HEALTHY CANADIANS

2010

A FEDERAL REPORT ON COMPARABLE HEALTH INDICATORS

Government of Canada

Gouvernement du Canada

Canada

Message from the Minister of Health

Our government remains committed to helping Canadians to be among the healthiest people in the world. To this end, I am delighted to release *Healthy Canadians—A Federal Report on Comparable Health Indicators 2010*.

This report is the fifth of the *Healthy Canadians* series, which provides Canadians with important information on the health of Canadians and an update on the performance of our health care system. The health indicators used in these reports provide standardized measures to track changes over time. They also help identify potential areas of our health care system to focus needed improvements.

As Minister of Health, I am extremely gratified to learn that most Canadians continue to be satisfied overall with health care services they receive. Since our last report in 2008, levels of physical activity have increased and more Canadians report their health as excellent or very good. While this is encouraging, more work has to be done in several areas, such as reducing obesity and wait times for health care.

Protecting the health and safety of Canadians and their families is a priority of our government. We recently invested $500 million to continue the development of Canada's electronic health record system. The *Canada Consumer Product Safety Act* became law in December 2010 and provides Government with the tools to continue to effectively protect the safety of Canadians. Health Canada will also continue to modernize the legislation governing consumer, therapeutic and food product safety to further protect Canadian families from unsafe consumer products. Recognizing the importance of effective disease prevention, health promotion and improved health outcomes for First Nations and Inuit, other recent initiatives include continued investment in Aboriginal health programs and improving the affordability and accessibility of healthy foods in northern and remote communities.

I would like to thank Statistics Canada and the Canadian Institute for Health Information for their continued support and vital contributions to the development of this report, in particular in their capacity as data providers.

As an excellent research tool, I am certain *Healthy Canadians 2010* will advance discussions aimed at strengthening our health system and support improvements that help Canadians maintain and enhance the quality of their health.

Sincerely,

Leona Aglukkaq
Minister of Health

Statement of Responsibility

Deputy Minister of Health
Health Canada
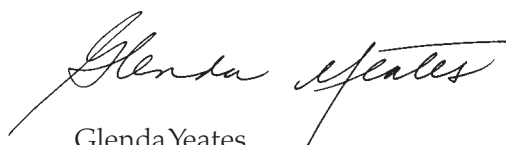
Management's Responsibility for Health Indicator Reporting

Healthy Canadians 2010 — A Federal Report on Comparable Health Indicators provides the public, health care providers and stakeholders with important information on the health of Canadians and the performance of Canada's health care system particularly in areas such as access, quality, health status and wellness.

Published every two years, the report fulfills the Government of Canada's commitment to improved public reporting on comparable health indicators under the *2003 First Ministers' Accord on Health Care Renewal* and the *2004 Ten-Year Plan to Strengthen Health Care*. More comprehensive, the 2010 edition includes data on fifty-two comparable health indicators, building on the thirty-seven indicators in the 2008 *Healthy Canadians* report.

The data contained in this report are drawn from the Canadian Community Health Survey, Vital Statistics, the Aboriginal Peoples Survey and other databases. Health Canada collaborated with Statistics Canada, the Canadian Institute for Health Information and the Public Health Agency of Canada to ensure accurate, reliable data are available for these reports.

Limitations on data quality in this report have been disclosed and explained where necessary. To the best of our knowledge, the report is complete and accurate, unless otherwise noted. I am confident that Canadians, the health sector and stakeholders alike will find the wealth of information offered in this report both interesting and useful.

Glenda Yeates
Deputy Minister of Health

Table of Contents

Health Status and Wellness

List of Figures

List of Tables

Acknowledgements

The *Healthy Canadians 2010* project team consisted of the following individuals from the Applied Research and Analysis Directorate, Strategic Policy Branch, Health Canada:

– Marcel Dubois and Bernard Bilodeau, Project leaders and authors
– Alexander Kuc, Analyst
– Allan Gordon, Manager

The project team acknowledges the following individuals for their assistance in preparing key sections of the report:

– Jean-François Asselin, Robyn Foster, Jim Grose, Shamali Gupta and Stéphane L. Paré

Health Canada also expresses its gratitude to the following individuals who provided advice and guidance on the production of *Healthy Canadians 2010—A Federal Report on Comparable Health Indicators*:

– Nana Amankwah, Health Care Policy Directorate, Strategic Policy Branch, Health Canada
– Ahmed Loita, Federal Provincial Relations Division, Strategic Policy Branch, Health Canada
– Lewis McCall, Audit and Accountability Bureau, Health Canada
– Michael Day-Savage, Strategic Policy, Planning and Analysis, First Nations and Inuit Health Branch, Health Canada
– Rene Dion, Strategic Policy, Planning and Analysis, First Nations and Inuit Health Branch, Health Canada
– Paul Sandage, Strategic Policy, Planning and Analysis, First Nations and Inuit Health Branch, Health Canada
– Paula Stewart, Centre for Chronic Disease Prevention and Control, Health Promotion and Chronic Disease Prevention Branch, Public Health Agency of Canada
– Eric R. Driscoll, Centre for Chronic Disease Prevention and Control, Health Promotion and Chronic Disease Prevention Branch, Public Health Agency of Canada
– Steven Guercio, National Microbiology Laboratory, Infectious Disease and Emergency Preparedness Branch, Public Health Agency of Canada

The following data suppliers are acknowledged for their provision of data:

– Statistics Canada
– Canadian Institute for Health Information
– Public Health Agency of Canada

The following departments are acknowledged for their input:

– Department of National Defence
– Correctional Service of Canada
– Veterans Affairs Canada
– Royal Canadian Mounted Police
– Citizenship and Immigration Canada

Health Canada would like to acknowledge the following individuals for their contribution to *Healthy Canadians 2010—A Federal Report on Comparable Health Indicators:*

– Irwin Hinberg, Constance Campbell and Brigitte Zirger, Therapeutic Products Directorate, Health Products and Food Branch, Health Canada
– Deborah Gibson, Office of Nutrition Policy and Promotion, Health Products and Food Branch, Health Canada

Executive Summary

The 2000 First Ministers' Communiqué on Health articulated the commitment of federal, provincial and territorial governments to improve accountability and reporting to Canadians. It directed them to collaborate and develop a framework of comparable health indicators on health status, health outcomes and quality of service. It also committed governments to comprehensive and regular public reporting. These commitments were reiterated in the 2003 and 2004 Health Accords.

Healthy Canadians—A Federal Report on Comparable Health Indicators 2010 is the fifth in a series of reports on the health status of Canadians and the performance of our health care system.

Healthy Canadians 2010 presents 52 indicators that are based on input from health partners, experts and the public at large, and were identified as being of interest and/or use to Canadians. Data on the general population come largely from Statistics Canada, the Canadian Institute for Health Information, and the Public Health Agency of Canada. Limited information on First Nations and Inuit are drawn from the Aboriginal Peoples Survey. Almost all of the reported data are from 2000 or later, and all highlighted differences are statistically significant.

Selected highlights from *Healthy Canadians 2010* are presented below:

The General Canadian Population:

- In 2009, 62.2% of Canadians aged 12 years and older reported that their health was "excellent" or "very good," an increase from 59.7% in 2003.

- In 2005-07, life expectancy for Canadian men was 78.3 years, an increase from 76.6 in 1999-2001. Life expectancy for women was 83.0 years in 2005-07, an increase from 81.9 years in 1999-2001.

- In 2008-09, fewer Canadians younger than 75 years of age were hospitalized for chronic conditions that could be cared for in the community—320 admissions per 100,000 population, down from 428 in 2002-03.

- Fewer teenagers reported smoking in 2009—11.0% of 12-to-19-year-olds said they were current smokers, compared to 14.9% in 2003.

- In 2009, more than half of Canadians (53.2%) aged 12 years and older stated they were active or moderately active, an increase from 51.3% in 2008.

- In 2009, 13.2% of Canadians reported that they had been diagnosed by a health professional as having arthritis, a decrease from 13.8% in 2007.

- In 2007, the incidence of breast cancer among Canadian women was 98.4 cases per 100,000 females, a decrease from 101.7 cases per 100,000 females in 2000.

- In 2007, the incidence of lung cancer was 56.0 cases per 100,000 population, a decrease from the 58.8 cases per 100,000 population in 2000. The incidence of lung cancer for males also decreased from 77.1 cases per 100,000 males in 2000 to 67.8 cases per 100,000 males in 2007, whereas the incidence of lung cancer for females increased from 45.1 cases per 100,000 females in 2000 to 47.2 cases per 100,000 females in 2007.

- In 2009, about a quarter (24.4%) of Canadians aged 15 years and older who required health services for themselves or a family member reported difficulty obtaining immediate care for a minor health problem—virtually unchanged from 23.8% in 2003.

- In 2009, most Canadians (81%) aged 18 years and older reported being "very satisfied" or "somewhat satisfied" with the overall health care services they received in the past year, virtually unchanged from 79% in 2005.

- In 2009, about two-thirds of seniors (66.5%) aged 65 years and older reported having received a flu shot during the 12 months before they were surveyed, virtually unchanged from 67.2% in 2003.
- In 2009, 8.3% of Canadians aged 12 years and older reported having been diagnosed with asthma by a health professional, virtually unchanged from 8.5% in 2003.
- In 2007, the incidence of prostate cancer among Canadian men was 124.7 cases per 100,000 males, unchanged from 124.8 cases per 100,000 males in 2000.
- In 2009, almost one third of Canadians (32.6%) aged 18 years and older reported a weight and height that corresponded to a body mass index (BMI) in the overweight category, unchanged from 2003. In addition, 17.2% reported a weight and height that corresponded to a BMI in the obese category, an increase from 14.9% in 2003.
- In 2006–07, 5.2% of Canadians were diagnosed with diabetes by a physician, an increase from 3.8% in 2000–01.
- In 2009, 14.2% of Canadians aged 12 years and older reported having been diagnosed with high blood pressure by a health professional, an increase from 13.0% in 2003.

First Nations:

- During the 10 year-period from 1991 to 2001, the mortality rate for intestinal/rectal cancer was higher among Registered Indian females (22.6 deaths per 100,000 females) than for Non-Aboriginal Canadian females (14.8 deaths per 100,000 females).
- During the 10 year-period from 1991 to 2001, mortality rates for ischemic heart disease were higher for Registered Indians (155.0 deaths per 100,000 males and 74.8 deaths per 100,000 females) than for Non-Aboriginal Canadians (123.2 deaths per 100,000 males and 48.8 deaths per 100,000 females).
- In 1991-2001, mortality rates for cerebrovascular disease of Registered Indians (35.4 deaths per 100,000 males and 40.9 deaths per 100,000 females) were higher than the rates for Non-Aboriginal Canadians (28.2 deaths per 100,000 males and 21.4 deaths per 100,000 females).

Inuit:

- In 2006, 50% of Inuit aged 15 years and older reported their health as "excellent" or "very good."
- In 2006, 58% of Inuit aged 15 years and older reported that they were daily smokers and 8% reported that they were occasional smokers.
- In the period from 1999-2003, male and female residents of Inuit regions had higher mortality rates for cerebrovascular disease (15.7 deaths per 100,000 males and 25.7 deaths per 100,000 females) when compared with all Canadian males and females (9.7 deaths per 100,000 males and 7.9 deaths per 100,000 females).
- During the five year-period from 1999 to 2003, both male and female residents of Inuit regions had higher mortality rates for lung cancer (54.7 deaths per 100,000 males and 53.2 deaths per 100,000 females) than their general Canadian counterparts (19.9 deaths per 100,000 males and 12.4 deaths per 100,000 females).
- During the five year-period from 1999 to 2003, both male and female residents of Inuit regions had higher mortality rates for colorectal cancer (18.3 deaths per 100,000 males and 17.7 deaths per 100,000 females) than their general Canadian counterparts (8.3 deaths per 100,000 males and 5.5 deaths per 100,000 females).
- In the period from 1999 to 2003, the potential years of life lost due to suicide and self-inflicted injuries were 5,415.8 years per 100,000 residents of Inuit regions, 14.4 times higher than for the overall Canadian population (376.9 years).
- In 1999-2003, the potential years of life lost due to unintentional injuries were 3,817.8 years per 100,000 residents of Inuit regions, 4.7 times higher than for overall Canadians (804.1 years).

I Introduction

This section provides information on the Government of Canada's *Healthy Canadians* series, what is included and what is new for 2010, as well as how the report is organized.

Purpose of this Report

The Government of Canada is committed to being accountable and reporting to Canadians. To do this, it provides information on comparable health indicators to help stakeholders—such as federal, provincial and territorial jurisdictions and health care providers—follow trends and progress toward improving the health of Canadians.

Healthy Canadians—A Federal Report on Comparable Health Indicators 2010, is the fifth in a series of reports designed to provide the most current national information available on the health status of Canadians and the performance of our health care system. Since one of the major data sources for this report, the Canadian Community Health Survey, does not collect data from First Nations on-reserve and some remote First Nations and Inuit communities, some information on these two groups is presented separately.

Background

Several agreements outlined the commitment of the federal, provincial and territorial (F/P/T) governments to improve accountability and reporting to Canadians. These include the First Ministers' Meeting Communiqué on Health[1] (also referred to as the 2000 Communiqué), the 2003 First Ministers' Accord on Health Care Renewal[2] (also known as the 2003 Health Accord), and the 10-Year Plan to Strengthen Health Care, also known as the 2004 Health Accord.[3] As part of their commitment to accountability, First Ministers also agreed to report to Canadians on health system performance. Details about these agreements have been published in previous editions of *Healthy Canadians*.[4]

Selection of Indicators

Healthy Canadians reports include various health indicators and related data to report on health system performance and health status. A health indicator is a summary measure, usually expressed as a number, which provides information on a particular topic. It keeps track of changes and compares information across years or geographical regions. For example, the indicator *Perceived Health* indicates the percentage of Canadians aged 12 years and older who rate their overall health as either "excellent" or "very good."

A preliminary list of indicators was generated using the complete list of 70 comparable health indicators approved by F/P/T Ministers of Health in 2004;[5] recommendations from the Office of the Auditor General of Canada from her report on health indicator reporting in Canada that was tabled in February 2009;[6] information from the Health Accords related to topics that might have been excluded from past editions of *Healthy Canadians;* information from Statistics Canada (SC) and the Canadian Institute for Health Information (CIHI) on what data are expected to be available in 2010 as well as on their revised Health Indicator Framework;[7] and information from public opinion research to replace SC indicators on satisfaction (e.g., satisfaction with overall health care services) that recently became optional content in its *Canadian Community Health Survey*[8] (national-level data will no longer be available on these indicators).

An advisory group composed of representatives from Health Canada and the Public Health Agency of Canada was formed and asked for advice on the list of proposed indicators for inclusion in this report. In addition, the group provided input into the production of *Healthy Canadians 2010*.

A total of 52 indicators have been selected for inclusion in this report, an increase from 37 in *Healthy Canadians 2008*.

What is New in this Edition

In addition to an increase in the number of indicators, this edition includes, where applicable, interpretation to help readers understand what the results mean and what they can do to maintain and improve their health. For example, for the indicator *Body Mass Index,* information is provided on the health problems associated with being underweight or overweight/obese, and some practical tips are provided to help you maintain or achieve a healthy weight.

Organization of this Report

Part II, *The Federal Government's Role in Health*, provides a brief overview of the Canadian health care system (including national health expenditures), and a more detailed description of the federal role in this system.

In Part III, *Measuring Performance*, national-level information is presented on the 52 indicators featured in this report, including: a description of what the indicators measure; how the indicators are used (where applicable); data limitations; data sources; results; and practical information for the reader (where applicable). Information on the general population is presented, as well as on First Nations and Inuit when data are available.

In Part IV, *Health Information—Challenges and Next Steps*, challenges facing the collection and reporting of health information are highlighted, notably for First Nations and Inuit populations.

How Health Indicators Can Be Used

Comparable health indicators can be used by public health professionals, policy makers and individuals to monitor trends in a particular area, such as changes in the prevalence of smoking among teenagers. They can also be used to plan and evaluate health-related programs aimed at helping Canadians maintain and improve their health.

Limitations of Health Indicators

Indicators alone are not useful in identifying the causes behind a health-related behaviour or medical condition. To illustrate this, consider the indicator *Body Mass Index (BMI)*. Knowing that BMI is changing tells us nothing about why BMI may be changing. In fact, quite often the underlying causes are complex and multi-factorial. For example, BMI can be influenced by one's socio-economic status, lifestyle or behaviour, factors which are not obvious when looking at the indicator itself. While the authors of *Healthy Canadians* have done their best to include information on the factors influencing each of the featured indicators, time and space constraints have limited what is displayed. Readers should therefore be cautious in terms of how they use this information. You should always consult a health care provider when you have questions about your health.

Methodological Note to Readers

Comparisons were made between the year for which the most recent data were available and the baseline year. Baseline refers to the year 2000, when the First Ministers' Meeting Communiqué on Health was signed, or the earliest subsequent year for which data were available. Comparisons were also made between the most recent year and the previous period. Where possible, comparisons were also made between the sexes.

Age-standardized data are presented when possible. Age-standardization presents the indicator as it would be if the population had a standard age structure. It corrects for Canada's aging population, or in the case of international comparisons, for the differences in population age structures between countries. By removing the influence of age, any observed differences can then be attributed to other underlying factors. For Canadian data, the 1991 Canadian age structure is used as the standard population, but other countries and organizations employ different standard populations (e.g., the 1980 Organisation for Economic Co-operation and Development (OECD) total population). The choice of a standard population can have an impact on the ranking of the countries being compared. Therefore, comparisons between data standardized to different populations should be limited.

All reported differences in the presentation of survey results (e.g., the Canadian Community Health Survey) are statistically significant ($p<0.05$),[9] i.e., they are based on tests that take into account the size of the sample and the design of the survey used, as well as the number of comparisons made. Where the data describe the overall population (e.g., Vital Statistics), no statistical testing was required (e.g., mortality, potential years of life lost, life expectancy and low birth weight).

While information on the general population and First Nations and Inuit are presented together, these populations differ in some significant ways. For example, First Nations and Inuit tend to be younger than the total Canadian population. In particular, the proportion of First Nations and Inuit populations under age 25 is 50% and 56%, respectively, while the proportion of the overall Canadian population under 25 is 31%.[10] In addition, some data for the Canadian population and First Nations and Inuit populations are derived from different sources. For example, data for self-reported health status for the general population were drawn from Statistics Canada's Canadian Community Health Survey (excludes persons living on First Nation reserves), whereas data for Inuit were drawn from the 2006 Aboriginal Peoples Survey. As a result, caution should be exercised when making comparisons between these distinct populations.

Other relevant details are presented in the notes beneath the figures or in Annex 2.

II The Federal Government's Role in Health

Canada's health care system involves various stakeholders including federal, provincial, territorial and municipal governments, health care providers, non-governmental organizations, the private sector and the Canadian public. The provinces and territories manage, organize and deliver health care services to the vast majority of Canadians, while the Government of Canada supports the publicly funded health care system by:

- providing funding to provinces and territories through the Canada Health Transfer (CHT) and other transfers targeted to health care
- supporting health research, health promotion and health protection
- direct spending initiatives in areas of federal responsibility

These three activities are described below in the section on *Expenditures on Health*.

The Government of Canada also administers the *Canada Health Act (CHA).* The Act articulates the main objective of Canadian health care policy, which is, "to protect, promote and restore the physical and mental well-being of residents of Canada and to facilitate reasonable access to health services without financial or other barriers." It specifies the criteria and conditions provinces and territories must adhere to—universality, accessibility, portability, comprehensiveness and public administration—in order to receive their full share of the federal cash contribution under the CHT.

The Government of Canada serves as guardian and regulator through legislation and the regulation of drugs and medical devices, consumer products and food, pesticides, chemicals, nuclear and radiological safety, illicit drugs, and through the use of science to assess health risks to Canadians and to put into place mechanisms to mitigate these risks. It acts as an information provider by generating and sharing knowledge and information for personal decision making, regulations and standards, and health innovations.[12]

The *Canada Health Act* excludes members of the Canadian Forces, persons appointed to a position of rank within the Royal Canadian Mounted Police, persons serving a prison term in a federal penitentiary, and persons who have not completed a minimum period of residence in a province or territory (a period that must not exceed three months). In addition, the definition of "insured health services" excludes services to persons provided under any other Act of Parliament (e.g., foreign refugees) or under the workers' compensation legislation of a province or territory.[11]

The Government of Canada provides services to First Nations and Inuit as well as the populations excluded from the CHA (military personnel, members of the Royal Canadian Mounted Police (RCMP), inmates of federal correctional facilities) and veterans, persons detained for immigration purposes, and refugees and refugee claimants. It provides some primary health care services to First Nations and Inuit and the Canadian Forces, as well as supplementary services (e.g., pharmaceuticals, dental and vision care, psychological and/or mental health care) to all these populations. See Annex 1 for more information.

Expenditures on Health

In 2010, total health expenditures in Canada were forecast as $191.6 billion.[13] Over two-thirds (70.5%) of this came from public sector sources, and less than one-third (29.5%) from the private sector (**Figure 1**). The federal government provided 3.5% in the form of direct health care spending, and provincial/territorial governments provided about two-thirds (65.2%). However, a significant portion of provincial/territorial expenditures are drawn from federal CHT support.[14, 15, 16]

Figure 1 Total Forecasted Health Expenditure by Funding Source, Canada, 2010

Private sector
$56.6 billion (29.5%)

Social Security Funds
$2.5 billion (1.3%)

Municipal governments
$0.9 billion (0.5%)

Federal Direct
$6.7 billion (3.5%)

Provincial/territorial governments
$125.0 billion (65.2%)
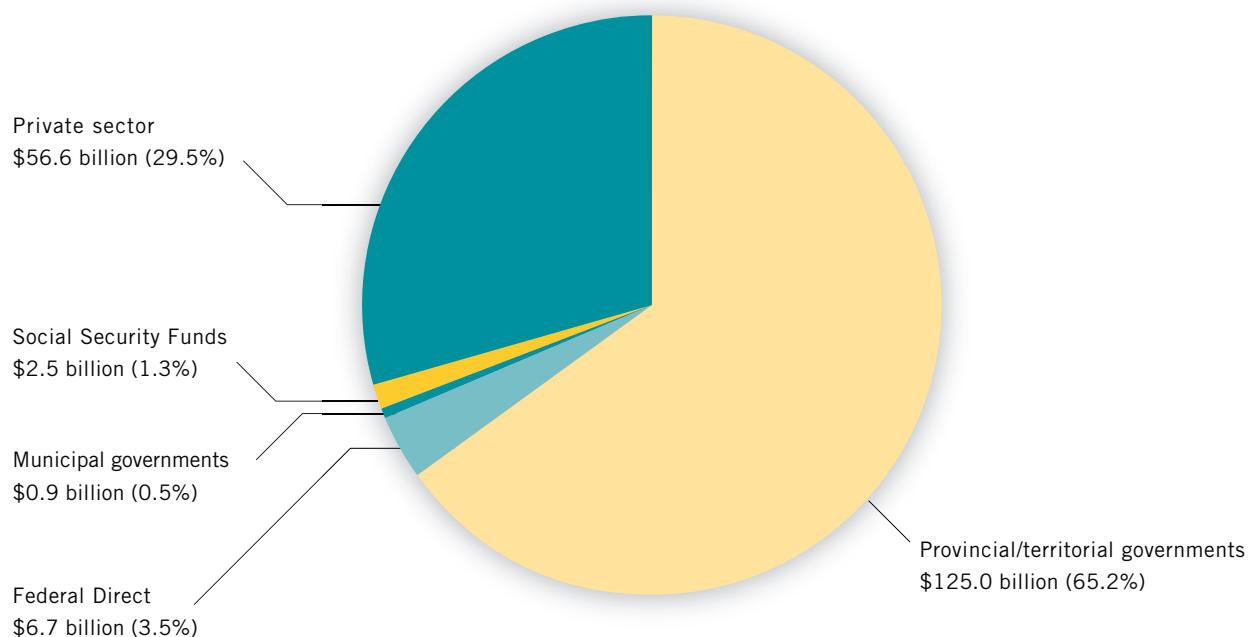
Source: Canadian Institute for Health Information. *National Health Expenditure Trends, 1975–2010, Table A.2.1.*

Notes: Public sector includes Provincial/territorial governments, Federal Direct, Municipal governments, and Social Security Funds.
These figures are forecast estimates. Final figures will not be available until December 2012.

In 2010-11, federal funding to the provinces and territories will amount to $25.4 billion in cash transfers, and with an annual 6% escalator, it will reach over $30 billion per year by 2013-14.[17] Provinces and territories also receive CHT support through tax transfers which amount to $13.1 billion in 2010-11 and that continue to grow in line with the economy.

In 2010, the Government of Canada provided an estimated $6.7 billion (**Figure 1**) for health research, health promotion and health protection, and for health services to populations excluded from the CHA, First Nations and Inuit, veterans, persons detained for immigration purposes, and refugees and refugee claimants. Specifically, to advance the development of research, the Government of Canada funds organizations like the Canadian Institutes of Health Research (CIHR). Finally, as a leader in health care renewal, the Government of Canada funds independent organizations that support health-related knowledge development and dissemination, such as CIHI, the Health Council of Canada, the Mental Health Commission of Canada, the Canadian Patient Safety Institute, and the Canadian Agency for Drugs and Technologies in Health.

The Government of Canada makes direct investments to address health care priorities. For example, in support of governments' shared commitments to reduce wait times, as set out in the 2004 10-Year Plan to Strengthen Health Care, the federal government is providing provinces and territories with $5.5 billion over ten years (from 2004–05 to 2013–14) through the Wait Times Reduction Fund.[18] Complementing this investment, the federal government also provided jurisdictions with $612 million (from 2007–08 to 2009-10) through the Patient Wait Times Guarantee Trust,[19] as part of over $1 billion in new funding to support the development of guarantees in select areas. Similarly, Budget 2009 provided $500 million in additional funding to Canada Health Infoway to encourage greater use of electronic health records.[20]

III Measuring Performance

Healthy Canadians—A Federal Report on Comparable Health Indicators 2010 provides the reader with the most current information available on the performance of our health care system and the health status of Canadians.

