated if the CHHS-AP targets for these risk factors are achieved.
- It is important to underscore that the cost savings from reduced risk factor prevalence increase dramatically over time.

Cardiovascular and cerebrovascular diseases are the leading cause of mortality and the most costly diseases in Canada. This analysis confirms that growth in the number of older Canadians will contribute to the rising economic costs associated with heart disease and stroke. One way to address the human and financial costs of CVDs is to reduce the risk factors associated with CVDs.

The cost savings from reducing five of the risk factors that contribute to CVDs is significant. Over the next 10 years, a cumulative reduction of more than $76 billion is anticipated if the CHHS-AP targets for these risk factors are achieved. The largest proportion of this reduction is related to the expected decrease in ischaemic heart disease. The decrease in premature mortality is the most important reason explaining this large cost reduction.

The potential cost savings from reducing the five risk factors highlighted in this report is significant.

Although beyond the scope of this analysis, it could be argued that additional cost reductions would occur if other modifiable CVD risk factors—such as diabetes rates, cholesterol levels, sodium consumption, and certain psychological factors—were reduced. Working on these fronts would also help reduce CVD prevalence and contribute to a reduction in future CVD costs.

Finally, it is important to underscore that the cost savings from reduced risk factor prevalence increase dramatically over time, compared with the scenario where only about half of the improvement takes place. As highlighted in this analysis, the cost savings between the two scenarios are under $2 billion per year in the first few years of the forecast period but increase to about $10 billion per year by 2020. The growing level of total savings indicates that reaching the CHHS-AP targets would lead to significantly larger savings if the forecast was extended beyond 2020.

APPENDIX A

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APPENDIX B

Related Products and Services

Centre for Chronic Disease Prevention and Management

The Centre for Chronic Disease Prevention and Management is designed to confront the pressures that chronic disease places on our economy, health systems, and individual quality of life and on the health of our communities.

Roundtable on Socio-Economic Determinants of Health

The Roundtable on Socio-Economic Determinants of Health explores the many ways in which better policy integration across all levels and domains of government can build strong communities that have the capacity to support healthy living.

Centre for Health System Design and Management

The Centre for Health System Design and Management brings together senior decision makers from across the country and from a variety of sectors to examine the evidence for effective system and management practices.

How Canada Performs: A Report Card on Canada

The Conference Board of Canada's annual report card measures how well Canada is meeting its overarching goal of creating a high and sustainable quality of life for all Canadians by earning high and sustainable grades in six categories: economy, innovation, environment, education and skills, health, and society. Visit www.conferenceboard.ca/HCP/ for benchmarking results.

Healthy People, Healthy Performance, Healthy Profits: The Case for Business Action on the Socio-Economic Determinants of Health

Business has an important role to play in addressing the socio-economic determinants of health. These determinants—income, employment and working conditions, education and literacy, housing, food security, etc.—have a greater impact on health outcomes than do genetics, individual choices, and the health-care delivery system. This report provides practical guidance and principles of success to businesses that may take action.

Healthy Provinces, Healthy Canadians: A Provincial Benchmarking Report

This publication breaks new ground in that it benchmarks the performances of the provinces on 70 health indicators grouped into the three categories of health status, health outcomes, and health-care utilization and performance. The report shows which provinces are top performers and gives them a clear understanding of where their systems are strong, where they need to improve, and to which provinces they should look for best practices.

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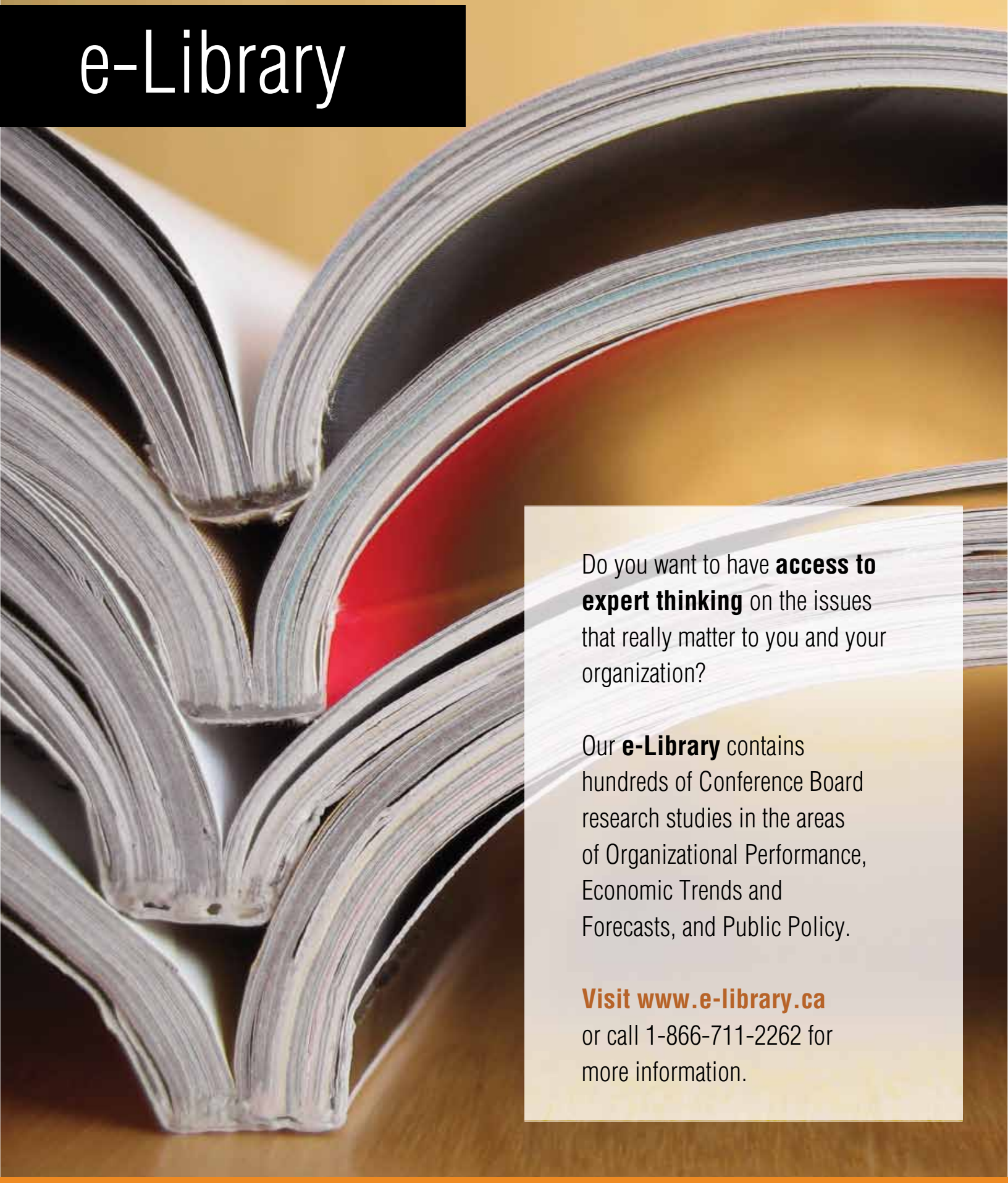