This section presents information on each of the 52 featured indicators and identifies the themes in recent Health Accords. It includes practical information to help Canadians maintain and improve their health. Practical information often refers to modifiable risk behaviours which are usually under your control, such as diet and lifestyle. In contrast, non-modifiable risk factors, which are not under your control, may include age, sex, the presence of a physical disability, or living or working in an environment that is not conducive to being physically active.

Information on the general population and First Nations and Inuit is included in this section. Data sources for the general population include members of some sub-groups under federal jurisdiction and exclude others. For example, the Canadian Community Health Survey includes veterans, members of the Royal Canadian Mounted Police, First Nations who are located off-reserve and Inuit, part-time members of the Canadian Forces, persons detained for immigration purposes and refugees living on Canadian soil. However, it excludes persons living on First Nation reserves and on Crown lands, residents of institutions, full-time members of the Canadian Forces and residents of certain remote regions. Additional information about data source exclusions is included in Annex 2.

In cases where data were available, international information is provided that compares data for various health indicators among the G7 countries. This may help the reader understand Canadian data in a broader international context.

> **G7 countries** are the original seven largest industrialized economies in the world. They includes Canada, France, Germany, Italy, Japan, the United Kingdom and the United States.

Overall, information presented in *Healthy Canadians 2010* shows health status improvements in several areas, such as life expectancy, ambulatory care sensitive conditions (chronic conditions that can be managed within the community rather than hospital settings), teenage smoking rates, physical activity and mortality rates for prostate and breast cancer. While this is certainly encouraging, deteriorations have been observed in other areas, such as in body mass index (notably in the obese category) and incidence and prevalence rates for diabetes.

Variation exists in the measurement and collection of wait times information across Canada, but CIHI continues to make good progress in working with provinces and territories to develop and implement a common approach. To complement these efforts, Statistics Canada collects self-reported wait times information that is comparable across the country. However, as is mentioned in Annex 2, self-reported information is subject to known limitations.

It should be noted that indicators featured in *Healthy Canadians 2010* represent only a part of the story on Canada's health care system and the health status of Canadians. Additionally, some contradictions in the observed data have been noted. For example, most Canadians report that their health was "excellent" or "very good," yet the data also show that close to half of the population report a body mass index corresponding to the overweight and obese categories.

Further research, as well as the continued development of additional indicators and collection of data, will contribute to a more fully developed picture of health status and health system performance in Canada, and to our shared understanding of progress toward Accord commitments.

THEME – ACCESS TO HEALTH CARE

1. PROPORTION OF THE POPULATION THAT REPORTS HAVING A REGULAR FAMILY DOCTOR

Key messages

- Having a regular family doctor improves access to preventive services
- Family doctors are an important link to diagnostic tests and medical specialists
- Most Canadians report having a regular family doctor

What does this indicator measure?

This indicator measures the percentage of the population aged 15 years and older who answered "yes" to the question: "Do you have a regular family doctor?"

> **Access to a family doctor . . .**
> . . . represents both a point of entry to Canada's health care system and a means of ensuring continuity of care across the system.

Most Canadians have access to a regular family doctor, but numbers are on the decline

The percentage of the Canadian population aged 15 years and older who reported having a regular family doctor has declined by 2.1% from 85.1% in 2003 to 83.0% in 2009.

Figure 2 **Proportion of Population that Reports Having a Regular Family Doctor**

Percentage of population aged 15 years and older having a regular family doctor, both sexes (age-standardized), Canada,* 2003-09
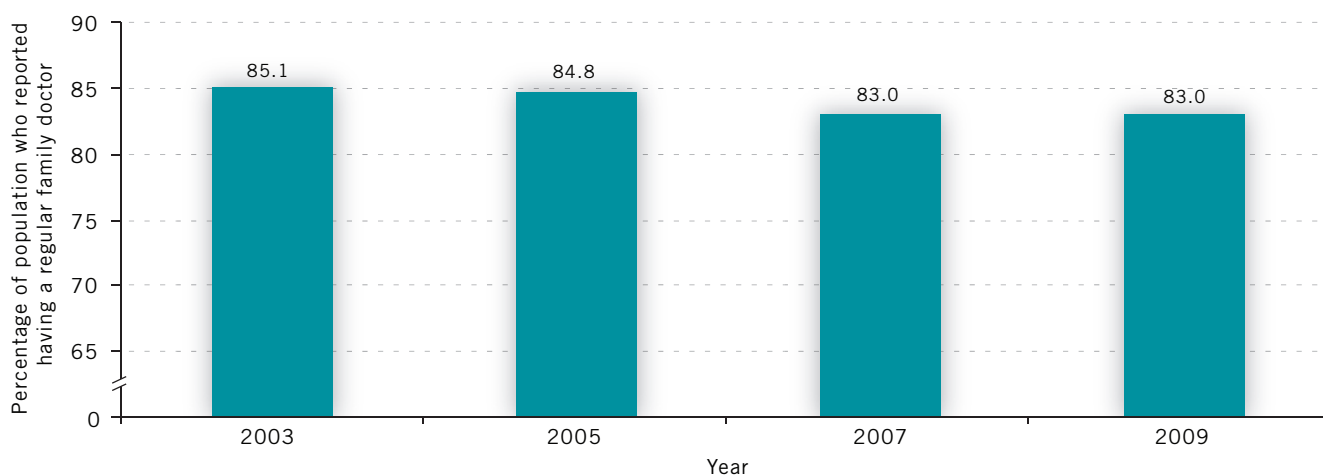
Source: Statistics Canada. Health Services Access Survey; supplement to the Canadian Community Health Survey, 2003-09.

Notes: *For 2003, 2007 and 2009, Canadian totals do not include Yukon, Northwest Territories and Nunavut. For 2005, the Canadian total includes Yukon, Northwest Territories and Nunavut's 10 largest communities.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Patients with a regular family doctor enjoy a range of benefits including access to preventive services that are based on expert guidelines as well as access to diagnostic test and referrals to medical specialists, such as oncologists or neurologists.[21, 22, 23] Continuity of care might not be of benefit to all individuals; in particular, those who have few, if any, health problems such as young adults.[21, 24] However, having the same doctor seems to benefit the elderly, people with chronic health problems and the disabled.[21] The latter statement does not mean that these individuals are the *only* ones to benefit from having a doctor; everybody should see a doctor if they suspect they have a health problem.

Benefits associated with having access to a regular family doctor

- Adults are more likely to receive recommended preventive services
- Access to diagnostic testing and specialist physicians
- Improved communication and trust fostered by an ongoing relationship with a family doctor
- Enhanced adherence to treatment

- Increased patient and doctor satisfaction
- Reduced use of emergency departments and hospital beds
- Fewer surgeries for children who have continuity of care
- Reduced health care costs
- Improved health status

Problems associated with not having access to a regular family doctor

- Difficulty accessing health care services
- Longer wait times for diagnostic tests
- Longer wait times to see medical specialists
- Poorer health outcomes

Some of the factors that might limit your ability to have access to a regular family doctor

- Where you live (rural versus urban)
- A limited supply of doctors in your community
- Your local area doctor is not taking new patients
- Language barriers
- Lack of or cost of transportation

Things you can do to find a family doctor if you do not have one

- Ask people you know including family, friends, and business associates
- Ask your nurse, pharmacist, or other health care provider for advice and guidance
- Contact provincial and territorial or regional/municipal departments of health
- If you need to consult a family doctor and one is not available, go to your nearest walk-in clinic

2. SELF-REPORTED DIFFICULTY OBTAINING ROUTINE OR ONGOING HEALTH SERVICES

3. SELF-REPORTED DIFFICULTY OBTAINING HEALTH INFORMATION OR ADVICE

4. SELF-REPORTED DIFFICULTY OBTAINING IMMEDIATE CARE

Key Messages

- Access to health services, information or care is important in maintaining and improving health
- Most Canadians do not have trouble obtaining routine or ongoing health services, health information or advice, or immediate care

What do these indicators measure?

These three indicators measure the percentage of the population 15 years of age and older who required health services for self or a family member in the 12 months prior to being surveyed, and who reported difficulties obtaining routine or ongoing health services, health information or advice, or immediate care for a minor health problem at any time of the day.

Routine or ongoing health services . . .	Immediate care for a minor health problem . . .	Health information or advice . . .
. . . refers to health care provided by a family or general physician including an annual check-up, blood tests or routine care for an ongoing illness (for example, prescription refills).	. . . includes fever, vomiting, major headaches, sprained ankle, minor burns, cuts, skin irritation, unexplained rash, and other non-life threatening health problems or injuries due to a minor accident.	. . . includes information sought from a doctor's office, community health centre or Centre local de santé communautaire (CLSC), walk-in clinic, telephone health line, hospital emergency room, or another hospital service.

What are the limitations of these indicators?

These indicators only present the distribution of people reporting difficulty and they do not measure in any way the degree of difficulty. In other words, we do not know how difficult it was for them to obtain health information or advice, for example.

Most Canadians do not have difficulty accessing health services, health information or advice, or immediate care

Most Canadians requiring routine or ongoing health services, health information or advice, or immediate care for a minor health problem do not report difficulties obtaining them. For example, in 2009, 17.9% of Canadians reported difficulty obtaining routine or ongoing health services; 15.8% reported difficulty obtaining health information or advice; and 24.4% reported difficulty obtaining immediate care.

Figure 3 Self-Reported Difficulty Accessing Health Services, Health Information or Advice, or Immediate Care

Percentage of population reporting difficulty obtaining various health services, both sexes (age-standardized), Canada,* 2003-09

What these results mean for you

Reported difficulty accessing services is an important measure of the Canadian public's ease of interacting with the health care system. Low rates are desirable as they suggest that there has been either a reduction in the need for these services, or more likely that these services are easier to access.

Accessing health services, health information or advice, or immediate care is essential in maintaining and improving health. For example, access to health information helps promote health, prevent diseases, and support clinical care, which is especially true for people with chronic diseases such as arthritis.[25] Moreover, information available through services such as Telehealth may result in fewer hospitalizations, emergency room admissions, urgent calls to the family physician, or problems related to a chronic condition.[26]

Research shows that health need—such as the number of health problems individuals may have and their self-perceived health status—is related to the use of health services. However, men and women with higher levels of education and income are more likely to access the services of a general practitioner than individuals with lower education or income. In addition, having a regular doctor is associated with having greater access to primary care and specialist care services.[27]

It is worth noting that populations most likely to benefit from services like health information may also be the least likely to access them, such as the elderly, immigrants, the disenfranchised, and the poor. To address this, health consumers need to be proactive to ensure that they fully understand the information that is available to them. Health professionals should also make attempts to tailor their messages for each specific patient.[28, 29, 30]

Benefits of access to health services, health information or advice, or immediate care

- Empowerment as individuals actively participate in their health care
- Awareness of benefits regarding health promotion to maintain and improve health
- Improved compliance with treatment
- Improved health status

Barriers in accessing health services, health information or advice, or immediate care

- Health problems may limit your ability to access services
- Disabilities such as visual impairment
- Illiteracy or low literacy
- Geographic location (urban versus rural)
- Culture/language
- Information on how to access these services is not readily available
- Service is not available (e.g., phone line is busy)

Things you can do to improve access to health services, health information or advice, or immediate care

- Seek help from a family member, friends or a trusted community member
- Ask your health care provider how to access services
- Seek out community educators to assist you in overcoming access barriers such as culture, language and low literacy levels
- Visit the website of your provincial/territorial department of health for tips and links to useful resources

5.   SELF-REPORTED WAIT TIMES FOR DIAGNOSTIC SERVICES

6.   SELF-REPORTED WAIT TIMES FOR SPECIALIST PHYSICIAN VISITS

7.   SELF-REPORTED WAIT TIMES FOR SURGERY

Key Messages

- Tracking wait times is an important part of assessing health system performance
- Early detection, diagnosis and treatment often leads to more favourable health outcomes
- Self-reported wait times for diagnostic services, non-emergency surgery and specialist physician visits remain relatively low and steady since 2003
- In areas identified as priorities for government wait time reduction efforts, eight out of ten patients received care within benchmarks in 2010
- Some patients who wait too long for non-urgent care may experience pain, stress and/or disability which can impact their quality of life[31]

What do these indicators measure?

These three indicators measure the self-reported median wait time (weeks people aged 15 years and older reported waiting) and the distribution (percentage of people aged 15 years and older that reported waiting less than one month, between one and three months, or more than three months) for (1) diagnostic services; (2) specialist physician visits; or (3) non-emergency surgery.

Diagnostic tests only include the following: non-emergency magnetic resonance imaging (MRI) devices that do not use X-rays to detect and treat illness inside the body; computed tomography (CT or CAT) scans that use X-rays for illness detection and treatment; and angiographies that use X-rays to examine the inner opening of blood-filled structures such as veins and arteries.

> **Median wait time . . .**
>
> . . . is the 50th percentile of the distribution of wait times: half the patients wait less and half wait longer than the median number of weeks.

Canadians have also become familiar with other reporting on and measurement of wait times in recent years. Separate from the indicators reported in this report, the Canadian Institute for Health Information (CIHI) is mandated to work with provinces and territories to report on progress in reducing waits for certain priority procedures. In 2011, CIHI reported the first nationally comparable data on wait times for the 2004 Accord priority areas of cardiac, cancer, joint replacements, sight restoration and diagnostic imaging. Statistics Canada's self-reported wait times information, the major source of national information on waits prior to this year and the main source of information on waits in this report, complements those efforts and continues to provide a different perspective on wait times in Canada.

Advisory to Readers: Patients who had not yet received the service were excluded from the indicator calculation.

What are the limitations of the indicators?

Wait times are based on the respondents' self-reporting and are often affected by their capacity to remember the duration that they waited for that specific health service. Because of a lack of definition as to what represents the starting point of a wait time, its duration can be difficult to estimate and could vary among respondents. Therefore, self-reported data are not always as accurate as they would be if they came from an actual clinical database.[32]

Self-reported median wait times for diagnostic services remain relatively low and steady at two weeks

In 2009, the median wait time for diagnostic services was 2 weeks, unchanged from 2003. Also in 2009, most Canadians (58.8%) aged 15 years and older who had a diagnostic service reported waiting less than one month for their test. However, 10.1% of Canadians reported that they waited over three months for diagnostic testing, although this number continues to decrease slightly year over year since 2003.

Table 1   Self-Reported Wait Times for Diagnostic Services

Median wait times, both sexes (age-standardized), Canada,* 2003-09

	2003	2005	2007	2009
Number of weeks	2**	3	2	2

Source: Statistics Canada. Health Services Access Survey; supplement to the Canadian Community Health Survey, 2003-09.

Notes: Based on household population aged 15 years and older reporting having had a diagnostic test in the 12 months prior to the survey.
Diagnostic tests include non-emergency MRIs, CT scans and angiographies only.
*For 2003, 2007 and 2009, the Canada totals do not include Yukon, Northwest Territories and Nunavut. For 2005, the Canadian total includes Yukon, Northwest Territories and Nunavut's 10 largest communities.
**Since the variability of this data point is relatively high (with a coefficient of variation between 16.6% and 33.3%), it should be used with caution.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Figure 4   Self-Reported Wait Times for Diagnostic Services

Distribution of wait times, both sexes (age-standardized), Canada,* 2003-09

Source: Statistics Canada. Health Services Access Survey; supplement to the Canadian Community Health Survey, 2003-09.

Notes: Based on household population aged 15 years and older reporting having had a diagnostic test in the 12 months prior to the survey.
Diagnostic tests include non-emergency MRIs, CT scans and angiographies only.
*For 2003, 2007 and 2009, the Canada totals do not include Yukon, Northwest Territories and Nunavut. For 2005, the Canadian total includes
Yukon, Northwest Territories and Nunavut's 10 largest communities.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Self-reported median wait times for specialist physician visits relatively steady at four weeks

The self-reported median wait time for specialist physician visits for a new illness or condition was 4.3 weeks in 2009, somewhat constant since 2003. Regarding the distribution of wait times, 46.4% of Canadians waited less than one month for specialist physician visits, while 39.2% waited from one to three months, and 14.4% waited longer than three months, an increase since 2003 when 10.4% reported waiting more than three months.

Table 2   Self-Reported Wait Times for Specialist Physician Visits

Median wait times, both sexes (age-standardized), Canada,* 2003-09

	2003	2005	2007	2009
Number of weeks	4.0	4.0	4.3	4.3

Source: Statistics Canada. Health Services Access Survey; supplement to the Canadian Community Health Survey, 2003-09.

Notes: Based on household population aged 15 years and older reporting having seen a specialist physician for a diagnosis or consultation for a new illness or
condition in the 12 months prior to the survey.
*For 2003, 2007 and 2009, the Canada totals do not include Yukon, Northwest Territories and Nunavut. For 2005, the Canadian total
includes Yukon, Northwest Territories and Nunavut's 10 largest communities.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Figure 5 Self-Reported Wait Times for Specialist Physician Visits

Distribution of wait times, both sexes (age-standardized), Canada,* 2003-09

Source: Statistics Canada. Health Services Access Survey; supplement to the Canadian Community Health Survey, 2003-09.

Notes: Based on household population aged 15 years and older reporting having seen a specialist physician for a diagnosis or consultation for a new illness or condition in the 12 months prior to the survey.
*For 2003, 2007 and 2009, the Canada totals do not include Yukon, Northwest Territories and Nunavut. For 2005, the Canadian total includes Yukon, Northwest Territories and Nunavut's 10 largest communities.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Self-reported median wait times for non-emergency surgery low and steady at four weeks

In 2009, the self-reported median wait time for non-emergency surgeries remained steady at 4.3 weeks, the same figure reported in 2003, 2005 and 2007. Regarding distribution of wait times, 42.9% of Canadians reported that they waited less than one month, while 41.0% of Canadians reported that they waited one to three months, and 16.0% of Canadians reported that they waited longer than three months, down slightly from previous years.

Table 3 Self-Reported Wait Times for Non-Emergency Surgery

Median wait times, both sexes (age-standardized), Canada,* 2003-09

	2003	2005	2007	2009
Number of weeks	4.3	4.3	4.3	4.3

Source: Statistics Canada. Health Services Access Survey; supplement to the Canadian Community Health Survey, 2003-09.

Notes: Based on household population aged 15 years and older reporting having had non-emergency surgery in the 12 months prior to the survey.
*For 2003, 2007 and 2009, the Canada totals do not include Yukon, Northwest Territories and Nunavut. For 2005, the Canadian total includes Yukon, Northwest Territories and Nunavut's 10 largest communities.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Figure 6 Self-Reported Wait Times for Non-Emergency Surgery

Distribution of wait times, both sexes (age-standardized), Canada,* 2003-09
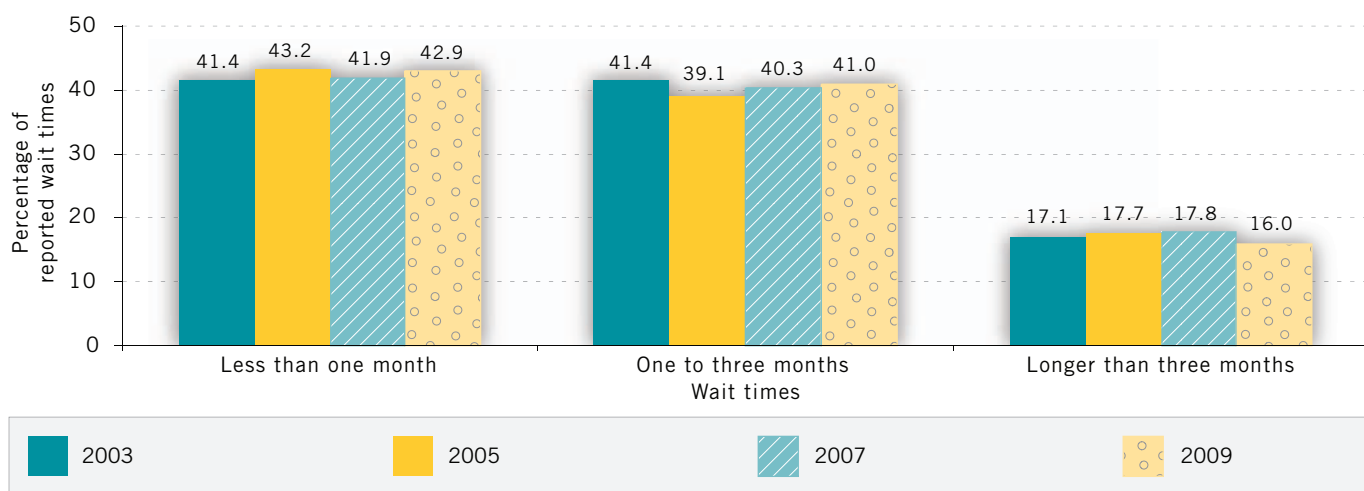
Source: Statistics Canada. Health Services Access Survey; supplement to the Canadian Community Health Survey, 2003-09.

Notes: Based on household population aged 15 years and older reporting having had non-emergency surgery in the 12 months prior to the survey.
*For 2003, 2007 and 2009, the Canada totals do not include Yukon, Northwest Territories and Nunavut. For 2005, the Canadian total includes Yukon, Northwest Territories and Nunavut's 10 largest communities.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Understanding why wait times for health care may become too long is complex, although it is most frequently a matter of demand for services exceeding the supply. This means that there are more patients requiring services than what the system is able to accommodate. Increases in demand for health services, such as diagnostic tests,[33] are rising in Canada due to such factors as advances in technology, clinical practices that allow for new ways to diagnose and treat illnesses, and changing demographics. Wait times can also be impacted by larger, system-wide challenges such as health human resources shortages (e.g., not enough specialists), lack of available beds and availability of complementary health services needed to support patients before and after a procedure. A small portion of waits can also be the result of factors other than increased demand, such as a patient's readiness for surgery or a requested delay to accommodate a patient's schedule.

To help address wait times in Canada, First Ministers, under the 2004 Health Accord, agreed to focus on reducing waits in five priority areas: cancer, cardiac procedures, diagnostic imaging, joint replacement and sight restoration. This was supported by the ten-year, $5.5 billion Wait Times Reduction Fund. Following the Accord, governments worked together to establish evidence-based common benchmarks and associated indicators for medically acceptable wait times in four of these areas. There are no benchmarks for diagnostic imaging, where there is not enough evidence on the appropriate use of the technologies to develop a benchmark. Each provincial/territorial government also agreed to publicly report to their residents on their progress (with the Canadian Institute for Health Information, or CIHI, reporting across jurisdictions).

To further support improving timely access to care, in 2007, provincial and territorial governments agreed to establish Patient Wait Times Guarantees[34] in one clinical area by March 2010. This was supported by $1 billion in federal funding. Guarantees allow patients who are coming close to the maximum medically acceptable wait time for a particular procedure to be offered an alternative option for care, such as seeing a different surgeon or travelling to a different hospital. One study showed, however, that given a choice, 63% of patients would not choose a surgeon with a shorter wait list.[35]

Evidence to date from provinces' own public reports shows that their considerable efforts to reduce wait times have decreased waits in priority areas in most parts of the country. This is reinforced by CIHI's latest report, *2011 Wait Times Tables – A Comparison by Province*,[36] which for the first time was able to provide national data and showed that eight out of ten patients received care within the benchmarks in 2010, although results varied by procedure and by province. Specifically, CIHI reports that 99% of cardiac bypass patients received care within the maximum benchmark of 26 weeks; 98% of Canadians received radiation therapy within the 4 week benchmark; 84% of hip replacements and 83% of cataract surgery patients received care within their respective benchmarks (of 26 weeks and 16 weeks); and, 79% of knee replacements and 78% of hip fracture repairs were completed within the benchmarks of 26 weeks and 48 hours, respectively.

Statistics Canada's self-reported wait times indicators discussed in the tables above continue to provide a complementary perspective on wait times in Canada by providing a national picture of Canadians' self-reported experiences with wait times in a few much broader categories of waits (e.g., self-reported waits for all surgery as opposed to the specific set of procedures included in CIHI's annual *Provincial Wait Times Tables series*).

Supporting efforts to reduce or better manage wait times remains a priority given some patients who wait for health services may be experiencing pain, stress or disability, which can impact quality of life or lead to inferior health outcomes.[37] For this reason, federal, provincial and territorial governments and health care providers remain committed to improving timely access to health services in Canada.

Benefits of timely access to health services

- Faster access to services
- Decreased risk of a health condition becoming worse
- Higher satisfaction with health care
- Greater quality of life

Health risks associated with excessive wait times to access health services

- Waiting for required health services can be frustrating, frightening and stressful
- Decreased quality of life
- Increased cost of treatment after a longer wait time
- Increased morbidity and health consequences such as pain and lost productivity
- Increased mortality

What to do if you find yourself waiting for a service

- Follow your doctor's advice in order to lessen additional injury or pain
- Consider travelling to a facility a further distance away or transferring to another specialist if advised, as it could decrease your wait[35]
- Be willing to go at unusual times of the day if services are available
- Prepare your environment, prepare yourself mentally and arrange for any help you may need afterwards if applicable
- If your wait is for surgery, learn about what you can expect before, during, and after the surgery, becoming familiar with exercises or other post-op instructions you will be required to follow

To learn more about provincial/territorial efforts to address wait times, visit the Health Council of Canada *Progress Report 2011: Health Care Renewal in Canada.* (http://www.healthcouncilcanada.ca/docs/rpts/2011/progress/2011Progress_app_ENG.pdf)

8. SELF-REPORTED PRESCRIPTION DRUG SPENDING AS A PERCENTAGE OF INCOME

Key Messages

- This indicator represents a start in our understanding of what Canadians are spending out-of-pocket to cover their prescription drug expenses
- Prescription drugs play an important role in disease prevention and treatment
- About two-thirds of Canadian households report spending less than 1% of after-tax income on prescription drugs

What does this indicator measure?

This indicator measures the percentage of Canadian households reporting out-of-pocket expenditures on prescription drugs over given percentages (i.e., 0%, 1%, 2%, 3%, 4% and 5%) of total after-tax income.

What are the limitations of this indicator?

Information on spending as reported by households represents an estimate and not the actual amount spent on prescription drugs.

After-tax income . . .

. . . is total income minus personal taxes.

Out-of-pocket . . .

. . . refers to a full or partial expenditure that is not reimbursed through a drug plan or other health insurance plan.

Most Canadian households report spending less than 1% of after-tax income on prescription drugs

In 2008, over one in five households were spending more than 1% of their after-tax income on prescription drugs. The percentages of Canadian households reporting out-of-pocket expenditures of over 2% and 3% of their after-tax income increased from 2000 to 2008.

Figure 7 Self-Reported Out-of-Pocket Prescription Drug Expenditures

By percentage of after-tax income, Canada, 2000-08

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Over 0%	64.9	65.4	65.2	64.8	65.3	65.3	65.7	66.6	66.0
Over 1%	19.0	18.6	19.1	20.3	21.0	20.0	21.0	19.8	20.8
Over 2%	10.3	10.2	10.5	11.3	11.7	11.3	12.4	11.4	11.7
Over 3%	6.3	6.2	6.5	7.1	7.1	7.5	8.0	7.2	7.6
Over 4%	4.0	3.8	4.5	4.7	5.0	4.8	5.2	4.9	4.7
Over 5%	2.9	2.7	3.0	3.1	3.5	3.3	3.8	3.4	3.0

Year

Legend: ● Over 1% ● Over 2% ○ Over 3% ○ Over 4% ▪ Over 5%
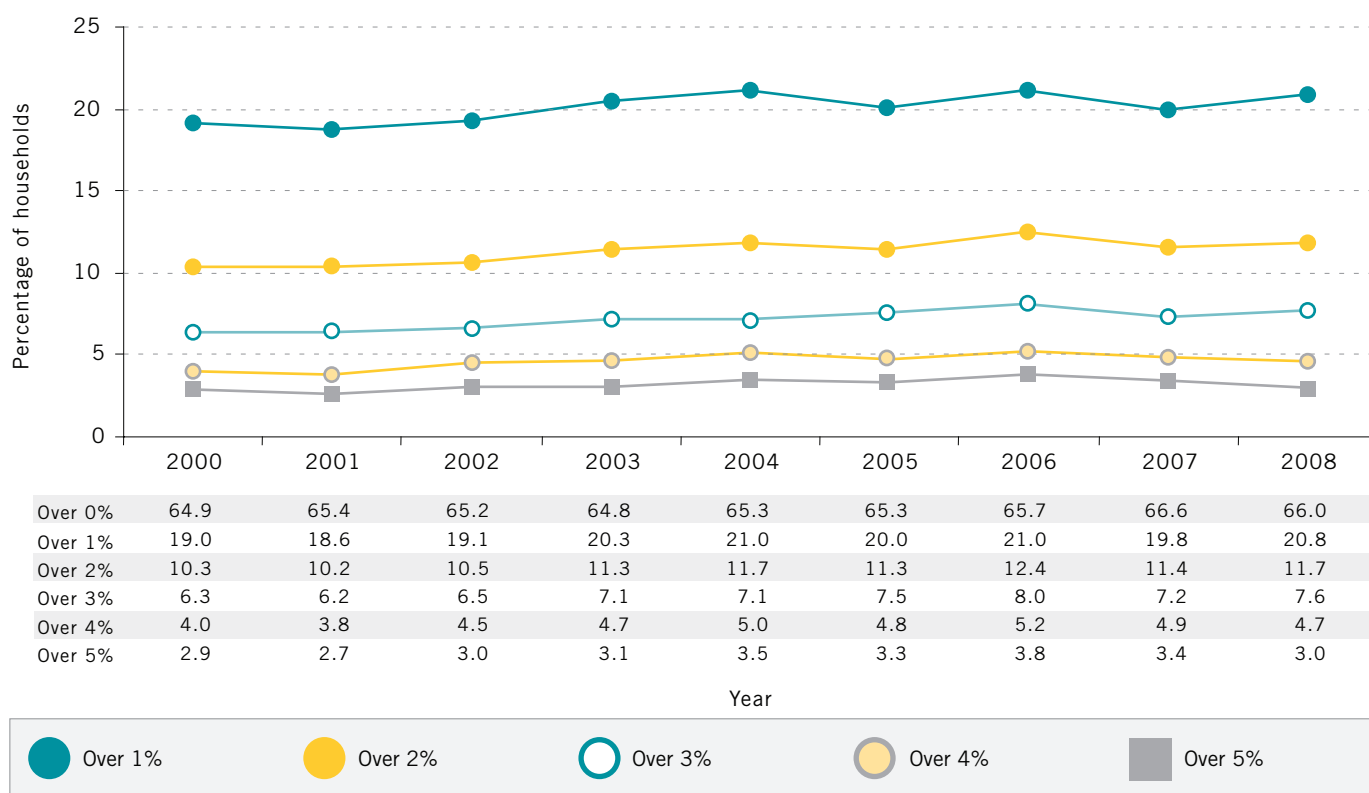
Source: Statistics Canada. Survey of Household Spending, 2000-08.

Notes: Prescription drug spending only includes prescription drugs purchased by households.
Over-the-counter drugs and drugs paid for by governments or insurance companies are not included.
Premiums for health care plans are not included.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Prescription drugs are a significant component in the fight against diseases and preventable mortality. In fact, a strong body of published evidence shows that prescription drugs have a positive impact on both the prevention and treatment of many conditions like cardiovascular disease,[38] rheumatoid arthritis,[39] diabetes,[40] the hepatitis B virus,[41] and sexually transmitted infections such as chlamydia.[42]

Treatment adherence is essential in achieving positive health outcomes and helping contain health system costs. A wide range of factors have been described as influencing adherence. Some causes of non-compliance include: the type of medical condition one has, the presence of mental disorders such as schizophrenia, language difficulties, poor memory, alcohol or substance abuse, the type of doctor-patient relationship one has, poor social supports, the route of drug administration, the appearance, colour and taste of medication, or its side effects. Meanwhile, demographic factors like age, sex and education are often not related to poor adherence.[43, 44]

Patients who do not take their medication according to the dosage and schedule are known to experience health problems, which result in a greater financial burden on health systems.[45] In addition, non-compliance with antibiotics or drugs can give rise to resistant forms of some pathogens which do not respond well to treatments. For example, resistant strains of tuberculosis are more difficult to treat and increase the likelihood that the disease is spread in the community, leading to costly outbreaks.[46]

Moreover, in a meta-analysis of 21 clinical studies involving over 46,000 individuals, researchers found a consistent link between adherence to drug therapy and mortality. In people with good adherence to a drug therapy, mortality risk was about half of that of people with poor adherence,[47] whether they took a beneficial drug therapy or a placebo.

Prescription drug use is affected by pricing and whether or not there is coverage. In fact, research has shown that cost-sharing policies—where individuals are required to pay a percentage of the cost of medication—may result in significant reductions in the number of prescribed drugs used per day by elderly patients and adult welfare recipients, resulting in a higher rate of adverse events and emergency department visits.[48]

Control of prices or coverage is essential in helping Canadians with their prescription drug expenditures. To accomplish this, the Patented Medicine Prices Review Board (PMPRB), which is an independent quasi-judicial administrative agency, regulates the prices of patented medicines (i.e., those drugs that are still protected by patents, ensuring that drug prices are not excessive). These prices refer to the "factory-gate" price for prescription and non-prescription patented drugs that are sold in Canada to wholesalers, hospitals, or pharmacies for human and veterinary use.

The PMPRB has no authority to regulate the prices of non-patented drugs, including those for which the patents have expired, and generic versions of these drugs, nor does it have jurisdiction over prices charged by wholesalers or pharmacists. However, the PMPRB analyzes and reports to Canadians on price trends of all medicines and on research and development conducted by patentees. Its work helps contribute to Canadian health care.

Benefits of prescription drugs

- Disease prevention and treatment
- Control of disease progression
- Decreased preventable mortality
- Improved health status

Problems associated with poor prescription drug compliance

- Increased morbidity
- Development of drug-resistant strains
- Increased mortality

Factors influencing the total cost of drugs

- Percentage of drugs that are patented
- Retail and wholesale mark-ups
- Pharmacists' professional fees
- The aging of the population
- The prescribing habits of physicians (e.g., patented versus generic drugs; the likelihood of prescribing a drug versus a non-drug therapy)
- Patient utilization of drugs (e.g., the number of drugs used)

Things you can do to control your prescription drug spending

- Speak with your pharmacist about purchasing generic medication
- Seek advice from your provincial/territorial department of health on their prescription drug plans
- Consult your local health care provider for additional information
- To learn more about drug therapy, please visit the Drugs and Health Products section of the Health Canada website (http://www.hc-sc.gc.ca/dhp-mps/index-eng.php) or the Patented Medicine Prices Review Board website (http://www.pmprb-cepmb.gc.ca/english/home.asp?x=1)

THEME – QUALITY OF HEALTH CARE

9. PATIENT SATISFACTION WITH HEALTH SERVICES (PUBLIC OPINION RESEARCH)

Key Messages

- Research on patient satisfaction with the health care system has become a widely assessed outcome for quality improvement
- However, the concept of satisfaction is not always well defined in research
- Most Canadians are satisfied with the health care services they received

What does this indicator measure?

This indicator measures the percentage of Canadians aged 18 years and older who rated their satisfaction with the health care services they received in the past year.

What are the limitations of this indicator?

Ratings of satisfaction may be influenced by respondent characteristics such as age, educational attainment, patient's expectations, and by socio-psychological effects such as self-interest and gratitude. Furthermore, the accuracy of ratings may be affected by many methodological factors, including sampling strategy, response rate, question format, and data collection procedure; therefore, caution must be exercised when linking patient satisfaction and the quality of services provided.

> The majority of Canadians are satisfied with the health care services they received within the last year.

Canadians satisfied with the health care service received

In 2009, 81% of Canadians who received health care services were satisfied with the service they received. Only 10% of Canadians were dissatisfied with this service.[49]

Figure 8   Patient Satisfaction with the Health Care Service Received

Percentage of Canadians who were satisfied with the health care service received within the last year, Canada, 2005-09
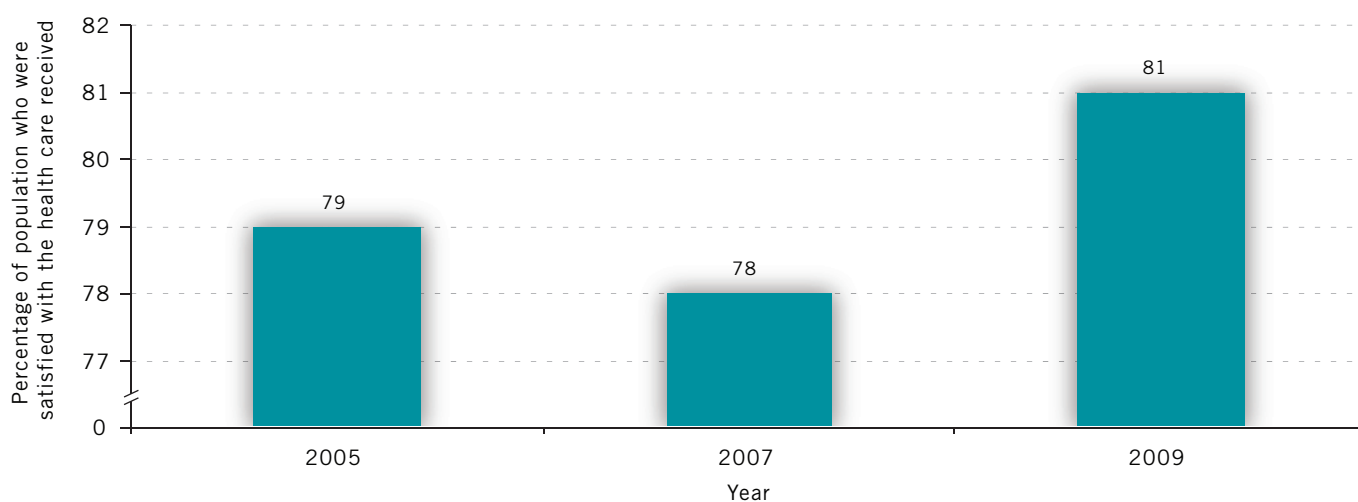
Source: *Health Canada Performance Survey 2009. The Strategic Counsel.*

Note: For additional exclusions/limitations, see Annex 2.

What these results mean for you

Several precautions must be taken into consideration when analysing the results of patient satisfaction with health care service studies. First, the quality of the measurement tools must be taken into consideration. Indeed, several studies have shown that such tools are not always valid and reliable.[50, 51] As well, patient satisfaction is a subjective measure that often relies on the patient's recollection, thus threatening the reliability of study findings.[50] With this in mind, it is not surprising to note that research findings are conflicting.[50, 52] However, most research indicate that the following factors have a positive influence on ratings of patient satisfaction with health care services: older age,[53] higher income,[54] higher self-rated health status,[55] evidence of increased health professional listening and better physician-patient communication,[56] and lower measures of depression or sadness.[56, 57] Increased patient satisfaction has also been linked to patient expectation[54] and public versus private nature of health care provision.[54] Some studies have shown that no association exists between patient satisfaction and care quality,[56, 58] while other studies have shown that patient satisfaction are associated with either high levels of education[55, 59] or lower levels of education.[52, 56]

Furthermore, there seems to be a lack of a consistent definition of patient satisfaction and what it entails. As such, the specific aspect of satisfaction with the health service in question must be noted before comparisons can be made across studies. Indeed, some studies focus on patient care satisfaction[56] while others focus on quality of treatment,[60] professional staff (interpersonal interaction),[55] quality of care (technical competence) and access to care,[55] thus making it difficult to compare across studies. Moreover, it should also be noted that the results of satisfaction studies tend to be positively skewed toward the higher end of satisfaction,[61] meaning that most respondents indicate that they are satisfied or very satisfied with the health care services they received.

Finally, some researchers argue that patient satisfaction ratings may falsely be considered to be a reflection of higher quality of care.[56]

Benefits of being satisfied with health care services

- Better adherence to treatment and doctor's recommendations
- Improved psychological well-being
- More likely to return for services when in need of care, preventing future complications
- May provide information about the health system and possible areas of concern

Disadvantages of health satisfaction studies

- Lack of evidence-based information to guide health system decision-making
- The distribution of scores is often heavily skewed toward the higher end of the satisfaction rating scale
- Difficult to link satisfaction with actual health care services because tools used to measure satisfaction are often neither valid nor reliable

Supplementary information on health satisfaction studies

Patients dissatisfied with the care they receive should take the time to express the details of their dissatisfaction with health-care provider administrators. Patient advocacy groups, satisfaction surveys and/or comment cards may be some key means to having one's concerns expressed in the public domain.

10. HOSPITALIZATION RATE FOR AMBULATORY CARE SENSITIVE CONDITIONS (ACSC)

Key Messages

- Hospitalization rate for Ambulatory Care Sensitive Conditions (ACSC) is an indictor of access to appropriate community-based care
- A disproportionately high rate for this indicator is presumed to reflect problems in obtaining access to/or the quality of primary and preventative care
- Hospitalization rates for these conditions tend to vary greatly between different socio-economic status and between urban and rural regions
- Hospitalization rates for chronic conditions that can be cared for in the community have declined since 2002–03

What are Ambulatory Care Sensitive Conditions?[62]

Ambulatory Care Sensitive Conditions are long-term health conditions which can often be managed with timely and effective treatment in the community without hospitalization. Conditions include angina, asthma, congestive heart failure, chronic obstructive pulmonary disease, diabetes, epilepsy and hypertension. High rates of hospital admissions for ACSCs may provide indirect evidence of problems with patient access to primary health care, inadequate skills and resources, or disconnection with specialist services.

What does this indicator measure?

This indicator measures the acute care hospitalization rate for conditions where appropriate ambulatory care prevents or reduces the need for admission to hospital, per 100,000 population under the age of 75 years.

Only visits resulting in an inpatient admission in a hospital are included from the Hospital Morbidity Database.

Hospitalization rates for ambulatory care sensitive conditions are decreasing since 2002-03

Hospitalization rates for chronic conditions that can be cared for in the community have declined for males and females. For both sexes combined, the latest data (2008-09) showed a rate falling to 320 admissions per 100,000 population, from 356 admissions per 100,000 population in the previous time frame (2006-07) and 428 admissions per 100,000 population in 2002-03.

The rate for males decreased to 357 admissions per 100,000 males in 2008–09 from 400 hospitalizations per 100,000 males in 2006-07, and from 488 admissions per 100,000 males in 2002-03. The rate for females decreased to 283 admissions per 100,000 females in 2008-09 from 312 hospitalizations per 100,000 females in 2006-07, and from 371 admissions per 100,000 females in 2002-03. Canadian males continue to have higher rates of hospitalizations than females (357 admissions per 100,000 males versus 283 admissions per 100,000 females in 2008-09). The difference in rates between males and females is smaller than it was in 2002-03.

Figure 9   **Ambulatory Care Sensitive Conditions**

Hospitalization rate for ambulatory care sensitive conditions, per 100,000 population under 75 years old, by sex (age-standardized), Canada, 2002-03 to 2008-09
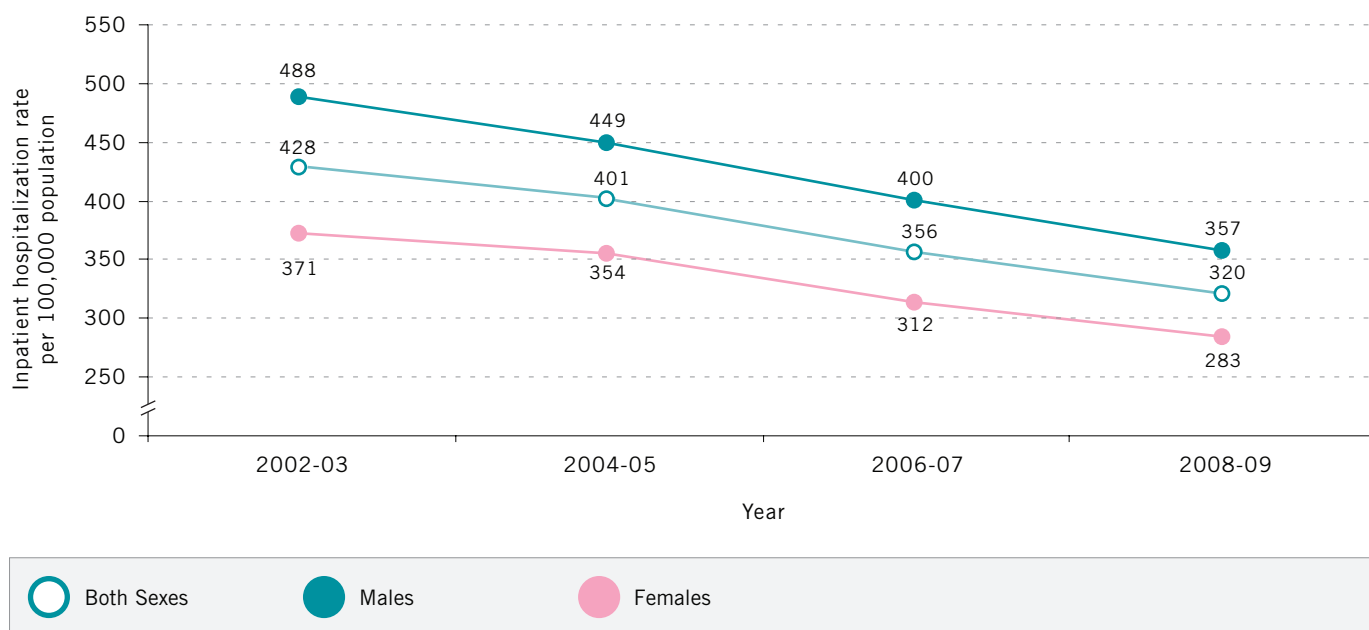
Sources: Canadian Institute for Health Information. Hospital Morbidity Database.
Fichier des hospitalisations MED-ÉCHO, Ministère de la Santé et des Services sociaux, Québec.

Notes: Starting with 2006-07, the indicator definition was revised and data were recalculated for the years beginning 2001–02 onwards. Comparison with rates from editions of *Healthy Canadians* published before 2008 should not be made.
Excludes patients not treated as inpatients in acute care hospitals, patients 75 years of age and older, and patients who died before discharge.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Quality primary health care is a key element in effective and efficient health systems. Primary care includes many services that are often difficult to measure and availability of primary health care data is also limited. The hospitalization rate for ambulatory care sensitive conditions, however, may serve as a proxy for the availability and quality of the primary health care system as it represents the volume of hospital activity that is potentially preventable by timely and effective primary care.[63, 64]

Although preventive care, primary care and community-based management of these conditions will not eliminate all hospitalizations, such steps could prevent many of them. For example, while not all admissions for ambulatory care sensitive conditions are avoidable, it is assumed that appropriate ambulatory care (i.e., community care) could prevent the onset of this type of illness or condition, control an acute episodic illness or condition, or manage a chronic disease or condition.[65]

Socio-economic status may play a role in hospitalization rates for ambulatory care sensitive conditions. Several studies from the United States showed that racial and ethnic minorities were more likely than Caucasians to be hospitalized for ambulatory care sensitive conditions,[66, 67] and rates of hospitalizations were higher for people with lower levels of education or income,[68] residents in rural areas,[69, 70] uninsured[67, 71] and U.S. Medicare beneficiaries.[67, 70] Even in countries with universal medical care systems such as Canada and Australia, patients who were economically disadvantaged were more likely to have higher hospitalization rates for selected ambulatory care sensitive conditions than those from the highest income scale.[63, 72] It is hypothesized that higher rates of visits and hospitalizations for less advantaged individuals may be because of their higher disease prevalence, increased disease severity and multiple comorbidities, all resulting from a lack of primary care in their neighbourhood.[62]

Optimizing the management and treatment of ambulatory care sensitive conditions will contribute to both improved patient health outcomes and more efficient resource utilization.[73]

Benefits of ambulatory care

- Decreased health care costs
- Patients can stay home instead of in the hospital
- Decreased risks of hospital-acquired infections (e.g., nosocomial infections)
- Better overall community health status
- Improved patient health

Impact of unnecessary hospitalization

- Increased wait times in hospital emergency rooms for everyone
- Increased costs to the health care system
- Increased risks of hospital-acquired infections (e.g., nosocomial infections, etc.)
- Hospital beds that could be used for more critical cases

Things you can do to prevent hospitalization for ACSC

- Talk to your health care provider about any routine or on-going care that may be necessary for your condition, or about the health care services and/or resources available in your community
- Emergency situations may require the use of hospital services

11. READMISSION RATE FOR ACUTE MYOCARDIAL INFARCTION (AMI)

Key Messages

- Examining hospital readmission rates for selected conditions is one way of measuring the quality and efficiency of care
- Multifaceted interventions provided in the community by different health care professionals have been shown to decrease the readmission rate for AMI
- Readmission rate for acute myocardial infarction is decreasing

What does this indicator measure?

This indicator measures the risk-adjusted rate of unplanned readmission following discharge for AMI. A case is counted as a readmission if it is for a relevant diagnosis and occurs within 28 days after the index (or first) episode of care. An episode of care refers to all contiguous acute care hospitalizations and same-day surgery visits.

What are the limitations of this indicator?

From 2003–04 to 2005–06, case selection criteria were revised to account for the fact that an increasing number of AMI patients were undergoing revascularization procedures (e.g., percutaneous coronary intervention or coronary artery bypass) at their initial admission. In the case of revascularization procedures, AMI diagnosis may not have been documented as the reason for the hospital admission. Therefore, while changes were expected to improve comparability between jurisdictions, the comparison of 2003-04 to 2005-06 rate with those of previous years should be done with caution.

Readmission rate for acute myocardial infarction is decreasing

Readmission rate for acute myocardial infarction for 2006-07 to 2008-09 was 4.7% (each point is an average covering a three-year period). This is a decrease from 5.6% in 2004-05 to 2006-07, and from 6.2% in 2003-04 to 2005-06.

Figure 10 Readmission Rate for Acute Myocardial Infarction (AMI)

Both sexes, Canada,*, ** 2003-04 to 2008-09
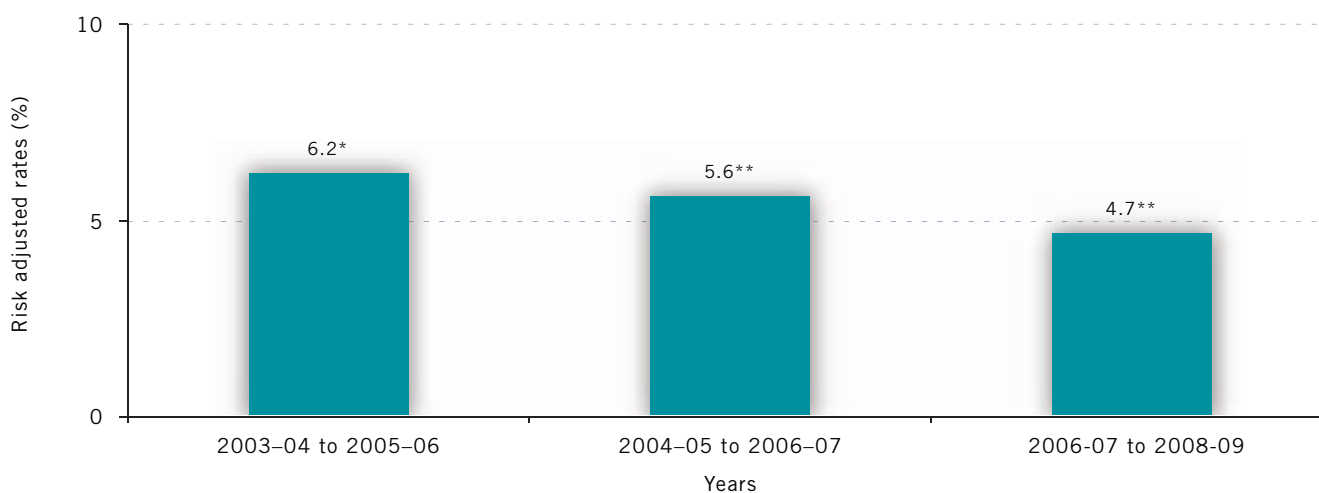
Sources: Canadian Institute for Health Information. Discharge Abstract Database; National Ambulatory Care Reporting System. Alberta Ambulatory Care Database, Alberta Health and Wellness.