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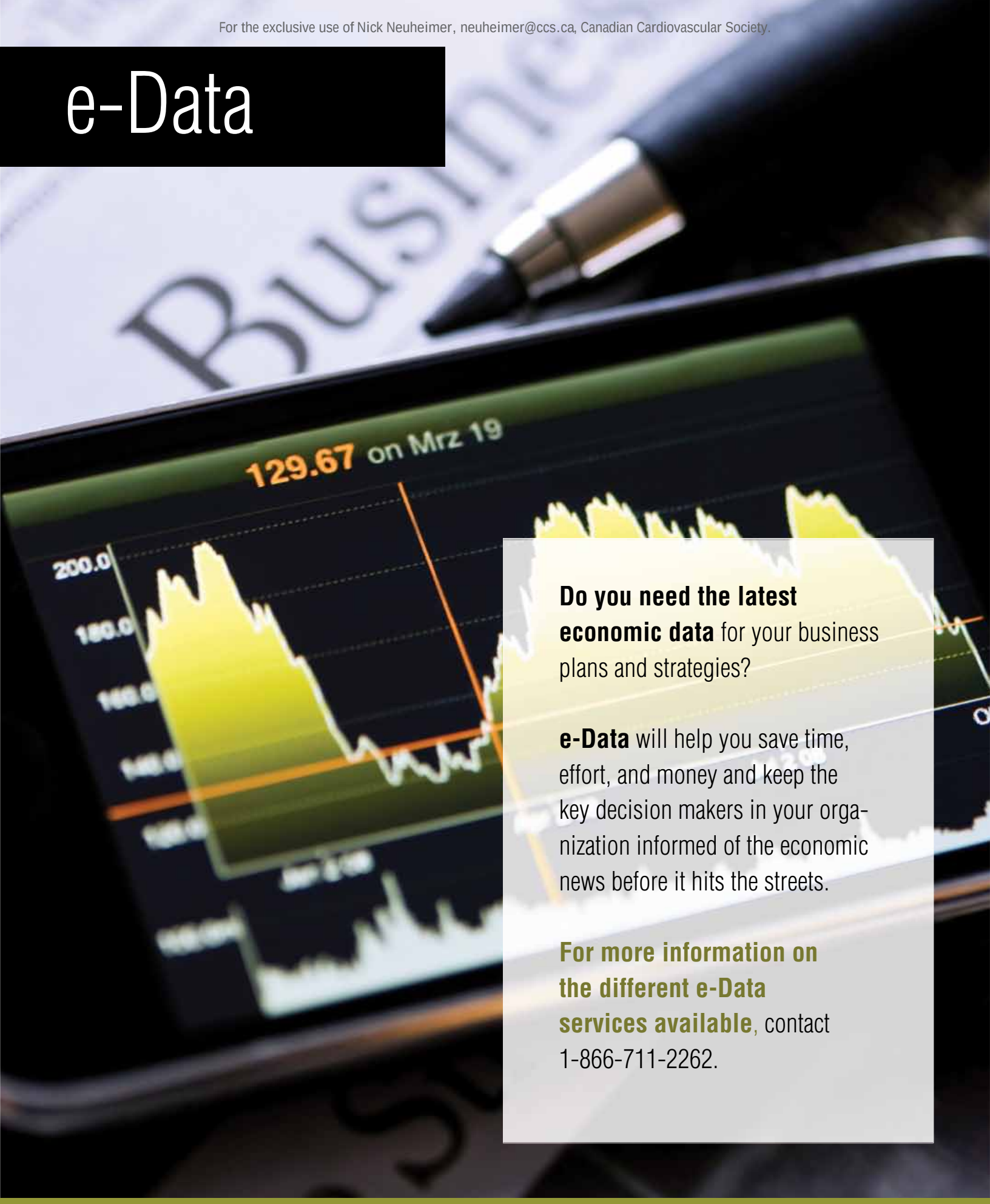

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