Notes: *Due to differences in collection, Québec and Manitoba data are not included in the 2003–04 to 2005–06 average.
**Due to differences in collection, Québec data are not included in the 2004–05 to 2006-07, and 2006-07 to 2008-09 averages.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Readmission after hospital discharge is increasingly being viewed as an indicator of quality and efficiency of care.[74] Factors that can influence readmission include: medication that is prescribed when an individual is initially discharged from the hospital; patient compliance with directions; the quality of follow-up care in the community; and the quality and completeness of care during initial hospitalization.[75] Some of these factors are directly related to care at the hospital while others relate to the availability of appropriate services in the community.

Several studies have shown the effectiveness of various quality improvement interventions, such as pairing patients with peer advisors after discharge,[76] disease management programs administered by home health nurses,[77] and enrolment in cardiac rehabilitation programs,[78, 79] all of which can be used to reduce the risk of readmission and improve outcomes for patients with AMI. These examples suggest that readmission rates can be reduced after hospitalization for AMI, in many cases by having health care providers in hospitals connect patients with appropriate community services after discharge.[80]

Although readmission for medical conditions can involve factors outside the direct control of the hospital, high rates of readmission act as a signal for hospitals to look more carefully at their practices, including the risk of discharging patients too early and the relationship with community physicians and community–based care.[75]

Benefits of not being readmitted in hospital following AMI

- Patients are treated in the community instead of in the hospital
- Increased knowledge and management of risk factors for the patient
- Patient is more in control of his/her health
- Lower cost to the health care system

Risks associated with AMI

- Smoking
- Physical inactivity
- Diet rich in saturated and trans fats
- Diet high in sodium
- High blood cholesterol
- High blood pressure
- Obesity
- Diabetes
- Excessive alcohol drinking
- Stress
- A family history of heart disease

Things you can do to prevent readmission for AMI

Talk to your health care provider about the following:

- Lifestyle modification and/or treatment of risk factors
- Enrollment in cardiac rehabilitation programs
- Pairing with a peer advisor after discharge to promote active participation in cardiac rehabilitation programs
- Discussing disease management programs available within your community

THEME – SUSTAINABILITY OF THE HEALTH CARE SYSTEM

12. NUMBER OF FAMILY PHYSICIANS

13. NUMBER OF SPECIALIST PHYSICIANS

14. NUMBER OF REGISTERED NURSES

15. NUMBER OF LICENSED PRACTICAL NURSES

Key Messages

- The supply, distribution and mix of family and specialist physicians and nurses affect the health care available to (and therefore the health status of) a population
- The number of family and specialist physicians has increased during the period 2000 to 2008
- The number of registered nurses and licensed practical nurses in the workforce has increased by close to 2% every year since 2004
- The average age of family and specialist physicians and registered nurses is on the rise
- Strategies are in place to address health human resource issues in Canada

What do these indicators measure?

These indicators measure the number of family physicians/doctors (family medicine and emergency medicine specialists) and specialist physicians (medical, surgical and laboratory specialists), as well as the number of registered nurses and licensed practical nurses, who were active on December 31 of the reference year, per 100,000 population.

There are three regulated nursing professions in Canada: registered nurses (includes nurse practitioners), licensed practical nurses (the title in Ontario is registered practical nurses) and registered psychiatric nurses. Registered psychiatric nurses (total workforce of 5,162 in 2008) are regulated and employed in only the four western provinces—Manitoba, Saskatchewan, Alberta and British Columbia. Therefore, the indicator on nurses nationally includes only the registered nurses and licensed practical nurses.

Nurse practitioners are a regulated subset of registered nurses who have additional educational preparation and experience. They are registered in all provinces and territories, with the exception of Yukon where the regulation is pending. The number of nurse practitioners in the workforce has doubled from 800 in 2004 to 1,626 in 2008.[81]

What are the limitations of these indicators?

Due to differences in data collection, processing and reporting methodology, CIHI data may differ from that originating from provinces and territories. Readers are cautioned to avoid inferences regarding the adequacy of provider resources based on supply ratios alone.

See Annex 2 for additional information.

The number of family and specialist physicians and nurses is on the rise

Relative to 2000 and 2006, more family and specialist physicians were practicing in Canada in 2008 (101 and 95 per 100,000 population, respectively). A similar trend is seen in nursing with more registered nurses and licensed practical nurses practicing in Canada (786 registered nurses and 223 licensed practical nurses per 100,000 population, respectively). According to CIHI, the number of regulated nurses in the workplace has increased by close to 2% every year since 2004.[81]

Figure 11 **Number of Family and Specialist Physicians**
Per 100,000 population, Canada, 2000-08
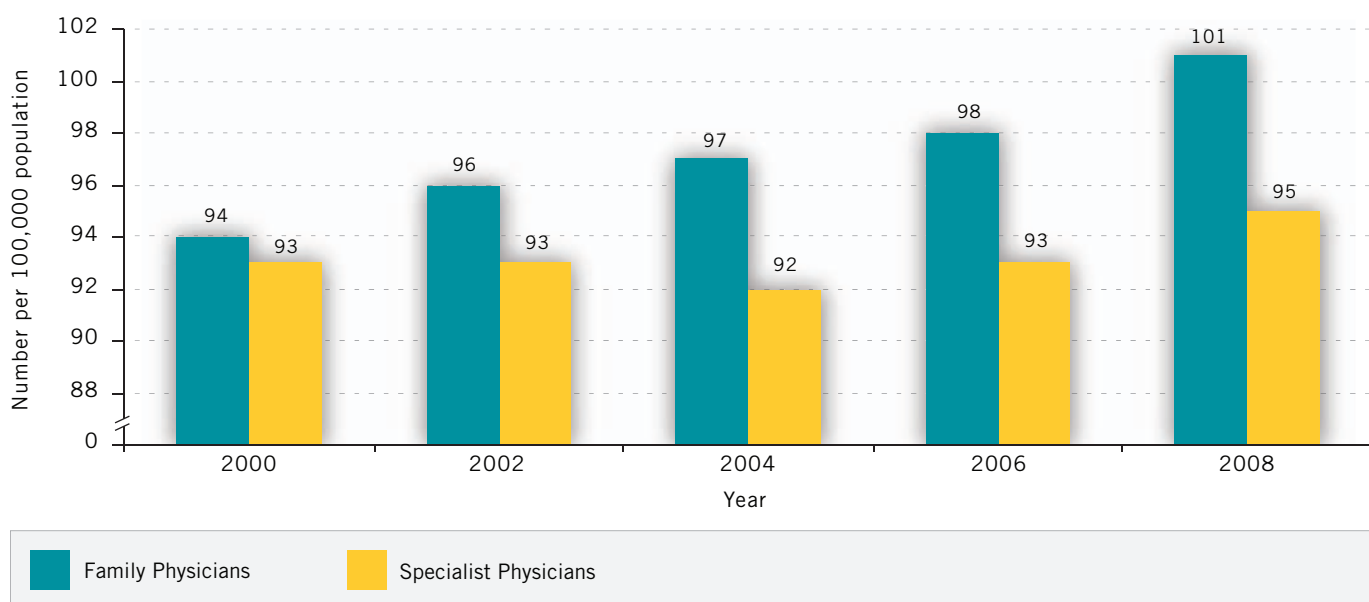
Source: Canadian Institute for Health Information. Scott's Medical Database.

Notes: Non-certified specialists are counted as family medicine physicians for all jurisdictions except, as of 2004, Newfoundland and Labrador and Saskatchewan and, as of 2007, Nova Scotia, New Brunswick and Yukon, where they are counted as specialists.
For additional exclusions/limitations, see Annex 2.

Figure 12 Number of Active-Practising Registered Nurses and Licensed Practical Nurses
Per 100,000 population, Canada, 2000-08
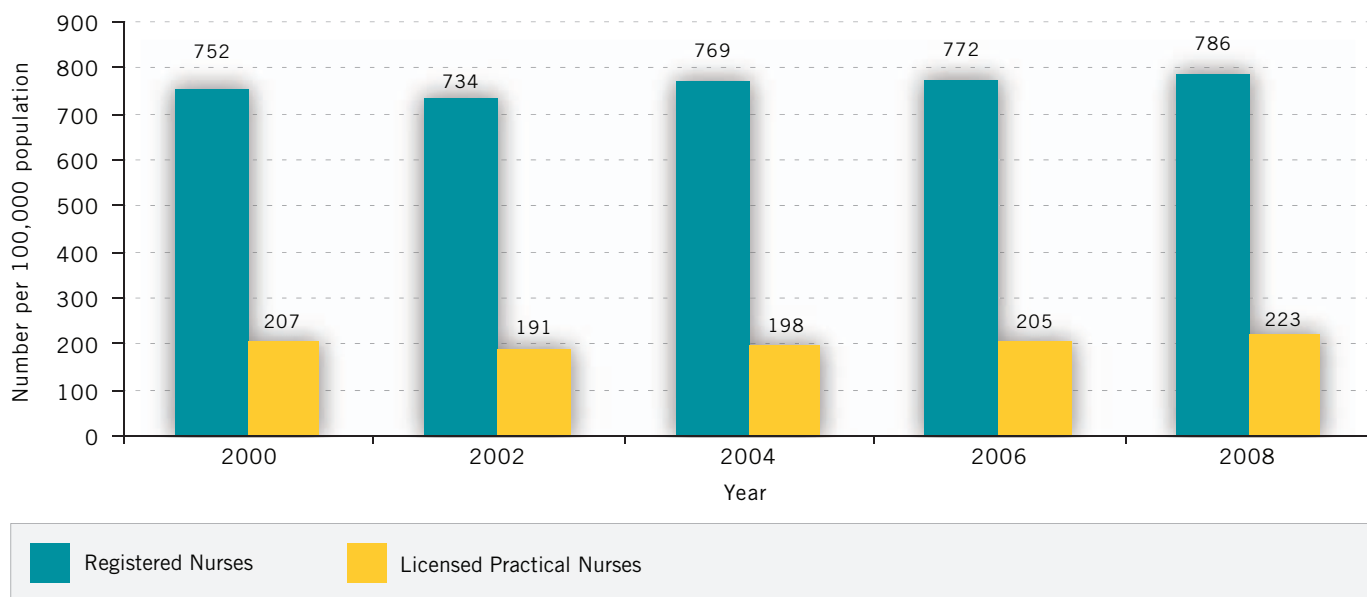
Sources: Canadian Institute for Health Information. *Health Indicators 2002-10.*

Notes: Because confidence intervals were not available for nurses, the analysis on this professional group does not refer to statistical significance. For additional exclusions/limitations, see Annex 2.

Data for the Organisation for Economic Co-operation and Development (OECD) may differ from Canadian data on the same indicators shown here because the original data source may have undergone a periodic revision or reference years may differ according to the country. Therefore, data are not directly comparable between Canadian and international graphs.

Internationally, in 2008 with respect to physicians, Canada ranked fifth of the six G7 countries for which data were available, with 2.27 professionally active physicians per 1,000 population. Regarding nurses, Canada ranked third of the five G7 countries for which the latest data were available, with 10.32 professionally active nurses per 1,000 population.

Figure 13 **Professionally Active Physicians**
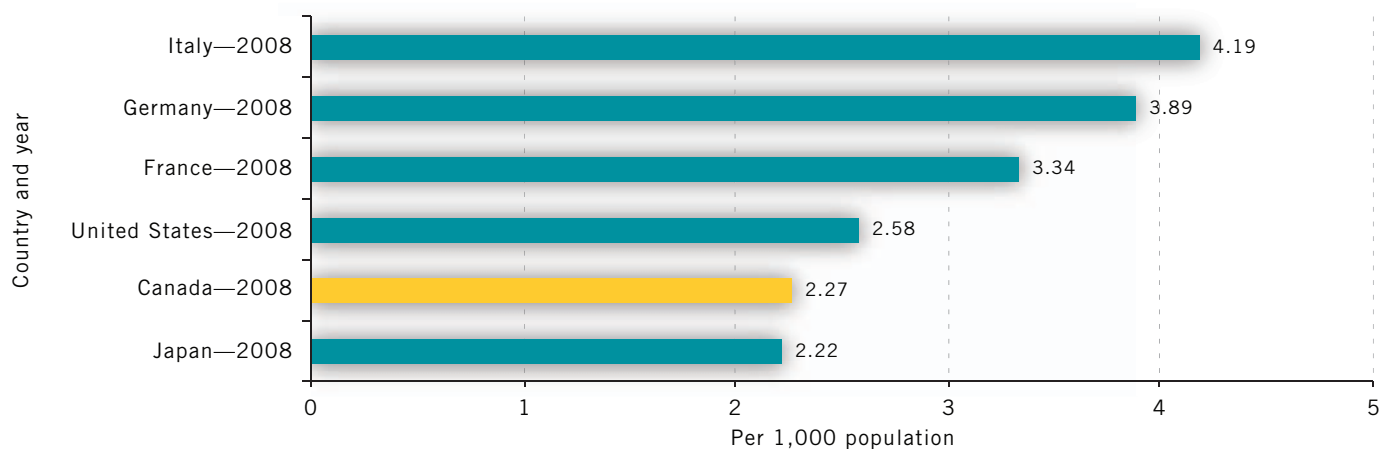
Per 1,000 population, selected countries and years

Country and year	Per 1,000 population
Italy—2008	4.19
Germany—2008	3.89
France—2008	3.34
United States—2008	2.58
Canada—2008	2.27
Japan—2008	2.22

Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.

Notes: Data were not available for the United Kingdom.
Canadian data shown in this OECD graph are not comparable to Canadian data on similar indicators shown elsewhere in *Healthy Canadians 2010* because the original data source may have undergone a periodic revision.
Includes physicians who have contact with patients, plus managers, professors, researchers, etc.
For additional exclusions/limitations, see Annex 2.

Figure 14 **Professionally Active Nurses**
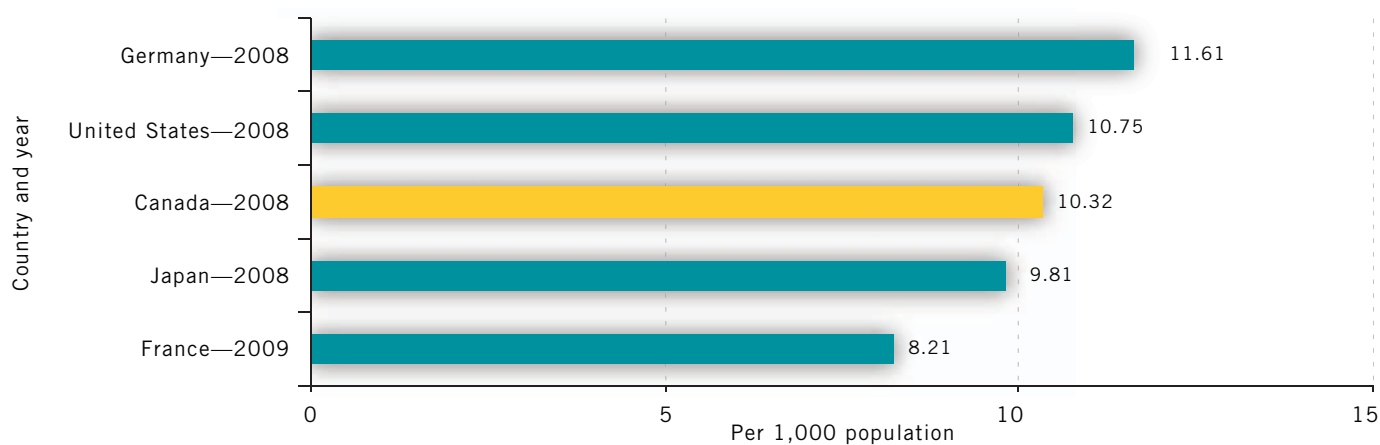
Per 1,000 population, selected countries and years

Country and year	Per 1,000 population
Germany—2008	11.61
United States—2008	10.75
Canada—2008	10.32
Japan—2008	9.81
France—2009	8.21

Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.

Notes: Data were not available for Italy and the United Kingdom.
Includes professional nurses, associate professional nurses, nurses working in administration, management and research.
Canadian data shown in this OECD graph are not comparable to Canadian data on similar indicators shown elsewhere in *Healthy Canadians 2010* because the original data source may have undergone a periodic revision.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

The supply, distribution and mix of health human resources have an important impact on the health of a population. Indeed, the largely knowledge-based nature of these resources makes it possible to dispense needed services to individuals and communities in a timely, cost-effective manner.[82] This, in turn, has a very real impact on health outcomes.[83] Therefore, to help improve the health status of individuals and communities, decision-makers must understand their health needs and tailor health human resource supplies and their distribution efficiently.

According to CIHI, the demographic profile of physicians has been changing.[84] In fact, in 2008, the average age of family and specialist physicians combined was 49.8 years old, which is a slight increase from 48.5 in 2004. Moreover, the number of male physicians increased by 3.8% between 2004 and 2008, while the number of female physicians increased by 16.3%. In 2008, 52.1% of new family physicians and 45.1% of new specialist physicians were females. Also in 2008, 34.7% of the physician workforce was composed of females, up from 32.1% in 2004.

Regarding nurses, the demographic profile of the workforce has also been changing.[81] In 2008, the average age of registered nurses was 45.1, up slightly from 2004. However, the average age of licensed practical nurses was 43.4 in 2008, down slightly from 2004. Also in 2008, over 92% of the workforce of registered nurses and licensed practical nurses were females.

The Pan-Canadian Health Human Resource (HHR) Strategy, developed out of the 2003 and 2004 Health Accords, supports a range of innovation projects undertaken with interested jurisdictions and stakeholders. These projects are intended to increase HHR planning capacity and optimize the delivery of health care services to better meet population health needs.

Health Canada, through the Office of Nursing Policy (ONP), addresses nursing policy issues within the Department. For example, ONP focuses on what needs to occur in the nursing workforce to ensure that all Canadians have access to health services when and where they need them; to ensure the quality of those services is continually improved; and that the system can provide the necessary care for today and has the capacity to identify and adapt to the emerging needs and challenges of tomorrow.

Supplementary information on the supply of physicians and nurses in Canada

- Consult CIHI's documents for more information on the supply of physicians (http://secure.cihi.ca/cihiweb/products/SMDB_2008_e.pdf) and nurses (http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=download_form_e&cw_sku=RNIC0408FPDF&cw_ctt=1&cw_dform=N) in Canada
- Government of Canada's Health Human Resources Strategy (http://hc-sc.gc.ca/hcs-sss/hhr-rhs/strateg/index-eng.php)
- Health Canada's Office of Nursing Policy (http://www.hc-sc.gc.ca/ahc-asc/branch-dirgen/spb-dgps/onp-bpsi/index-eng.php)

16. NUMBER OF MAGNETIC RESONANCE IMAGING (MRI) SCANNERS

17. NUMBER OF MAGNETIC RESONANCE IMAGING (MRI) TESTS

18. NUMBER OF COMPUTED TOMOGRAPHY (CT) SCANNERS

19. NUMBER OF COMPUTED TOMOGRAPHY (CT) TESTS

Key messages

- Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) Scanners are important diagnostic tools that help identify diseases and other health problems
- As of January 1, 2010, 281 MRI scanners and 484 CT scanners were operational in Canada, an increase from 149 MRI scanners and 325 CT scanners in 2003

What do these indicators measure?

These indicators measure the number of MRI and CT scanners, respectively, and the number of MRI and CT tests, respectively.

> An **MRI scan** is a pain-free, non-invasive test that is used to detect problems within the body or brain, and it can identify abnormalities from outside the body. MRI scans can view from various angles.

> A **CT scan** is a pain-free, non-invasive test that is used to detect problems within the body or brain, and it can identify abnormalities from outside the body. CT scans can view images horizontally.

> **MRI OR CT SCAN?**
>
> The decision as to which scanner is the best tool to diagnose a health condition depends, in part, on available resources (e.g., availability of scanners and the technicians needed to use them), the type of condition the physician thinks you may have and which type of tissue or structure may be affected. MRI scans are known to provide more detail. CT scans are better at scanning bone or "hard" tissue while MRI scans are better for "soft" tissue. The MRI cannot be used if patients have metal in their body.

What are the limitations of these indicators?

According to the Canadian Institute of Health Information (CIHI), wide variation exists across Canada in terms of the use of these machines.[85]

The number of MRI and CT scanners continues to rise in Canada

In 2010, 281 MRI and 484 CT scanners, respectively, were available in Canada, which are increases from 149 MRI and 325 CT scanners in 2003, and 266 MRI and 464 CT scanners in 2009.[85]

Figure 15 Number of Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) Scanners
Canada, 2003-10
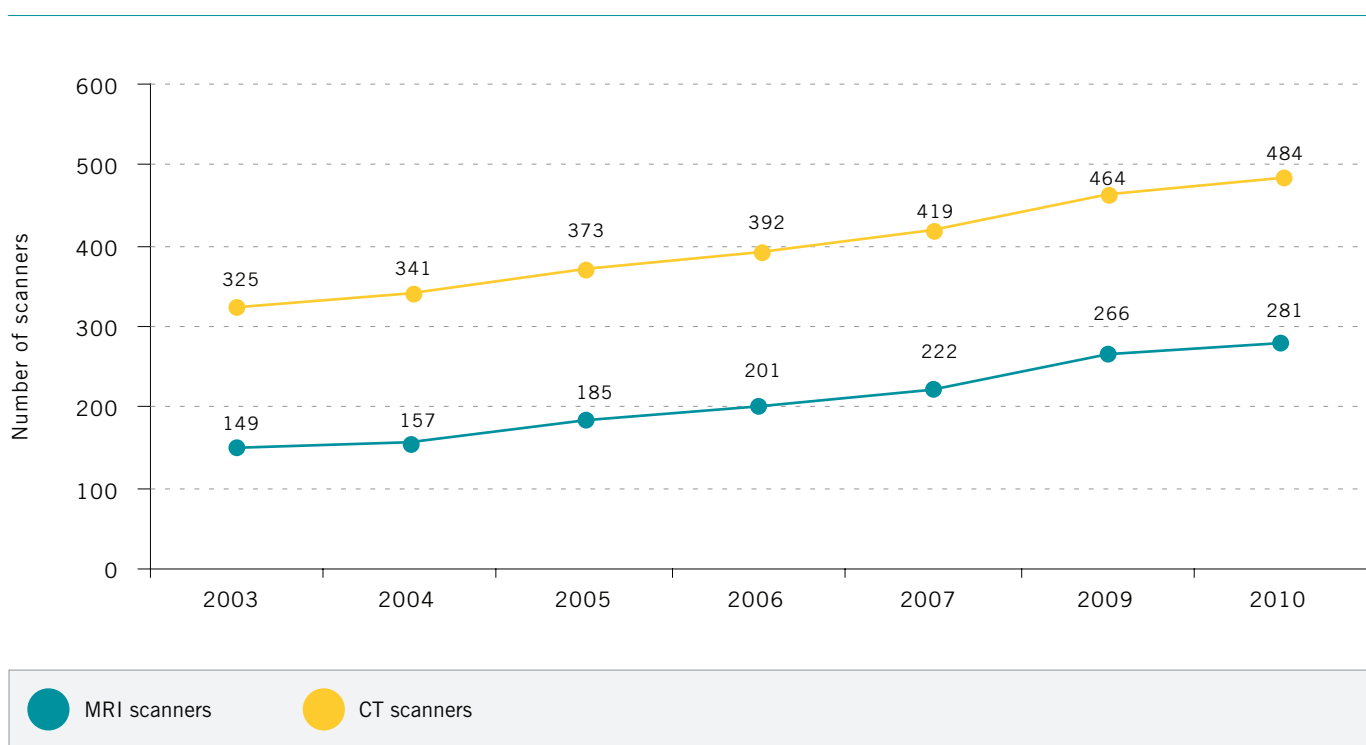
Source: Canadian Institute for Health Information. National Survey of Selected Medical Imaging Equipment.

Note: For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country. Therefore, data are not directly comparable between Canadian and international graphs.

Internationally, in 2009 Canada ranked fourth of the five G7 countries for which data were available, with 8.0 MRI scanners per 1,000,000 population, and 13.9 CT scanners per 1,000,000 population. A large degree of variation exists across OECD countries in the number of MRI and CT scanners that are available.

Figure 16 Number of Magnetic Resonance Imaging (MRI) units per 1,000,000 population
Selected countries and years
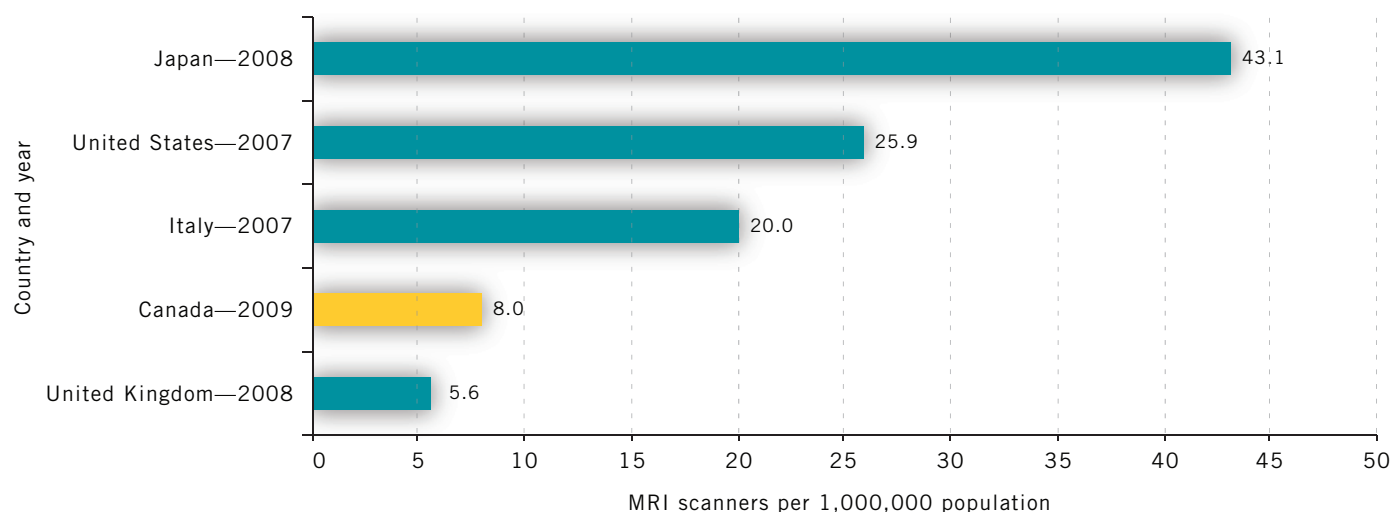
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010.*

Notes: Data were not available for France and Germany.
For additional exclusions/limitations, see Annex 2.

Figure 17 Number of Computed Tomography (CT) Scanners per 1,000,000 population
Selected countries and years
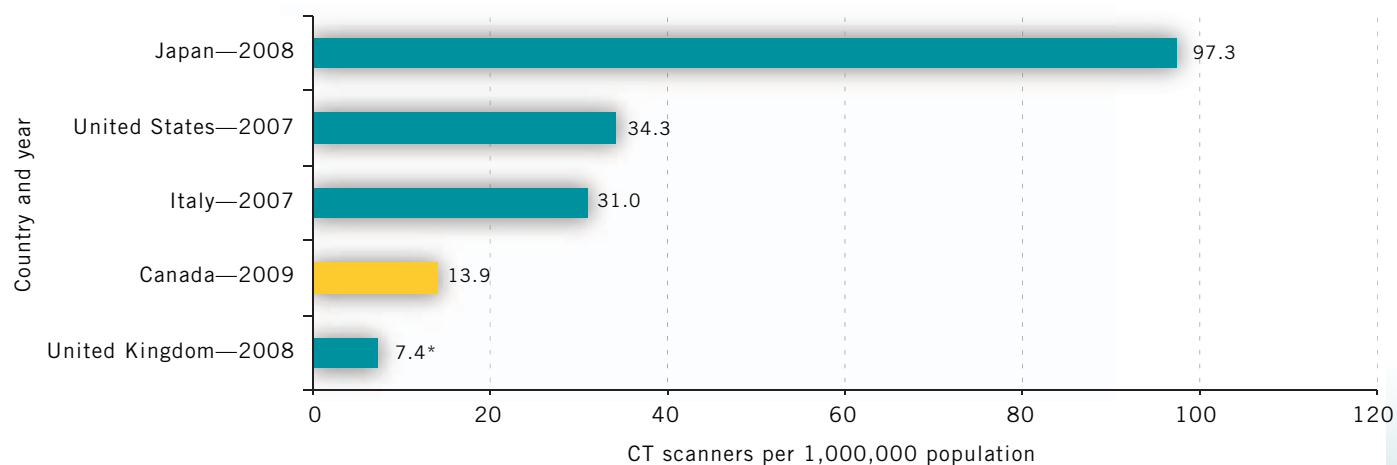
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010.*

Notes: *Data for the United Kingdom are an estimate.
Data were not available for France and Germany.
For additional exclusions/limitations, see Annex 2.

In 2009-10, 1,434,500 MRI and 4,183,946 CT scan tests, respectively, were done in Canada, which are increases from 768,302 MRI and 2,767,849 CT scan tests done in 2003-04.

Figure 18 Number of Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) Scan Tests
Canada, 2003-04 to 2009-10
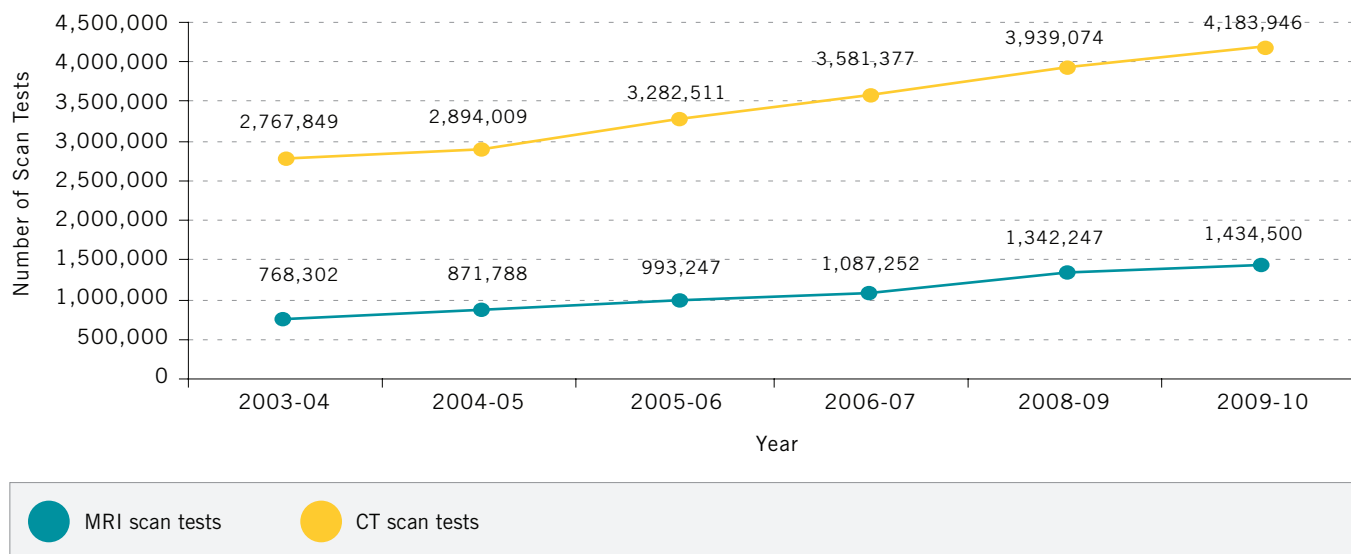
Source: Canadian Institute for Health Information. National Survey of Selected Medical Imaging Equipment.

Notes: In each year, exams failed to be reported for a number of MRI and CT scanners. Exams for these scanners were imputed by CIHI according to a single method for the years 2003-04 to 2006-07, but a different method for 2008-09 resulting in a break in series. Therefore, the number of exams in 2008-09 is not strictly comparable to the numbers for the preceding years.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

While physicians can diagnose many conditions by undertaking a clinical examination of the patient, they often require more sophisticated technologies to improve upon their diagnostic skills, thus benefiting the patient. Devices such as MRI and CT scanners are important tools that help identify diseases and other health problems. Moreover, as the population ages, these technologies will certainly become more in demand.[86] Although both are useful to diagnose a range of conditions, each has strengths and weaknesses.

Research suggests that, relative to other technologies, MRI machines can more accurately identify conditions such as brain haemorrhage or ischemia,[87] fractures,[88] or some gastrointestinal tumours (e.g., assessments of liver metastases).[89]

CT scanners have plenty of uses as well. For example, they outperform ordinary x-rays when screening patients at very high risk of cervical spine injury,[90] have been shown to be highly sensitive in their ability to rule out significant coronary artery disease in the assessment of chest pain,[91] or, compared to the MRI, can more accurately identify certain gastrointestinal tumours (e.g., assessments of mesenteric metastases).[90]

These devices do have some risks associated with them.[92] For example, MRIs can make metallic implants (e.g., pacemakers, metal pins or clips) move and tear soft tissue so patients with implants, metal or even tattoos[93] are generally not accepted as candidates. These objects may also cause burns. In addition, an MRI's magnetic field can magnetize nearby objects which can then become dangerous projectiles in an examination room. MRI scanners are also very noisy and can restrict the movement of the patient. As a result, these devices can sometimes evoke claustrophobia or anxiety.[94] Still, MRI machines are generally safe for patients with no metal in their body.

Meanwhile, CT scanners expose you to high levels of radiation that are 500 to 1,000 times as high as those of a routine chest X-ray, increasing your risk of developing radiation-induced cancer. Thus, the risks related to CT devices are arguably much larger than those associated with the MRI.

MRI and CT scans may require the use of contrast agents, which are solutions that the patient receives orally or by injection, in order to enhance the contrast of the image. These agents may have side effects ranging from the benign (such as the after-taste they may leave behind) to the more serious (such as Nephrogenic Systemic Fibrosis), although serious effects are rarely encountered in a typical health care practice.[95, 96, 97]

There is no consensus on what the ideal number of MRI or CT scanners or volume of exams is for a given population. There is an increase in research examining the 'appropriateness' of tests for a given situation, meaning the test is cost-effective and its benefit outweighs potential harm. The Canadian Association of Radiologists found that as many as 30% of imaging studies are inappropriate or contribute no useful information, which wastes resources, increases wait times and may negatively impact quality of care.[98] This is why there is an increasing focus on ensuring the right test is done at the right time, leading to more efficient and effective use of both imaging equipment and health human resources, and to increased patient safety by, for example, reducing exposure to unnecessary radiation.[99]

Benefits of undergoing MRI or CT scans

- Improved localization of possible medical conditions or treatment needs
- Improved image quality compared to some other image modalities
- Availability of multiple views and, in some cases, 3D representation of anatomy
- Non-invasive procedure
- Possible improvement or confirmation of diagnosis

Risks of not having a required MRI or CT diagnostic exam

- Poor diagnostic information available to determine treatment options
- Increased morbidity
- Death

Things you can do to be better informed about MRI and CT scanners

- Always ask your health care provider if the exam is necessary and if the benefit outweighs the known risks (such as high radiation dosages)
- More information on MRI and CT scanners is available on Health Canada's website (http://www.hc-sc. gc.ca/hl-vs/alt_formats/pacrb-dgapcr/pdf/iyh-vsv/med/mri-irm-eng.pdf)

THEME – HEALTH STATUS AND WELLNESS

20. POTENTIAL YEARS OF LIFE LOST DUE TO SUICIDE

21. POTENTIAL YEARS OF LIFE LOST DUE TO UNINTENTIONAL INJURY

Key Messages

- Injuries are the leading cause of death of children and young adults in Canada
- Many injuries are preventable
- Residents of Inuit regions are at greater risk of injury than the general Canadian population
- Potential years of life lost due to suicide is greater among Canadian males and the residents of Inuit regions compared to Canadian females and overall Canadians

What do these indicators measure?

These indicators measure the number of potential years of life lost due to suicide or unintentional injury when a person dies "prematurely," which is defined as dying before age 75. For example, a death due to suicide or unintentional injury at age 25 represents a loss of 50 potential years of life.

Mortality data specific to Inuit are not consistently collected in administrative databases across the country. However, a method has been developed which allows the use of geographic identifiers to inform the health of Inuit in Canada. Certain communities in northern Canada have a high proportion of Inuit residents. These communities can be organized into four Inuit Regions (Inuvialuit region, Nunavut, Nunavik and Nunatsiavut). Health indicators for residents of these regions can serve as a proxy for Inuit-specific health indicators. It should be noted that because these data also include non-Inuit residents of these regions, who tend to have better health outcomes than the Inuit population living in the same area, caution should be used when interpreting these results. While this information is not Inuit-specific, it can be used to infer the health of Inuit in Canada.

What are the limitations of these indicators?

Quality studies done on the certification have shown that approximately one third of certificates from the Vital Statistics – Death Database contain major errors, mainly due to the use of non-specific conditions and competing causes of death.[100] Misclassification of injuries by cause could also represent a limitation.[101] It is also important to remember that the actual number of suicides in Canada may be under-reported. A death is only certified as a suicide by medical and legal authorities when the victim's intent is clearly proven.[102]

Potential years of life lost due to suicide is decreasing for males and both sexes combined since 2000

In 2006, the potential years of life lost (PYLL) due to suicide in Canada was 334.8 years lost per 100,000 population. The PYLL due to suicide for males and females were 511.2 years per 100,000 males and 156.9 years per 100,000 females, respectively. PYLL due to suicide has been decreasing for males and both sexes combined since 2000.

Figure 19 Potential Years of Life Lost (PYLL) due to Suicide

Per 100,000 population aged 0-74 years, by sex, Canada, 2000-06
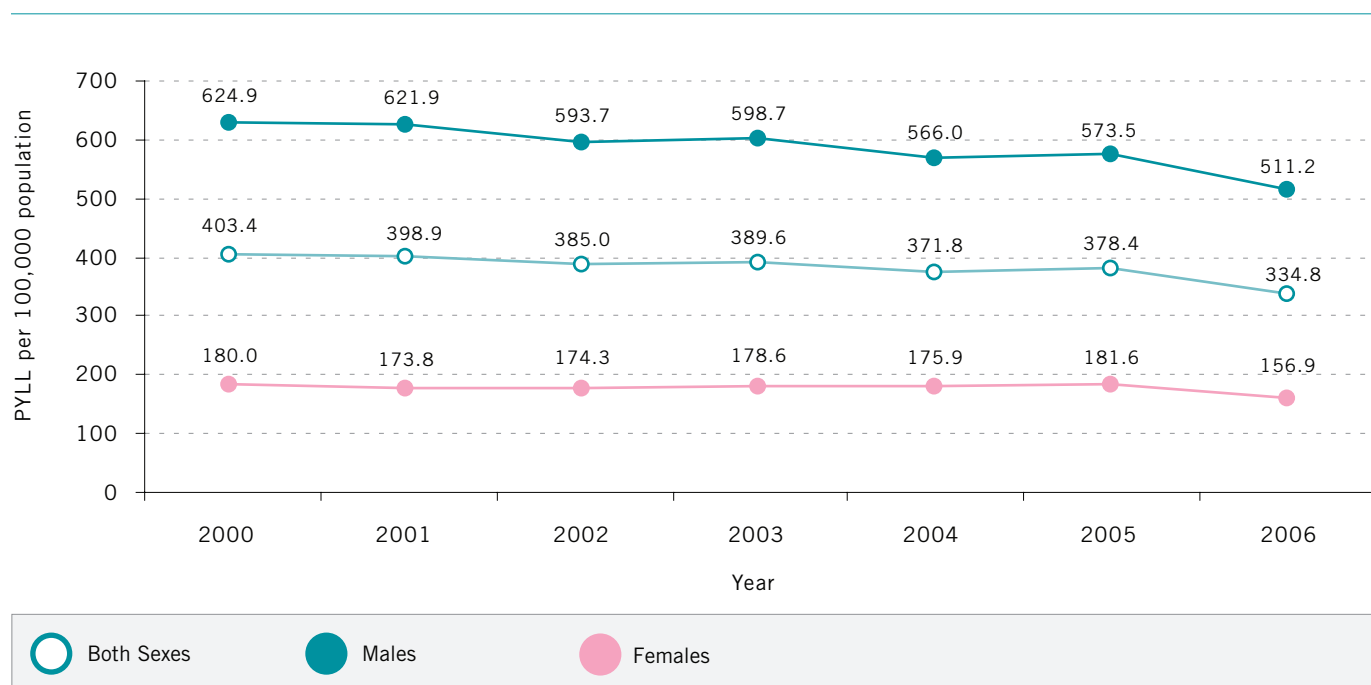
Sources: Statistics Canada. Vital Statistics — Death Database and Demography Division (population estimates).
Institut de la Statistique du Québec.

Notes: PYLL is calculated for ages <75 years.
For additional exclusions/limitations, see Annex 2.

Potential years of life lost due to suicide is much higher among residents of Inuit regions

In 1999-2003, the potential years of life lost due to suicide and self-inflicted injuries among residents of Inuit regions were 5,415.8 years lost per 100,000 population. The PYLL due to suicide for male and female residents of Inuit regions were 8,604.9 years per 100,000 males and 2,051.0 years per 100,000 females. Compared to the male and female Canadian populations for that same period, potential years of life lost due to suicide and self-inflicted injuries were 14.7 times and 12.5 times higher, respectively, among the male and female population of Inuit regions.

Figure 20 **Potential Years of Life Lost (PYLL) due to Suicide and Self-Inflicted Injuries**
Per 100,000 population aged 0-74 years, by sex, Canada and Inuit regions, 1999-2003

Sources: Statistics Canada. Vital Statistics — Death Database and Demography Division (population estimates).
           Institut de la Statistique du Québec.

Notes: PYLL is calculated for ages <75 years.
           Numbers and rates on this table are based on the summation of data for five consecutive years of deaths.
           Age-standardized to the 2001 total population age structure of Inuit Nunangat.
           Wide variations exist in the confidence intervals for PYLL among residents of Inuit regions. Thus, comparisons between these and those for the general
           population should be interpreted with caution.
           For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country. In addition, OECD data are age-standardized to the 1980 total OECD population whereas Canadian data (presented in the graph, *Potential Years of Life Lost Due to Suicide*) are not age-standardized. Lastly, OECD's PYLL is calculated to age 70 rather than age 75. Thus, data are not directly comparable between Canadian and international graphs.

Of the G7 countries, Canada had the third highest PYLL due to intentional self-harm, with 290 PYLL per 100,000 population.

Figure 21 **Potential Years of Life Lost (PYLL) due to Intentional Self-Harm**

Per 100,000 population aged 0-69 years, both sexes (age-standardized), selected countries and years
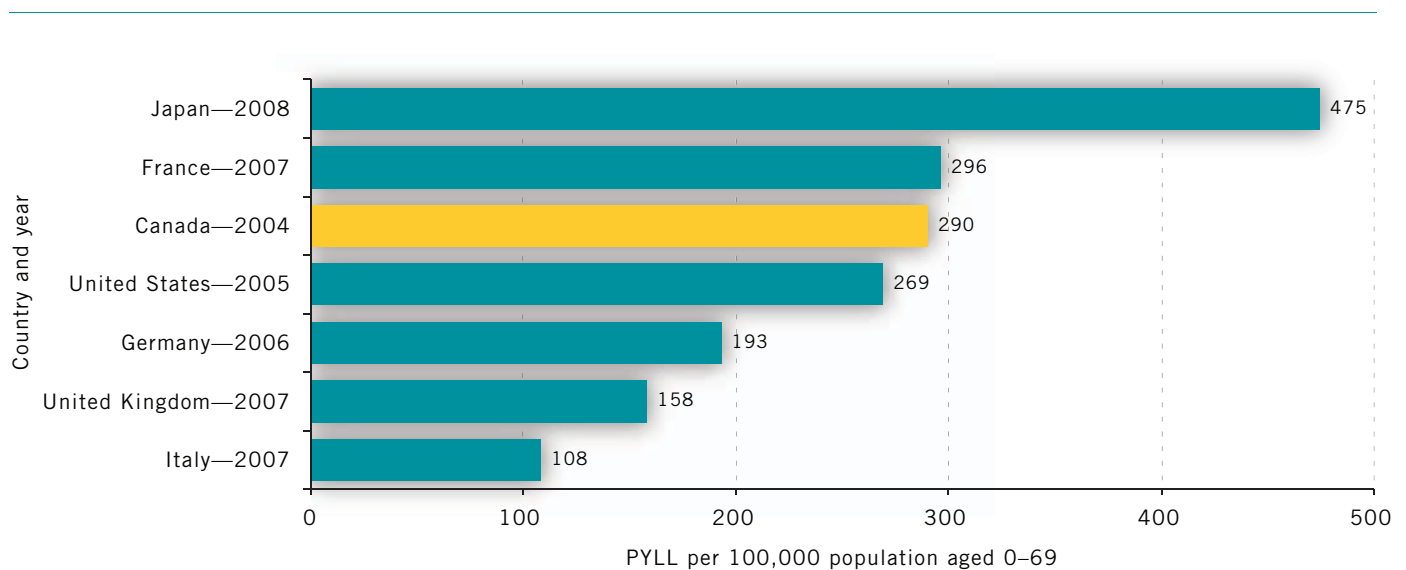
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010.*

Notes: Data are for selected years.
          Data are not comparable to Canadian trend data for the indicator *Potential years of life lost due to suicide* because OECD data are age-standardized to the 1980 total OECD population whereas the data in the Canadian graph are not age-standardized. In addition, PYLL is calculated to age 70, rather than age 75. For additional exclusions/limitations, see Annex 2.

Potential years of life lost due to unintentional injuries has decreased for males since 2000

In 2006, the PYLL due to unintentional injuries in Canada was 606.9 years per 100,000 population. The PYLL for males and females were 884.6 years per 100,000 males and 326.7 years per 100,000 females, respectively. The rate of PYLL due to unintentional injuries has decreased for males since 2000.

Figure 22 Potential Years of Life Lost due to Unintentional Injuries
Per 100,000 population aged 0-74 years, by sex, Canada, 2000-06
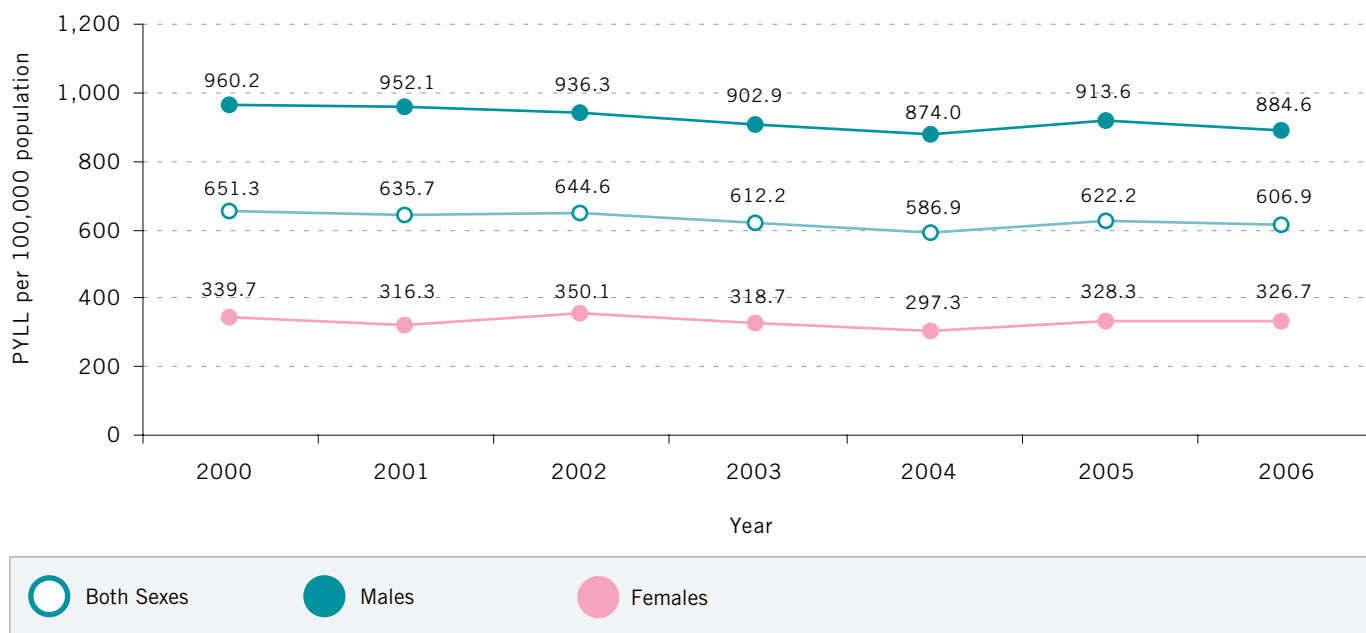
Sources: Statistics Canada. Vital Statistics — Death Database and Demography Division (population estimates).
Institut de la Statistique du Québec.

Notes: PYLL is calculated for ages <75 years.
For additional exclusions/limitations, see Annex 2.

Potential years of life lost due to unintentional injuries is much higher among residents of Inuit regions

In 1999-2003, the PYLL due to unintentional injuries in Canada among residents of Inuit regions was 3,817.8 years per 100,000 population. The PYLL for male and female residents of Inuit regions were 5,178.5 years per 100,000 males and 2,368.8 years per 100,000 females. Compared to the overall Canadian population for that same period, potential years of life lost due to unintentional injuries among residents of Inuit regions were approximately four-and-a-half and five times higher in males and females, respectively.

Figure 23 Potential Years of Life Lost (PYLL) due to Unintentional Injuries

Per 100,000 population aged 0-74 years, by sex, Canada and Inuit regions, 1999-2003

Sources: Statistics Canada. Vital Statistics — Death Database and Demography Division (population estimates).
            Institut de la Statistique du Québec.

Notes: PYLL is calculated for ages <75 years.
            Numbers and rates on this table are based on the summation of data for five consecutive years of deaths.
            Age-standardized to the 2001 total population age structure of Inuit Nunangat.
            Wide variations exist in the confidence intervals for PYLL among residents of Inuit regions. Thus, comparisons between these and those for the general population should be interpreted with caution.
            For additional exclusions/limitations, see Annex 2.

What these results mean for you

Injury is a serious public health issue with a major impact on the lives of Canadians. It is the leading cause of death of children and young adults and is among the leading causes of hospitalization for children, young adults and seniors.[103] Injury is also a major cause of short- and long-term impairment and disability for Canadians.[104]

Intentional injuries include those that are self-inflicted, most notably suicide, as well as those inflicted by someone else (i.e., homicide, family violence, assaults). Injuries can also be unintentional and include events such as motor vehicle collisions, falls, fires and poisoning.[104] Unintentional injuries are the leading cause of death for Canadian children and youth from one to 19 years of age.[105]

Injuries differ from other diseases in that they have an immediate onset. An individual goes from being perfectly healthy one minute and seconds later is injured, disabled or fatally wounded.[104] Injuries also result in a diminished quality of life from emotional anguish, pain, disability and activity limitations, as well as the grief associated with the death of a loved one from a fatal injury.[106] Studies also suggest that injuries carry an economic burden.[106, 107, 108] Many injuries are preventable through the application of interventions such as the development of policy,[109] proper awareness and education,[108] screening to identify high-risk behaviours,[108] preventive counselling,[110] treatment and weapon restrictions.[108]

Benefits of good mental health

- Reduces the risk of depression, psychological and social problems
- Makes you enjoy life, the environment and people around you
- Helps you create, learn, try new things, and take calculated risks
- Helps you cope with difficult times in your personal and professional life
- Prevents the onset or relapse of a physical or mental illness

Ways to prevent suicide

- Frequently engage in shared activities
- Surround yourself with supportive peers
- Participate in frequent extracurricular activities
- Consult counsellors or nurses in your community

Benefits of safe practices

- Decreases the risk of injuring yourself and others
- Reduces activity limitations due to unintentional injuries
- Reduces time away from work due to unintentional injuries
- Promotes peace of mind and safe environments

Useful everyday safety tips

- Choose "green" or non-toxic cleaning products
- Look at your home from a child's point of view
- Introduce new outdoor activities carefully and with patience
- Make sure indoor and outdoor play spaces are safe
- Keep constant watch over children around water, in parks and public places
- Wear protective equipment approved by the Canadian Standards Association (CSA) when appropriate
- Follow the rules and laws of the road by buckling up, slowing down and eliminating distractions
- Do not use your hand-held cellular and/or text while driving
- For more helpful safety tips to preventing injuries, please visit the Health Canada's website on safety and injuries (http://www.hc-sc.gc.ca/hl-vs/securit/work-travail/index-eng.php)

22. INCIDENCE RATE FOR LUNG CANCER

23. INCIDENCE RATE FOR PROSTATE CANCER

24. INCIDENCE RATE FOR BREAST CANCER

25. INCIDENCE RATE FOR COLORECTAL CANCER

Key Messages

- Lung cancer is the most commonly diagnosed cancer in the world
- Incidence rates of these cancers are either stable or decreasing, except for the incidence rate of lung cancer in females
- Despite the decrease in incidence rates, the number of new cancer cases and deaths continues to rise steadily as the Canadian population grows and ages
- Adopting a healthy lifestyle can strongly mitigate the risks of being diagnosed with cancer

What do these indicators measure?

These four indicators measure the number of newly diagnosed primary cancer cases in a given year for lung, prostate, breast and colorectal sites per 100,000 population that would be observed in the population if it had the same age composition as the reference or "standard" population.

What are the limitations of these indicators?

The incidence rates presented are age-standardized. Age-standardized rates have been relatively stable but, overall, the actual numbers are increasing due to the aging Canadian population, potentially representing an increased burden on the health care system. Changes in population size and age structure are the primary components of the increasing burden of cancer among Canadians.[111]

These incidence rates are influenced by two factors:

1. The underlying rate of cancer incidence, which partly reflects the past prevalence of risk factors such as smoking and, therefore, the success of past primary prevention efforts; and
2. The rate of detection and diagnosis of cancers, which can be influenced by the intensity and effectiveness of cancer screening programs.

These two factors, however, work in opposite directions. For example, an increase in measured cancer incidence could reflect either some decline in population lifestyle or an over-diagnosis of cancers (detection of a cancer that would never cause symptom or death during a patient's lifetime). It is unlikely that this over-detection continues for an extended period of time so that, generally, a declining incidence of cancer

suggests a positive change in population health. This interpretation issue is being addressed by the addition of "staging" data to the cancer registry systems. Cancer staging provides information on how advanced the cancer is (i.e., what stage it is) at the time of diagnosis.

Lung cancer incidence rates are decreasing, overall and for males, but increasing among females

In 2007, the overall lung cancer incidence rate in Canada was 56.0 new cases per 100,000 population, which is a decrease from the 58.8 new cases per 100,000 population in 2000. The lung cancer rate for males in 2007 decreased to 67.8 new cases per 100,000 males from 77.1 new cases per 100,000 males in 2000. The lung cancer rate for females in 2007 was 47.2 new cases per 100,000 females, an increase from 45.1 new cases per 100,000 females in 2000. However, the small reduction in the female rate from 2006 to 2007 may herald a longer-term decline in the lung cancer incidence rate of females. Males continue to have a higher incidence rate of lung cancer, though the difference between male and female rates has decreased since 2000.

Figure 24 Incidence Rate for Lung Cancer

Per 100,000 population, by sex (age-standardized), Canada, 2000-07

Sources: Statistics Canada. Canadian Cancer Registry.
Institut de la Statistique du Québec.

Notes: Includes cancers of the lungs and bronchus (ICD-O-3, code C34 excluding morphology codes 9590-9989, 9050-9055, and 9140).
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Prostate cancer incidence rate remains stable

In 2007, the prostate cancer incidence rate in males was 124.7 new cases per 100,000 males, almost unchanged from the 124.8 new cases per 100,000 males in 2000. The higher rate in 2001 may reflect a variation in screening in prostate cancer.

Figure 25 Incidence Rate for Prostate Cancer
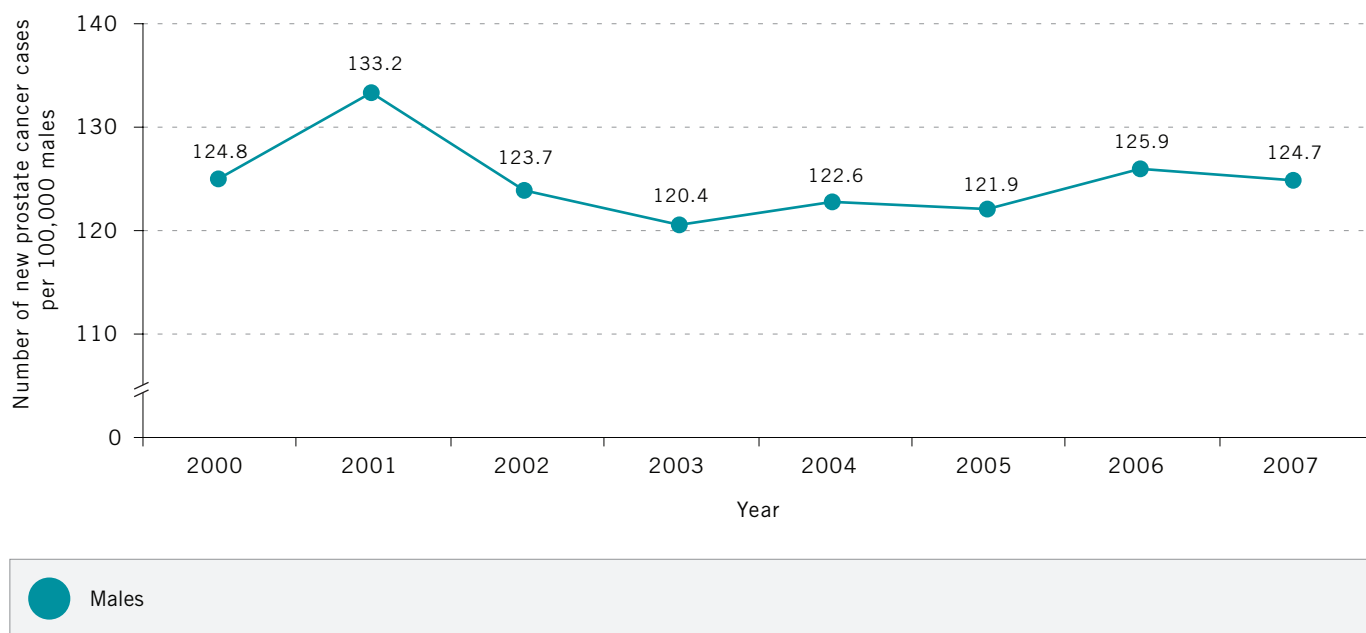
Per 100,000 males (age-standardized), Canada, 2000-07

Sources: Statistics Canada. Canadian Cancer Registry.
            Institut de la Statistique du Québec.

Notes: International Classification of Diseases for Oncology (ICD-O-3, code C61).
            Age-standardized to the 1991 Canadian population.
            For additional exclusions/limitations, see Annex 2.

Breast cancer incidence rate has decreased from 2000, but stable since 2006

In 2007, the breast cancer incidence rate in females decreased to 98.4 new cases per 100,000 females from 101.7 new cases per 100,000 females in 2000.

Figure 26 Incidence Rate for Breast Cancer
Per 100,000 females (age-standardized), Canada, 2000-07
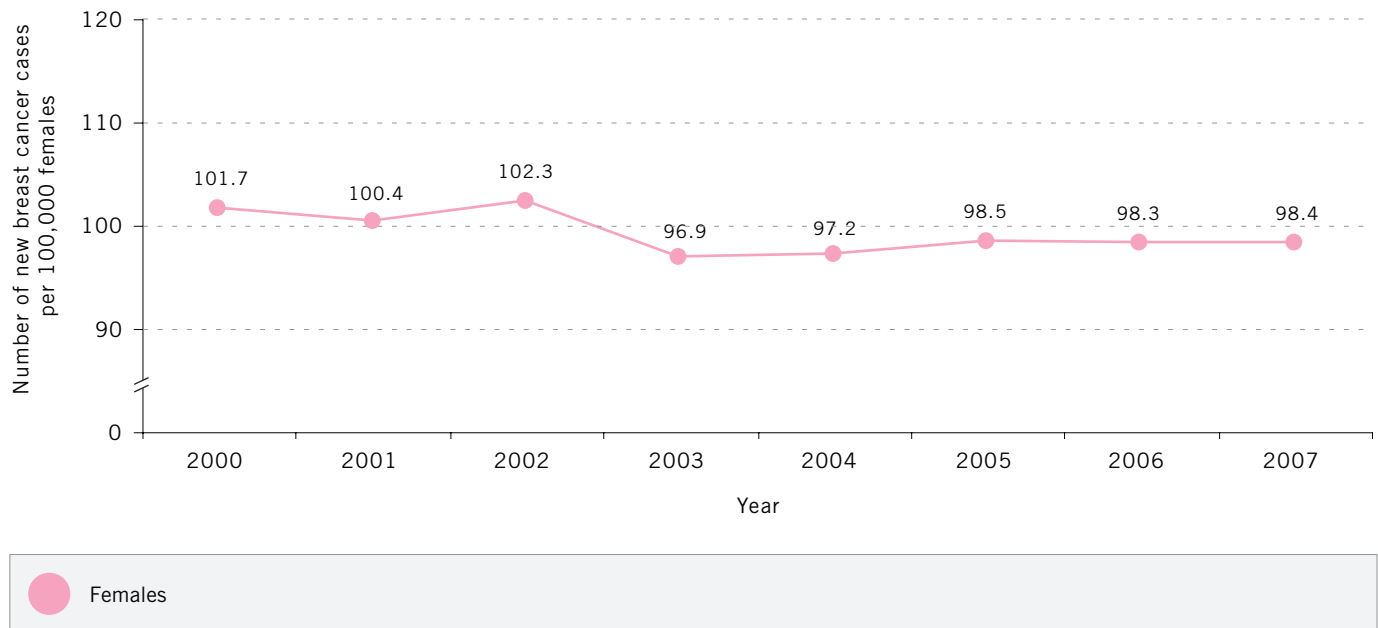
Sources: Statistics Canada. Canadian Cancer Registry.
Institut de la Statistique du Québec.

Notes: International Classification of Diseases for Oncology (ICD-O-3, code C50).
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Incidence rates of colorectal cancer are on the decline

In 2007, the overall colorectal cancer incidence rate in Canada was 49.6 new cases per 100,000 population, a decrease from 52.5 new cases per 100,000 population in 2000. The colorectal cancer rate for males in 2007 was 60.4 new cases per 100,000 males, a decrease from 64.2 new cases per 100,000 males in 2000. Also in 2007, the colorectal cancer rate for females was 40.6 new cases per 100,000 females, a decrease from 42.9 new cases per 100,000 females in 2000.

Figure 27 Incidence Rate for Colorectal Cancer

Per 100,000 population, by sex (age-standardized), Canada, 2000-07

Sources: Statistics Canada. Canadian Cancer Registry.
Institut de la Statistique du Québec.

Notes: Includes cancers of the colon, rectum, rectosigmoid junction, and intestinal tract, part unspecified (ICD-O-3, codes C18–C20, C26.0).
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Despite declining incidence rates, the total number of new cancer cases and deaths in Canada continues to rise steadily as the Canadian population grows and ages. Although genetic factors can be determinants in cancer diagnosis, one's lifestyle has a very strong impact on cancer risk. Therefore, adopting a healthy lifestyle can strongly mitigate the risks of being diagnosed with cancer. Even after cancer is diagnosed, a change towards a healthy lifestyle has some influence on slowing the progression of the disease and possibly preventing its associated mortality.[112, 113, 114]

Smoking is a well-known risk factor for several diseases, including asthma, cardiovascular disease and some types of cancer. Heavy smoking increases the risk of lung cancer by around 30-fold, and smoking causes over 80% of lung cancer in western countries.[115] Smoking is also a risk factor for other cancers such as larynx, pharynx, oesophageal, pancreas, stomach, bladder, kidney, cervix and endometrial.[116] Consequently, smoking cessation is the single most effective modifiable risk factor for cancer.

After smoking, chronic infections and possibly obesity,[117] alcohol is the single most important cause of cancer. A causal relationship has been established between alcohol consumption and cancers of the colon and breast[118] and a causal relationship is suspected between alcohol consumption and lung cancer in heavy drinkers.[117]

Eating a healthy diet can also reduce the risk of cancer.[119] For example, a diet high in tomatoes (which contains lycopene) has been associated with a reduced risk of prostate cancer,[120] and fruit and vegetable consumption may help protect against lung cancer, especially in women.[121] However, high consumption of preserved meats and red meats have been associated with a higher incidence and mortality from colorectal and prostate cancers.[122, 123]

When it comes to the effect of diet on cancer incidence and mortality, several studies show conflicting results. While fat intake may play a role, it is the total amount of energy consumed that is most important in colorectal cancer development.[124] Similarly, although some research shows that eating large amounts of fruit, vegetables and fibre decreases the risk for colorectal cancer,[125, 126] other studies have shown that it may not be beneficial.[127, 128, 129] In addition, high consumption of dairy products may lead to prostate cancer.[123]

Obesity is a contributor to a wide variety of cancers including breast, colon and prostate cancer.[130] There is also strong evidence that physical activity decreases the risk of colon and breast cancer,[131, 132, 133] and has a moderate effect on prostate and lung cancer.[131]

Benefits of a healthy lifestyle

- Better health
- Better control over your weight
- Decreased risk of diseases including cancers
- Better control of a disease
- More energy to fight a disease if a disease occurs

Risk factors for cancer

Lung Cancer	Prostate Cancer	Breast Cancer	Colorectal Cancer
• Smoking • Exposure to second-hand smoke • Alcohol consumption • Diet low in fruit and vegetables • Exposure to environmental pollutants (radon, asbestos, etc.)	• Obesity • Physical inactivity • Diet low in tomatoes • Diet high in saturated and trans fats and red meat • Diet high in dairy products • Diet low in fruit and vegetables	• Obesity • Alcohol consumption • Young age at menarche • Older age at menopause • Recent use of oral contraceptives • No full-term pregnancies • Having a full-term first pregnancy after age 30 • No breastfeeding • Physical inactivity • Diet high in saturated and trans fats • Diet low in fruit and vegetables	• Obesity • Alcohol consumption • Physical inactivity • Diet rich in red meats and/or preserved meats • Diet high in fats • Diet low in fibre, fruit and vegetables

Things you can do to prevent cancer

- Do not smoke / stop smoking
- Exercise regularly
- Keep a healthy body weight
- Reduce your alcohol consumption
- Eat a healthy diet
- See your doctor regularly and discuss any sudden changes in your physiology (blood in urine, stool or sputum, persistent cough, sudden weight change, change in sleep patterns, lump in breast, etc.) with him/her; don't wait until your health deteriorates and you have no choice but to see your doctor
- Follow your doctor's advice, be it having screening tests, making changes in lifestyle or diet
- For more information on cancer, visit Health Canada's website (http://www.hc-sc.gc.ca/hc-ps/dc-ma/cancer-eng.php)

26. MORTALITY RATE FOR LUNG CANCER

27. MORTALITY RATE FOR PROSTATE CANCER

28. MORTALITY RATE FOR BREAST CANCER

29. MORTALITY RATE FOR COLORECTAL CANCER

Key Messages

- Lung cancer is the leading cause of cancer death worldwide, followed by breast cancer
- Mortality rates for these four cancers are decreasing
- Despite these decreases, the number of new cancer cases and deaths continues to rise steadily as the Canadian population grows and ages
- Canada has the second highest mortality rates in the G7 countries for lung, prostate and colorectal cancers, and the third highest mortality rates in the G7 countries for breast cancer
- Adopting a healthy lifestyle can strongly mitigate the risks of being diagnosed with cancer, and may slow the progress of the disease once it is diagnosed
- Mortality rates for intestinal and rectal cancer for female Registered Indians are higher than for female Non-Aboriginal Canadians
- Mortality rates for lung and colorectal cancers are higher for residents of Inuit regions compared to Canada overall

What do these indicators measure?

These four indicators measure the number of deaths of individuals where the underlying cause of death is lung, prostate, breast or colorectal cancer per 100,000 population that would be observed in the population if it had the same age composition as the reference or "standard" population.

For Registered Indians, the indicator is the number of deaths of individuals 25 years and older in which the underlying cause of death is tracheal/bronchial/lung, prostate, breast, or intestinal/rectal cancer per 100,000 population that would be observed in the population if it had the same age composition as the reference or "standard" population. Data for Registered Indians are an average from 1991 to 2001 (centred on 1996) in order to provide more stability in numbers.

Mortality data specific to Inuit are not consistently collected in administrative databases across the country. However, a method has been developed which allows the use of geographic identifiers to inform the health of Inuit in Canada. Certain communities in northern Canada have a high proportion of Inuit residents. These communities can be organized into four Inuit Regions (Inuvialuit region, Nunavut, Nunavik and Nunatsiavut). Health indicators for residents of these regions can serve as a proxy for Inuit-specific health indicators. It should be noted that because these data also include non-Inuit residents of these regions, who tend to have better health outcomes than the Inuit population living in the same area, caution should be used when interpreting these results. While this information is not Inuit-specific, it can be used to infer the health of Inuit in Canada.

What are the limitations of these indicators?

Lung, breast, colorectal and prostate cancer represent the four most common cancer mortalities. The mortality rates presented here are age-standardized. Age-standardized rates are useful for comparison between years because of the aging Canadian population, but may underestimate the burden on the health care system, as changes in population size and age structure are the primary components of the increasing burden of cancer among Canadians.

Prevention, detection and treatment can help reduce death rates due to cancer or cardiovascular disease. Although mortality rates for some conditions are declining, mortality rates are rising in other areas. Due to the inclusion of cancer of the rectosigmoid junction, the international data on colon cancer mortality rates will differ slightly from the rates reported for Canada.

Mortality rate of lung cancer decreasing for males but increasing for females

In 2007, the overall lung cancer mortality rate in Canada was 45.1 deaths per 100,000 population. The lung cancer mortality rate for males has been decreasing to 57.0 deaths per 100,000 males in 2007 from 64.3 deaths per 100,000 males in 2000. The lung cancer mortality rate for females has increased to 36.1 deaths per 100,000 females in 2007 from 34.4 deaths per 100,000 females in 2000. However, the small reduction in the female rate from 2006 to 2007 may herald a longer-term decline in the lung cancer mortality rate of females.

Figure 28 Mortality Rate for Lung Cancer

Per 100,000 population, by sex (age-standardized), Canada, 2000-07
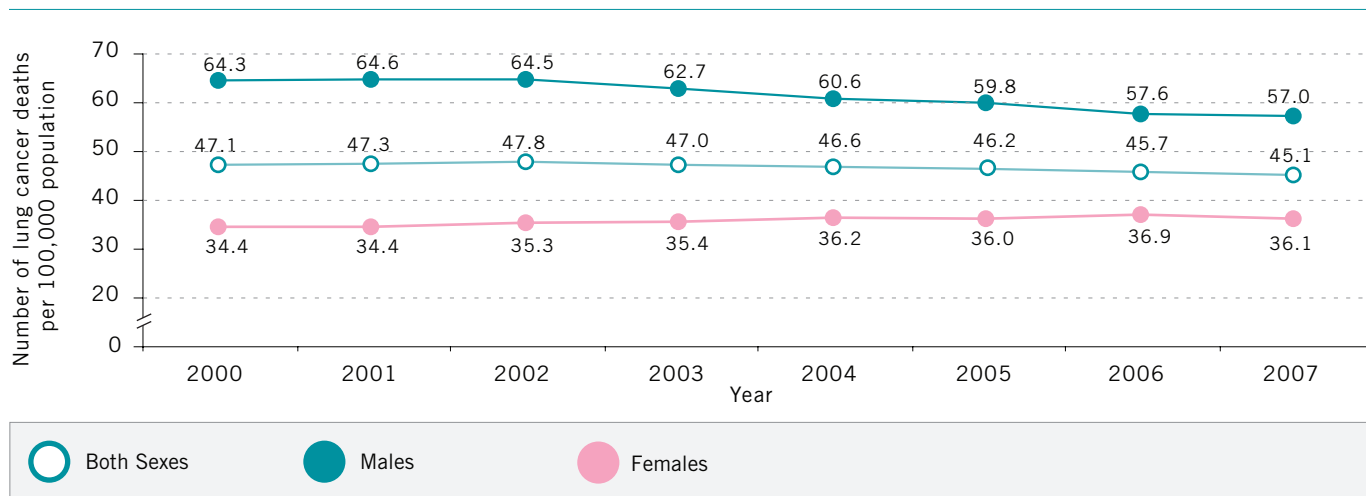
Sources: Statistics Canada. Vital Statistics — Death Database.
           Institut de la Statistique du Québec.

Notes: Includes cancers of the trachea, bronchus and lung (ICD-10, codes C33-C34).
           Age-standardized to the 1991 Canadian population.
           For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country in question. OECD data are also age-standardized to the 1980 total OECD population whereas Canadian data (in each Canadian mortality graph) are age-standardized to the 1991 Canadian population. Therefore, data are not directly comparable between Canadian and international graphs.

In 2004, Canada had the second highest lung cancer mortality rate of the G7 countries with 46.2 deaths per 100,000 population, behind the United States. However, in 2007 the Canadian mortality rate for lung cancer was 45.1 deaths per 100,000 population, which would still place Canada second highest among the G7 countries for lung cancer mortality rate.

Figure 29 **Mortality Rate for Lung Cancer**

Per 100,000 population, both sexes (age-standardized), selected countries and years
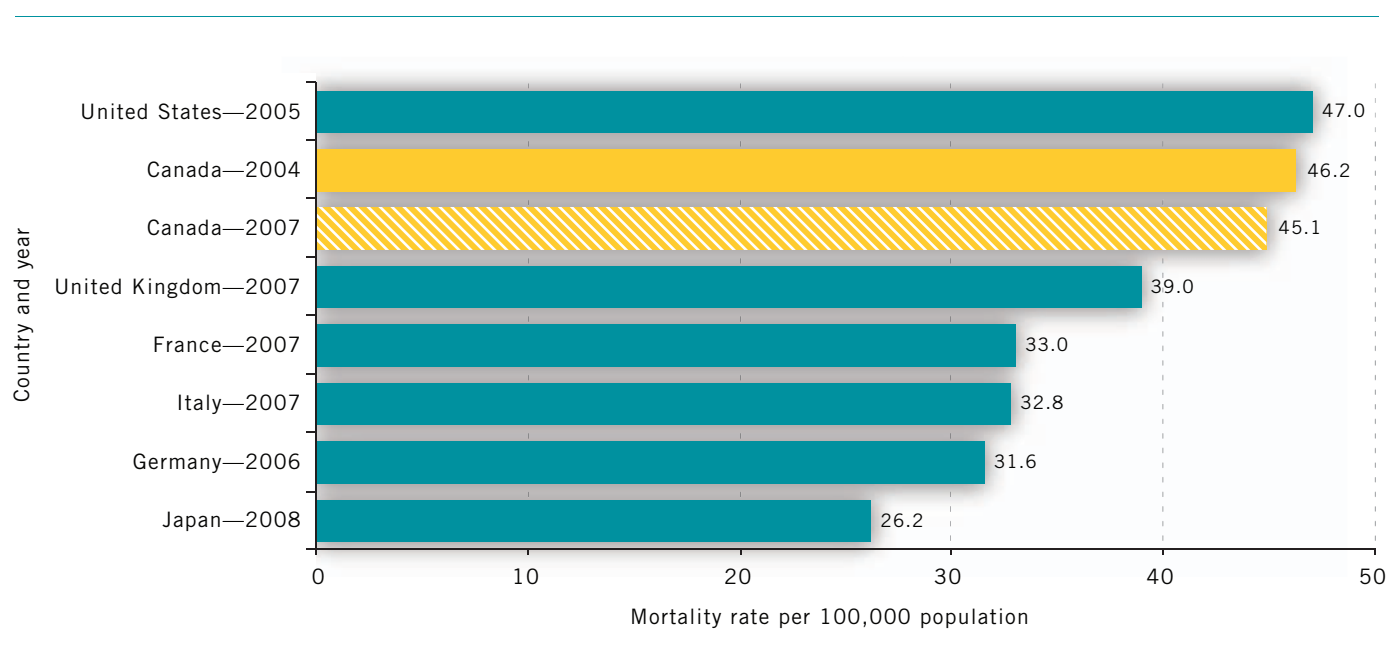
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.
Statistics Canada. Vital Statistics — Death Database.
Institut de la Statistique du Québec.

Notes: Data are for selected years.
Includes cancers of the trachea, bronchus and lung (ICD-10, codes C33-C34).
Since the OECD's latest Canadian data are for 2004, more recent (2007) Canadian data from Statistics Canada and the Institut de la Statistique du Québec are provided as well. Because OECD data are age-standardized to the 1980 total OECD population, and Statistics Canada and the Institut de la Statistique du Québec are age-standardized to the 1991 Canadian population, comparisons between the 2007 Canadian data and other G7 countries must be interpreted with caution.
For additional exclusions/limitations, see Annex 2.

Prostate cancer mortality rate on the decline

In 2007, males had a prostate cancer mortality rate of 20.6 deaths per 100,000 males, a decrease from 26.7 deaths per 100,000 males in 2000.

Figure 30 Mortality Rate for Prostate Cancer
Per 100,000 males (age-standardized), Canada, 2000-07
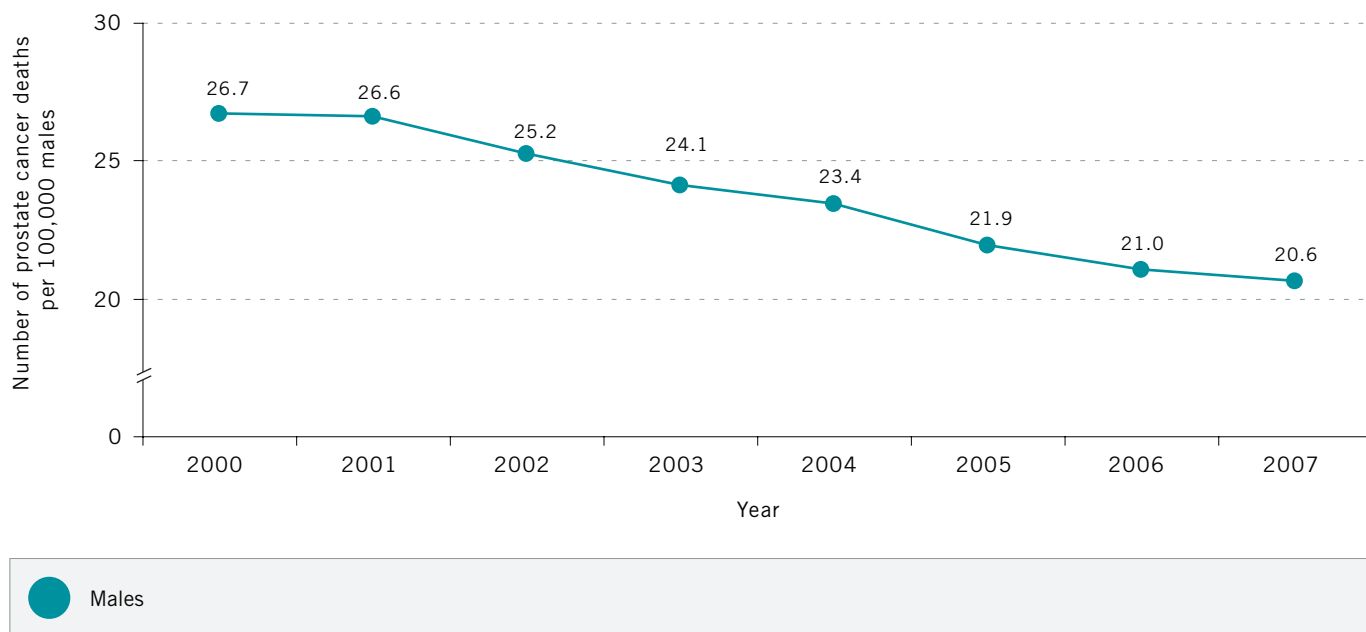
Males

Sources: Statistics Canada. Vital Statistics — Death Database.
              Institut de la Statistique du Québec.

Notes: International Statistical Classification of Diseases and Related Health Problems (ICD-10, code C61).
              Age-standardized to the 1991 Canadian population.
              For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country in question. OECD data are also age-standardized to the 1980 total OECD population whereas Canadian data (in each Canadian mortality graph) are age-standardized to the 1991 Canadian population. Therefore, data are not directly comparable between Canadian and international graphs.

In 2004, Canada had the second highest prostate cancer mortality rate in the G7 countries with 21.2 deaths per 100,000 males, behind the United Kingdom. However, in 2007 the Canadian mortality rate for prostate cancer was 20.6 deaths per 100,000 males, which would place Canada fourth highest among the G7 countries for prostate cancer mortality rate.

Figure 31 Mortality Rate for Prostate Cancer

Per 100,000 males (age-standardized), selected countries and years
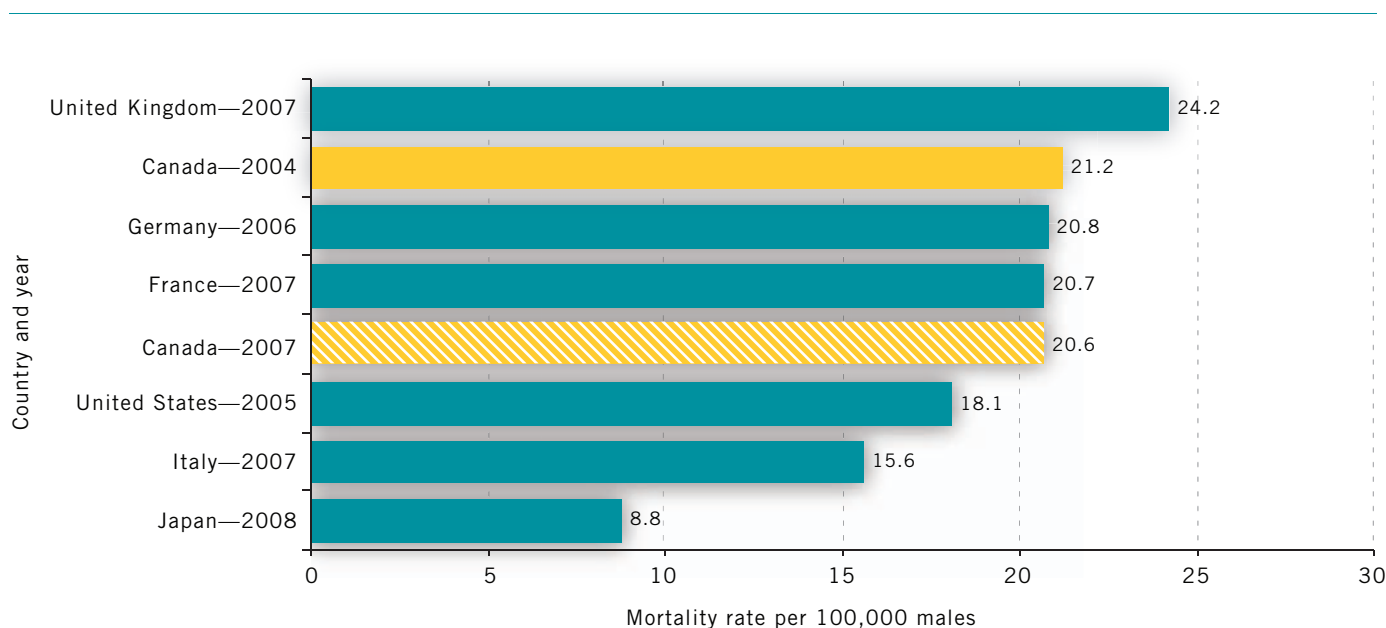
Sources: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.
Statistics Canada. Vital Statistics — Death Database.
Institut de la Statistique du Québec.

Notes: Data are for selected years.
International Statistical Classification of Diseases and Related Health Problems (ICD-10, code C61).
Since the OECD's latest Canadian data are for 2004, more recent (2007) Canadian data from Statistics Canada and the Institut de la Statistique du Québec are provided as well. Because OECD data are age-standardized to the 1980 total OECD population, and Statistics Canada and the Institut de la Statistique du Québec are age-standardized to the 1991 Canadian population, comparisons between the 2007 Canadian data and other G7 countries must be interpreted with caution.
For additional exclusions/limitations, see Annex 2.

Breast cancer mortality rate declining

In 2007, the breast cancer mortality rate was 21.7 deaths per 100,000 females, compared to 25.0 deaths per 100,000 females in 2000.

Figure 32 Mortality Rate for Breast Cancer
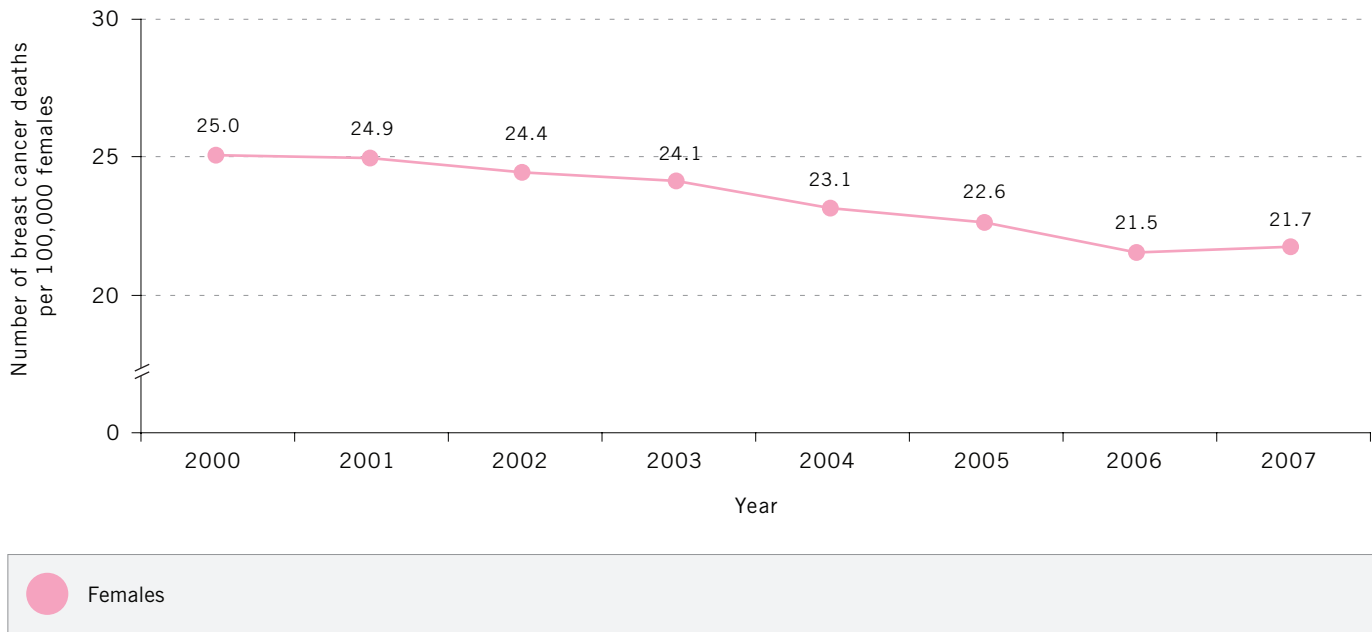
Per 100,000 females (age-standardized), Canada, 2000-07

Females

Sources: Statistics Canada. Vital Statistics — Death Database.
Institut de la Statistique du Québec.

Notes: International Statistical Classification of Diseases and Related Health Problems (ICD-10, code C50).
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country in question. OECD data are also age-standardized to the 1980 total OECD population whereas Canadian data (in each Canadian mortality graph) are age-standardized to the 1991 Canadian population. Therefore, data are not directly comparable between Canadian and international graphs.

In 2004, Canada had the third highest breast cancer mortality rate of G7 countries at 22.4 deaths per 100,000 population, behind the United Kingdom and Germany. However, in 2007 the Canadian mortality rate for breast cancer was 21.7 deaths per 100,000 females, which would place Canada fourth highest among the G7 countries for breast cancer mortality rate.

Figure 33 **Mortality Rate for Breast Cancer**

Per 100,000 females (age-standardized), selected countries and years
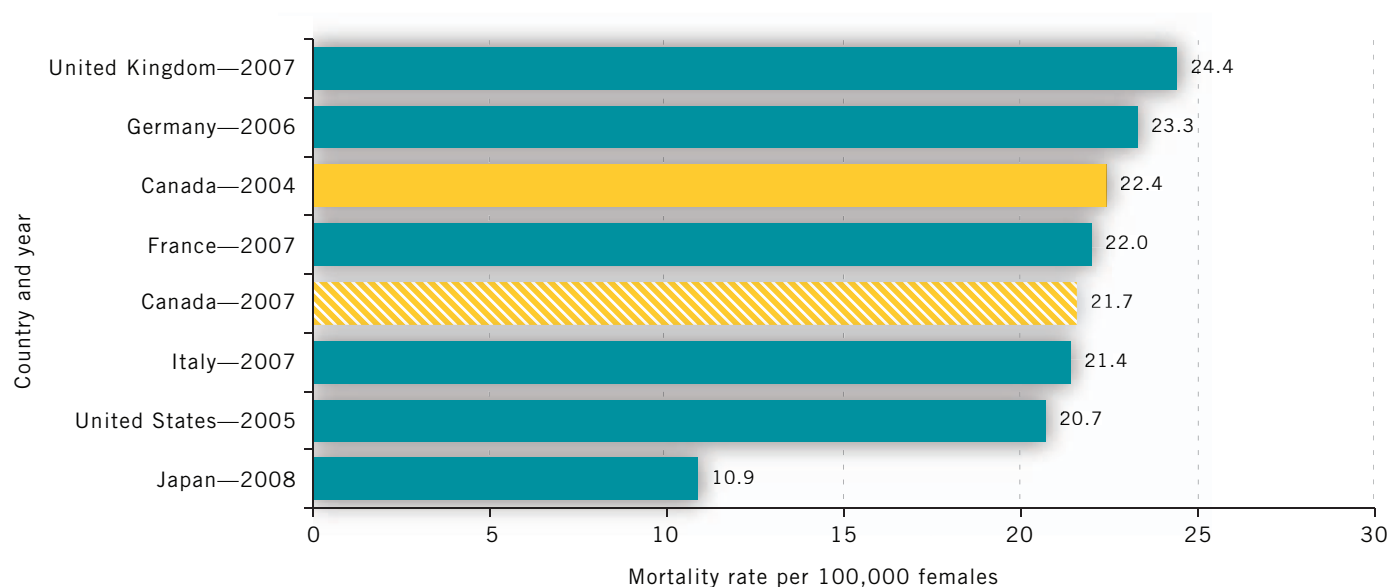
Sources: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.
Statistics Canada. Vital Statistics — Death Database.
Institut de la Statistique du Québec.

Notes: Data are for selected years.
International Statistical Classification of Diseases and Related Health Problems (ICD-10, code C50).
Since the OECD's latest Canadian data are for 2004, more recent (2007) Canadian data from Statistics Canada and the Institut de la Statistique du Québec are provided as well. Because OECD data are age-standardized to the 1980 total OECD population, and Statistics Canada and the Institut de la Statistique du Québec are age-standardized to the 1991 Canadian population, comparisons between the 2007 Canadian data and other G7 countries must be interpreted with caution.
For additional exclusions/limitations, see Annex 2.

Mortality rate for colorectal cancer is higher in males than in females

The overall colorectal cancer mortality rate in Canada in 2007 was 18.0 deaths per 100,000 population. The colorectal cancer mortality rate is higher for males than females, with 22.1 deaths per 100,000 males and 14.6 deaths per 100,000 females.

Figure 34 Mortality Rate for Colorectal Cancer

Per 100,000 population, by sex (age-standardized), Canada, 2000-07

Sources: Statistics Canada. Vital Statistics — Death Database.
            Institut de la Statistique du Québec.

Notes: Includes cancers of the colon, rectum and anus (ICD-10, codes C18, C20–C21).
            Age-standardized to the 1991 Canadian population.
            For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country in question. It should be noted that OECD and Canadian definitions differ—OECD data include mortality due to cancers of the colon, rectum, rectosigmoid junction and anus, while Canadian trend data refer to cancers of the colon, rectum and anus. OECD data are also age-standardized to the 1980 total OECD population whereas Canadian data (in each Canadian mortality graph) are age-standardized to the 1991 Canadian population. Therefore, data are not directly comparable between Canadian and international graphs.

In 2004, Canada had the second highest colon cancer mortality rate among G7 countries with 18.0 deaths per 100,000 population, after Germany. The Canadian mortality rate for colon cancer in 2007 was 18.0 deaths per 100,000 population, which would still place Canada second highest among the G7 countries for colon cancer mortality rate.

Figure 35 Mortality Rate for Colon Cancer

Per 100,000 population, both sexes (age-standardized), selected countries and years

Sources: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.
Statistics Canada. Vital Statistics — Death Database.
Institut de la Statistique du Québec.

Notes: Data are for selected years.
OECD data include mortality due to cancers of the colon, rectum, rectosigmoid junction and anus (ICD-10, codes C18–C21).
Since the OECD's latest Canadian data are for 2004, more recent (2007) Canadian data from Statistics Canada and the Institut de la Statistique du Québec are provided as well. Because OECD data are age-standardized to the 1980 total OECD population, and Statistics Canada and the Institut de la Statistique du Québec are age-standardized to the 1991 Canadian population, comparisons between the 2007 Canadian data and other G7 countries must be interpreted with caution.
For additional exclusions/limitations, see Annex 2.

Mortality rate for intestinal and rectal cancer for female Registered Indians are higher than for female Non-Aboriginal Canadians

In 1991-2001 (centred on 1996), the mortality rate for intestinal and rectal cancer was higher for female Registered Indians (22.6 deaths per 100,000 person-years) than for female Non-Aboriginal Canadians (14.8 deaths per 100,000 person-years). No statistically significant differences were found between groups for the other types of cancers.[134]

Table 4   **Mortality Rates for Selected Cancers**

For Registered Indians and Non-Aboriginal Canadians aged 25 years and older (per 100,000 person-years), by sex (age-standardized), 1991-2001 (centred on 1996)

Cancers	Males		Females	
	Registered Indian	**Non-Aboriginal Canadian**	**Registered Indian**	**Non-Aboriginal Canadian**
Lung	49.6	56.8	30.1	28.9
Prostate	15.8	17.4	----	----
Breast	----	----	25.0	28.9
Intestinal/Rectal	18.3	23.1	22.6	14.8

Source: Tjepkema, M., Wilkins, R., Senécal, S., Guimond, E., Penney, C. (2009). Mortality of Métis and Registered Indian adults in Canada: An 11-year follow-up study. *Health Reports* (Statistics Canada, Catalogue 82-003-X) 20(4): 1-21. Available from: http://www.statcan.gc.ca/pub/82-003-x/2009004/article/11034-eng.htm.

Notes: Cancers of the trachea, bronchus and lung (ICD-10, codes C33-C34).
Prostate cancer (ICD-10, code C61).
Breast cancer (ICD-10, code C50).
Intestinal/Rectal includes cancer of the small intestine, colon, rectosigmoid junction, rectum, anus and intestinal tract, part unspecified (ICD-10, codes C17–C21, C26.0).
Age-standardized using the 1991 to 2001 total Aboriginal population structure (person-years at risk), centred on 1996.
Registered Indians refer to Registered First Nations.
These mortality statistics are estimates. Rates for Canadians that are shown in this table will differ from Canadian mortality rates (on the same conditions) that are displayed elsewhere in *Healthy Canadians 2010*; thus, these data should not be compared with each other.
For additional limitations, please consult the published article noted above.

Mortality rates for lung and colorectal cancers are higher for residents of Inuit regions compared to Canada overall

In 1999-2003, male and female residents of Inuit regions had higher mortality rates for lung and colorectal cancers compared to all Canadian males and females. No statistically significant differences were found between residents of Inuit regions and all Canadians for prostate and breast cancers.

Table 5   **Mortality Rates for Selected Cancers**

For Residents of Inuit Regions and all Canadians (per 100,000 population), by sex (age-standardized), 1999-2003

Cancers	Males		Females	
	Inuit Regions	**Canada overall**	**Inuit Regions**	**Canada overall**
Lung	54.7	19.9	53.2	12.4
Prostate	7.0	5.2	----	----
Breast	----	----	6.1	10.3
Colorectal	18.3	8.3	17.7	5.5

Sources: Statistics Canada. Vital Statistics — Death Database and Demography Division (population estimates).

Notes: Lung cancer includes cancer of the trachea, bronchus and lung (ICD-10, codes C33-C34).
Prostate cancer (ICD-10, code C61).
Breast cancer (ICD-10, code C50).
Colorectal includes cancer of the colon, rectosigmoid junction, rectum and anus (ICD-10, codes C18–C21).
Age-standardized to the 2001 total population age structure of Inuit Nunangat.
Numbers and rates on this table are based on the summation of five consecutive years of deaths data.
These mortality statistics are estimates. Rates for Canadians that are shown in this table will differ from Canadian mortality rates (on the same conditions) that are displayed elsewhere in *Healthy Canadians 2010*; thus, these data should not be compared with each other.
For additional limitations, see Annex 2.

What these results mean for you

Despite the decrease in mortality rates, the total number of new cancer cases and deaths in Canada continues to rise steadily as the Canadian population grows and ages. Although genetic factors can be determinants in cancer diagnosis, one's lifestyle has a very strong impact on cancer risk; adopting a healthy lifestyle can strongly mitigate the risks of being diagnosed with cancer. Even after cancer is diagnosed, a change towards a healthy lifestyle has some influence on the slowing of the progression of the disease and might prevent its associated mortality.[112, 113, 114]

Smoking is a well-known risk factor for several diseases, including asthma, cardiovascular disease and some types of cancer. Heavy smoking increases the risk of lung cancer by around 30-fold, and smoking causes over 80% of lung cancer in western countries.[115] Smoking is also a risk factor for other cancers such as larynx, pharynx, oesophageal, pancreas, stomach, bladder, kidney, cervix and endometrial.[116] Therefore, smoking cessation is the single most effective modifiable risk factor for cancer.

After smoking, chronic infections and possibly obesity,[117] alcohol is the single most important cause of cancer. A causal relationship has been established between alcohol consumption and cancers of the colon and breast[118] and a causal relationship is suspected between alcohol consumption and lung cancer in heavy drinkers.[117]

Obesity is a contributor to a wide variety of cancers including breast, colon and prostate cancer.[130] There is also strong evidence that physical activity decreases the risk of colon and breast cancer,[131, 132, 133] and has a moderate effect on prostate and lung cancer.[131]

Eating a healthy diet can also reduce the risk of some cancer.[119] For example, a diet high in tomatoes (which contains lycopene) has been associated with a reduced risk of prostate cancer,[120] and fruit and vegetable consumption may help protect against lung cancer, especially in women.[121] However, high consumption of preserved meats and red meats have been associated with a higher incidence and mortality from colorectal and prostate cancers.[122, 123]

When it comes to the effect of diet on cancer incidence and mortality, several studies show conflicting results. While fat intake may play a role, it is the total amount of energy consumed that is most important in colorectal cancer development.[124] Similarly, although some research shows that eating large amounts of fruit, vegetables and fibre decreases the risk for colorectal cancer,[125, 126] other studies have shown that it is not beneficial.[127, 128, 129] In addition, high consumption of dairy products may lead to prostate cancer.[123]

Things you can do to reduce the risk of cancer-related death

- Do not smoke / stop smoking
- Exercise regularly
- Keep a healthy body weight
- Reduce your alcohol consumption
- Eat a healthy diet
- See your doctor regularly and discuss any sudden changes in your physiology (blood in urine, stool or sputum, persistent cough, sudden weight change, change in sleep patterns, lump in breast, etc.) with him/her; don't wait until your health deteriorates and you have no choice but to see your doctor
- Follow your doctor's advice, be it having screening tests, making changes in lifestyle or diet
- For additional information on these cancers risk factors, go to page 60 on the incidence rates for cancer

30. MORTALITY RATE FOR ACUTE MYOCARDIAL INFARCTION (AMI)

31. MORTALITY RATE FOR STROKE

Key Messages

- Cardiovascular diseases (CVD) are the most significant cause of death in Canada, accounting for about one third of all deaths
- They include, among others, acute myocardial infarction (AMI) and stroke
- Mortality rates for AMI and stroke have been declining for decades
- Mortality rates for both ischemic heart disease and cerebrovascular diseases were higher for Registered Indians than for Non-Aboriginals
- Ischemic heart disease mortality rates were not found to be different for residents of Inuit regions and Canadians overall
- Cerebrovascular disease mortality rates are higher for residents of Inuit regions compared to Canada overall

What do these indicators measure?

These indicators measure the number of deaths of individuals in which the underlying cause of death is AMI or stroke, per 100,000 population that would be observed in the population if it had the same age composition as the reference or "standard" population.

For Registered Indians, the indicator is the number of deaths of individuals 25 years and older in which the underlying cause of death is ischemic heart disease or cerebrovascular disease, per 100,000 population that would be observed in the population if it had the same age composition as the reference or "standard" population. Data for Registered Indians are an average from 1991 to 2001 (centred on 1996) in order to provide more stability in numbers.

Mortality data specific to Inuit are not consistently collected in administrative databases across the country. However, a method has been developed which allows the use of geographic identifiers to inform the health of Inuit in Canada. Certain communities in northern Canada have a high proportion of Inuit residents. These communities can be organized into four Inuit Regions (Inuvialuit region, Nunavut, Nunavik and Nunatsiavut). Health indicators for residents of these regions can serve as a proxy for Inuit-specific health indicators. It should be noted that because these data also include non-Inuit residents of these regions, who tend to have better health outcomes than the Inuit population living in the same area, caution should be used when interpreting these results. While this information is not Inuit-specific, it can be used to infer the health of Inuit in Canada.

What are cardiovascular diseases?[135]

CVD refer to more than one disease of the circulatory system (which includes the heart and blood vessels). Two major causes of CVD include AMI and stroke. AMI, commonly known as a heart attack, is a result of a complete blockage of an artery in the heart which may eventually lead to tissue damage in the heart from lack of oxygen. Stroke generally refers to a similar problem with the blood vessels of the brain.

Ischemic heart disease is a condition where the heart muscle is damaged or works inefficiently because of the absence or relative deficiency of its blood supply. It can cause a heart attack, angina (chest pain), and sudden death.

Cerebrovascular disease is a broad term that includes strokes and disorders of brain blood vessels. Acute stroke is the most common of all these conditions.

What are the limitations of these indicators?

In Canada, as in many other countries, mortality rates for AMI and stroke have been on the decline for decades. It is not known how much of this decline in mortality rate is due to a decreased incidence of these diseases or improved treatment for those who developed them. For instance, improved lifestyle[136, 137, 138] and therefore decreased risk factors, such as high cholesterol,[139] high blood pressure[140] and diabetes,[141] could reduce the incidence in AMI and stroke. As well, the decline in mortality rate may also be reflective of improved treatment of AMI and stroke victims in terms of better medical interventions and pharmaceutical treatments.

The use of age-standardized mortality rates improves comparability over time by correcting for the increasing age of the population, but may underestimate the actual rates and the true burden on the health care system.

Mortality rate for AMI is decreasing

In 2006, the overall AMI mortality rate in Canada was 37.1 deaths per 100,000 population, with 51.7 deaths per 100,000 males and 25.7 deaths per 100,000 females. Mortality (and generally, prevalence and incidence of AMI) has always been higher in males, but over time the difference between sexes has been lessening. AMI mortality rates have steadily decreased since 2000.

Figure 36 **Mortality Rate for Acute Myocardial Infarction (AMI)**
Per 100,000 population, by sex (age-standardized), Canada, 2000-06
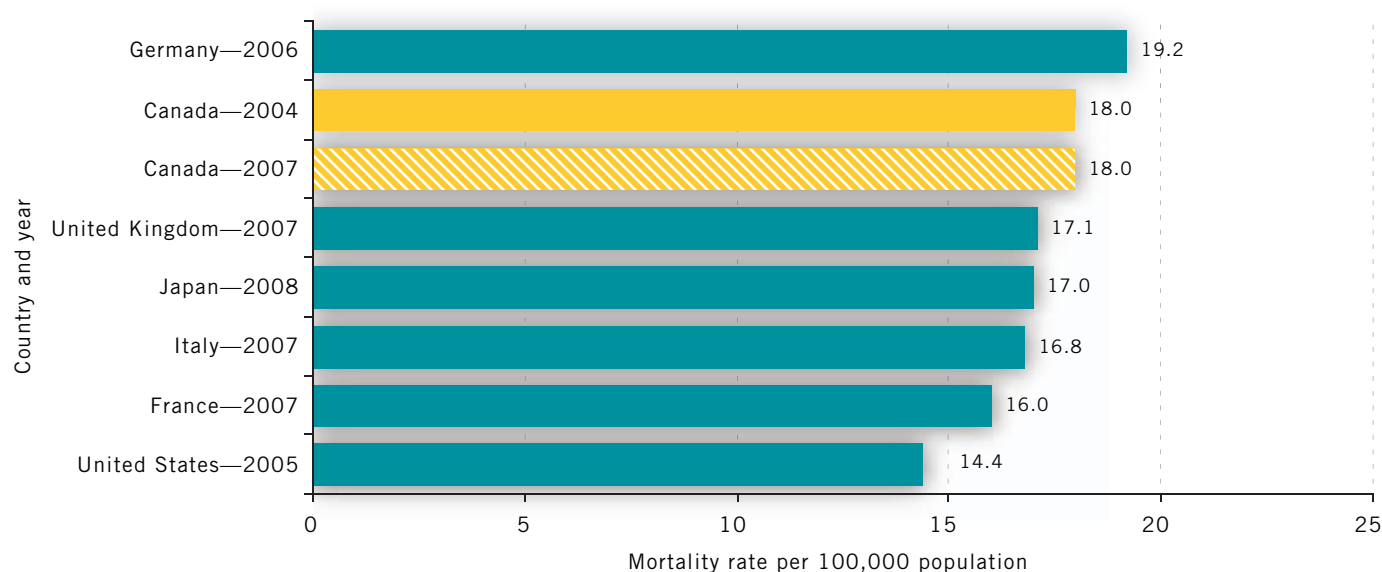

Sources: Statistics Canada. Vital Statistics — Death Database.
           Institut de la Statistique du Québec.

Notes: Age-standardized to the 1991 Canadian population.
           For additional exclusions/limitations, see Annex 2.

Ischemic heart disease mortality rates for Registered Indians were higher than for Non-Aboriginal Canadians

In 1991-2001 (centred in 1996), the mortality rates for ischemic heart disease of Registered Indians were 155.0 deaths per 100,000 males and 74.8 deaths per 100,000 females, which were higher than the rates for Non-Aboriginal Canadian males (123.2 deaths per 100,000 males) and females (48.8 deaths per 100,000 females).[134]

Table 6   Mortality Rate for Ischemic Heart Disease

For Registered Indians and Non-Aboriginal Canadians aged 25 years and older (per 100,000 person-years), by sex (age-standardized), 1991-2001 (centred on 1996)

	Males		Females	
	Registered Indian	**Non-Aboriginal Canadian**	**Registered Indian**	**Non-Aboriginal Canadian**
Ischemic Heart Disease	155.0	123.2	74.8	48.8

Source: Tjepkema, M., Wilkins, R., Senécal, S., Guimond, E., Penney, C. (2009). Mortality of Métis and Registered Indian adults in Canada: An 11-year follow-up study. *Health Reports* (Statistics Canada, Catalogue 82-003-X) 20(4): 1-21. Available from: http://www.statcan.gc.ca/pub/82-003-x/2009004/article/11034-eng.htm.

Notes: Age-standardized using the 1991 to 2001 total Aboriginal population structure (person-years at risk), centred on 1996.
Registered Indians refer to Registered First Nations.
These mortality statistics are estimates. Rates for Canadians that are shown in this table will differ from Canadian mortality rates (on the same conditions) that are displayed elsewhere in *Healthy Canadians 2010*; thus, these data should not be compared with each other.
For additional limitations, please consult the published article noted above.

Ischemic heart disease mortality rates were not found to be statistically different for residents of Inuit regions and Canadians overall

In 1999-2003, no differences were found between the ischemic heart disease mortality rates for residents of Inuit regions and Canadians overall.

Table 7   Mortality Rate for Ischemic Heart Disease

For Residents of Inuit Regions and all Canadians (per 100,000 population),
by sex (age-standardized), 1999-2003

	Males		Females	
	Inuit Regions	**Canada overall**	**Inuit Regions**	**Canada overall**
Ischemic Heart Disease	37.3	40.6	17.8	16.5

Sources: Statistics Canada. Vital Statistics — Death Database and Demography Division (population estimates).

Notes: Age-standardized to the 2001 total population age structure of Inuit Nunangat.
Numbers and rates on this table are based on the summation of five consecutive years of deaths data.
These mortality statistics are estimates. Rates for Canadians that are shown in this table will differ from Canadian mortality rates (on the same conditions) that are displayed elsewhere in *Healthy Canadians 2010*; thus, these data should not be compared with each other.
For additional limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country. It should be noted that OECD data are age-standardized according to the 1980 total OECD population, while Canadian data (presented in the graph *Mortality Rate for Acute Myocardial Infarction*) are age-standardized to the 1991 Canadian population. Reference years for OECD data also differ according to the country. Therefore, data are not directly comparable between Canadian and international graphs.

Canada had the second highest rate of AMI mortality among G7 countries (41.5 deaths per 100,000 population), behind Germany.

Figure 37 **Mortality Rate for Acute Myocardial Infarction (AMI)**

Per 100,000 population, both sexes (age-standardized), selected countries and years
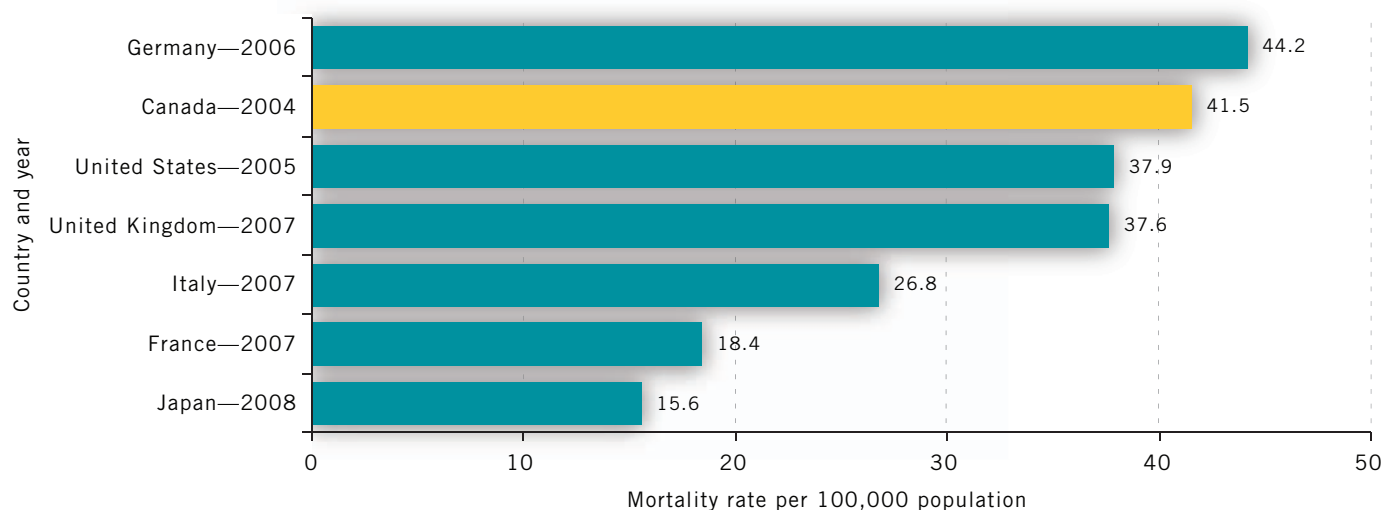
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010.*

Notes: Data are for selected years.
            Data are not comparable to Canadian trend data for the indicator *Mortality rate for acute myocardial infarction (AMI)* because OECD data are age-standardized to the 1980 total OECD population rather than the 1991 Canadian population.
            For additional exclusions/limitations, see Annex 2.

Mortality rate for stroke is decreasing

In 2006, the overall stroke mortality rate in Canada was 26.5 deaths per 100,000 population, with 28.6 deaths per 100,000 males and 24.6 deaths per 100,000 females.

Figure 38 Mortality Rate for Stroke

Per 100,000 population, by sex (age-standardized), Canada, 2000-06

Sources: Statistics Canada. Special tabulation, based on Vital Statistics — Death Database and estimates of population by age and sex for the years 2000 to 2006.

Notes: Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Cerebrovascular disease mortality rates for Registered Indians were higher than for Non-Aboriginal Canadians

The mortality rates for cerebrovascular disease of Registered Indians in 1991-2001 (centred on 1996) were 35.4 deaths per 100,000 males and 40.9 deaths per 100,000 females, higher than the rates for Non-Aboriginal Canadian males (28.2 deaths per 100,000 males) and females (21.4 deaths per 100,000 females).[134]

Table 8   **Mortality Rate for Cerebrovascular Disease**

For Registered Indians and Non-Aboriginal Canadians aged 25 years and older
(per 100,000 person-years), by sex (age-standardized), 1991-2001 (centred on 1996)

	Males		Females	
	Registered Indian	**Non-Aboriginal Canadian**	**Registered Indian**	**Non-Aboriginal Canadian**
Cerebrovascular Disease	35.4	28.2	40.9	21.4

Source: Tjepkema, M., Wilkins, R., Senécal, S., Guimond, E., Penney, C. (2009). Mortality of Métis and Registered Indian adults in Canada: An 11-year follow-up study. *Health Reports* (Statistics Canada, Catalogue 82-003-X) 20(4): 1-21. Available from: http://www.statcan.gc.ca/pub/82-003-x/2009004/article/11034-eng.htm.

Notes: Age-standardized using the 1991 to 2001 total Aboriginal population structure (person-years at risk), centred on 1996.
Registered Indians refer to Registered First Nations.
These mortality statistics are estimates. Rates for Canadians that are shown in this table will differ from Canadian mortality rates (on the same conditions) that are displayed elsewhere in *Healthy Canadians 2010*; thus, these data should not be compared with each other.
For additional limitations, please consult the published article noted above.

Cerebrovascular disease mortality rates are higher for residents of Inuit regions compared to Canada overall

In 1999-2003, male and female residents of Inuit regions had higher mortality rates for cerebrovascular disease compared to all Canadian males and females.

Table 9   Mortality Rate for Cerebrovascular Disease

For Residents of Inuit Regions and all Canadians (per 100,000 population), by sex (age-standardized), 1999-2003

	Males		Females	
	Inuit Regions	**Canada overall**	**Inuit Regions**	**Canada overall**
Cerebrovascular Disease	15.7	9.7	25.7	7.9

Sources: Statistics Canada. Vital Statistics — Death Database and Demography Division (population estimates).

Notes: Age-standardized to the 2001 total population age structure of Inuit Nunangat.
Numbers and rates on this table are based on the summation of five consecutive years of deaths data.
These mortality statistics are estimates. Rates for Canadians that are shown in this table will differ from Canadian mortality rates (on the same conditions) that are displayed elsewhere in *Healthy Canadians 2010*; thus, these data should not be compared with each other.
For additional limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country. It should be noted that OECD data are age-standardized according to the 1980 total OECD population, while Canadian data (presented in the graph *Mortality Rate for Stroke*) are age-standardized to the 1991 Canadian population. Therefore, data are not directly comparable between Canadian and international graphs.

Canada had the second lowest cerebrovascular disease mortality rate in the G7 countries (31.2 deaths per 100,000 population), with only France having a lower rate.

Figure 39 Mortality Rate for Cerebrovascular Diseases
Per 100,000 population, both sexes (age-standardized), selected countries and years
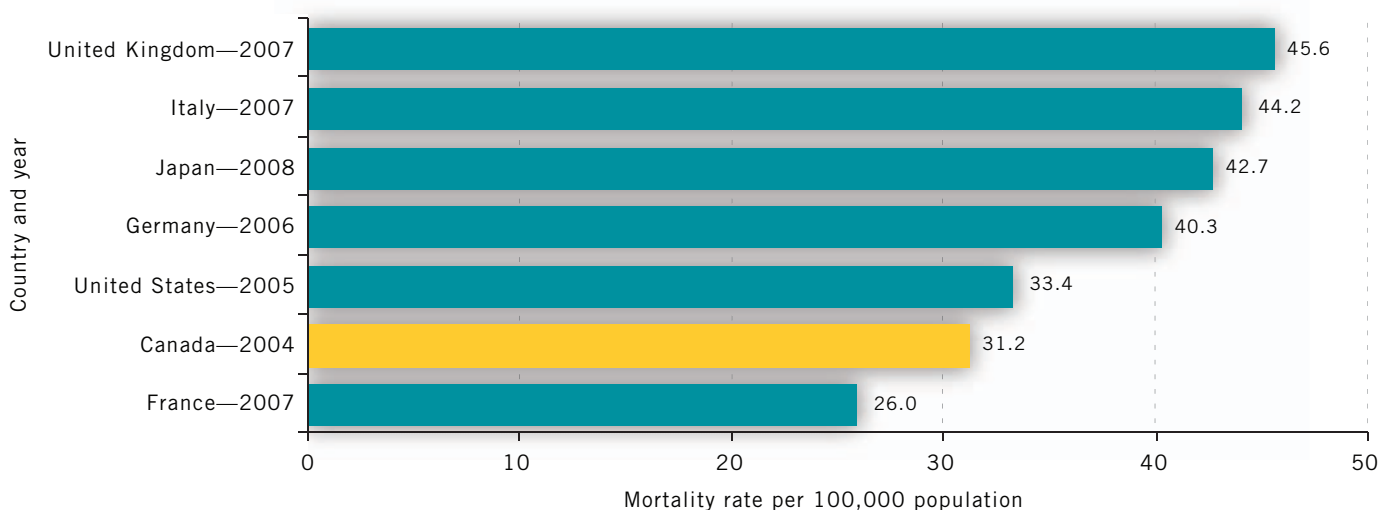
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.

Notes: Data are for selected years.
             Data are not comparable to Canadian trend data for the indicator *Mortality rate for stroke* because OECD data are age-standardized to the 1980 total OECD population rather than the 1991 Canadian population. In addition, the OECD data examine mortality due to all cerebrovascular diseases (ICD-10, codes I60–I69), while Canadian trend data refer only to stroke (ICD-10, codes I60–I66).
             For additional exclusions/limitations, see Annex 2.

What these results mean for you

Cardiovascular diseases, including AMI and stroke, are a major cause of death in Canada, accounting for about one third of all deaths.[135] CVD are chronic, lifelong diseases caused by interactions among genetic predisposition, health behaviours, and the environment. Fortunately, treatment can relieve symptoms, improve the quality of life, and reduce the possibility of early death.[142] More importantly, however, CVD can be prevented by not smoking,[143, 144] regular physical activity,[145, 146] healthy nutrition,[147, 148] healthy weight,[149] early recognition and treatment of high blood pressure[150, 151] and high cholesterol,[152] along with effective stress management.[153]

In Canada, as in many countries, mortality rates for AMI and stroke have been declining for decades. It is not known how much of this decline is due to a change in the underlying incidence of these diseases, which would reflect changes in lifestyle and risk factors, or to an improvement in survival brought on by improved treatment.

Optimal prevention of CVD requires the use of primary, secondary and tertiary prevention strategies. Primary prevention, by risk factor modification (e.g., develop healthy eating habits, regular physical activity, etc.), can reduce disease incidence; secondary prevention, through early identification and management of the disease states (e.g., management of high blood pressure, cholesterol, etc.), can increase survival; tertiary prevention, through the rehabilitation from established disease, can further reduce disability and suffering, enhancing quality of life.

Benefits of cardiovascular health

- Better health
- Stronger heart and lungs
- Decreased fatigue to accomplish a particular task
- Improved blood flow through the arteries
- Decreased odds of other serious illnesses

Risk factors associated with AMI and stroke

- Smoking
- Physical inactivity
- Diet rich in saturated and trans fats
- Diet high in sodium
- High blood cholesterol
- High blood pressure
- Obesity
- Diabetes
- Excessive alcohol drinking
- Stress
- A family history of heart disease

Things you can do to prevent heart disease

- Avoid smoking and/or alcohol abuse
- Enjoy a balanced diet which includes a variety of foods and choosing lower-fat alternatives
- Engage in regular physical activity
- Manage your stress effectively
- Maintain a healthy body weight
- Speak to your health care provider about other ways to improve your heart health (e.g., early detection and treatment of high blood pressure, diabetes and/or monitoring your blood cholesterol level, etc.)
- To learn more about prevention of CVD, visit the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/publicat/hdsc97/s07-eng.php)

32. SELF-REPORTED CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Key Messages

- Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality
- COPD is a chronic lung disease characterized by shortness of breath, cough and mucus (sputum) production, and includes chronic bronchitis and emphysema
- It progresses slowly over a period of several years
- It usually appears in people over the age of 55 years, although changes to the lungs begin many years earlier
- A little more than 4% of Canadians aged 35 years and older reported suffering from COPD

What does this indicator measure?

This indicator measures the percentage of Canadian adults who reported that they have been diagnosed by a health professional as having COPD. COPD is a term that includes chronic bronchitis and emphysema.

> COPD can be prevented. If you are a smoker, the best thing you can do to reduce or eliminate your risk is to stop smoking.

What are the limitations of this indicator?

Although this indicator appears to refer to a diagnosis made by a health professional, it is based on the respondents' self-report and is influenced by their capacity to remember or comprehend the health professional's diagnosis. In this case, self-reported data are never as accurate as they would be if they came from an actual clinical database.[32]

Few Canadians reported being diagnosed with COPD

In 2009, 4.1% of Canadians aged 35 years and older reported that they had been diagnosed by a health professional as having COPD. Rates for males and females were 3.9% and 4.3%, respectively.

Figure 40 Chronic Obstructive Pulmonary Disease (COPD)

Percentage of population aged 35 years and older who reported having COPD, by sex, (age-standardized), Canada, 2003-09
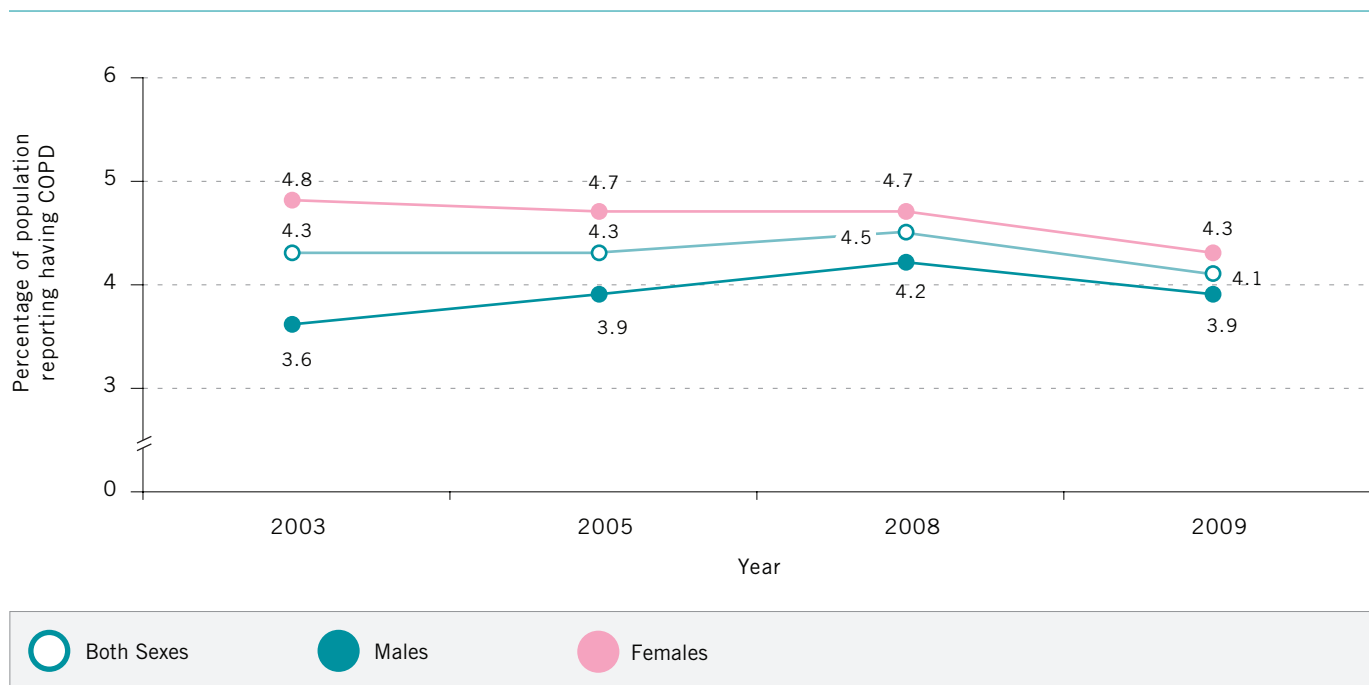
Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Includes household population aged 35 years and older who reported that they have been diagnosed by a health professional as having COPD. COPD includes two main diseases: chronic bronchitis and emphysema.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

As people age, they are more likely to report having been diagnosed with COPD.

Figure 41 Chronic Obstructive Pulmonary Disease (COPD)

Percentage of population aged 35 years and older who reported having COPD, by sex and age groups, (age-standardized), Canada, 2009
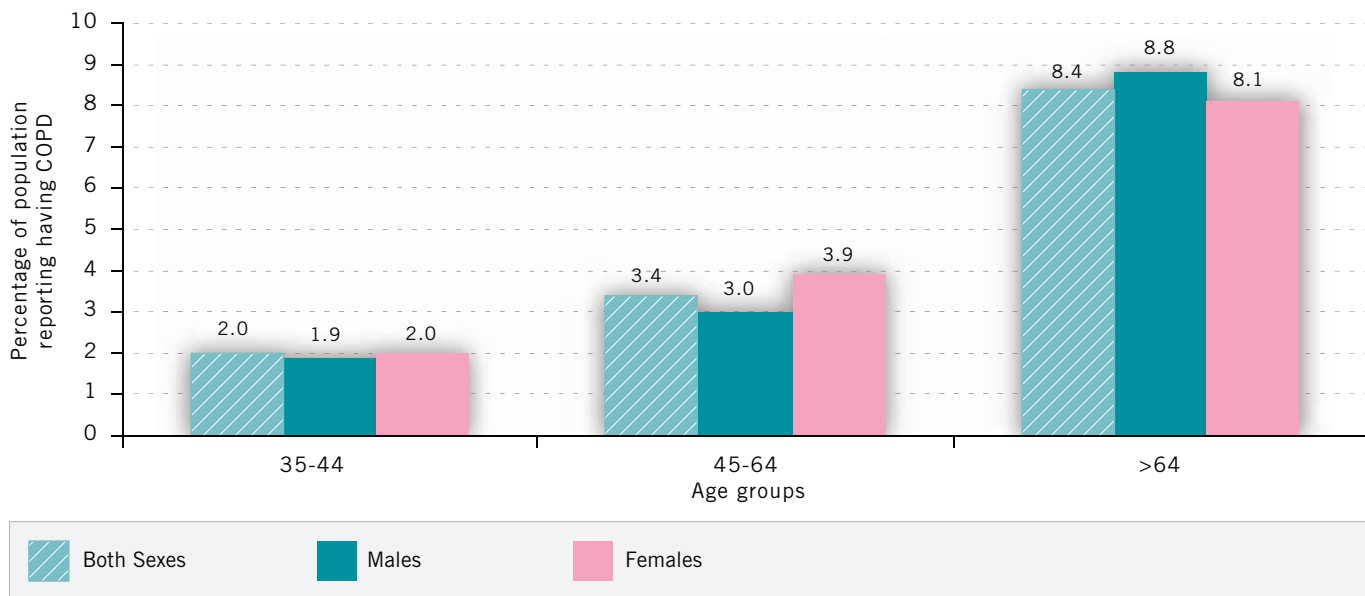
Source: Statistics Canada. Canadian Community Health Survey, 2009.

Notes: Includes household population aged 35 years and older who reported that they have been diagnosed by a health professional as having COPD. COPD includes two main diseases: chronic bronchitis and emphysema.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Chronic obstructive pulmonary disease (COPD) is a chronic disease characterized by shortness of breath, cough and mucus (sputum) production. It slowly progresses over several years and, as severity increases, becomes irreversible and leads to a further reduction in airflow and possibly premature death. It becomes such a debilitating disease that the activity levels of individuals is limited, reducing their quality of life.

Unlike most other leading causes of death and disability, COPD is projected to increase around the world as smoking rates rise and the population ages.[154, 155] Furthermore, some researchers suggest that the rates of COPD mortality and morbidity are rising faster among females than males, and this may be linked to an increase in tobacco exposure or to greater susceptibility among females.[156, 157, 158]

Benefits of healthy lungs

Your lungs are the main structures of the respiratory system allowing the exchange of gases between the atmospheric air and your body. The function of the lungs is to supply the body with oxygen (carried through the blood) and dispose of carbon dioxide and other waste gases. This process is called respiration.

Healthy lungs offer the following benefits:

- More efficient and faster gas exchange between the atmospheric air and the body through the alveoli
- Greater capacity to perform daily chores and activities, reducing the feeling of not having enough air (feeling winded)
- Less fatigue during physical activity
- Smaller amount of mucus or sputum formed in the respiratory system

Risk factors for COPD

- Smoking is the principal risk factor in 50% to 70% of cases
- Second-hand smoke exposure may also play an important role
- Occupational exposure to various dusts, chemicals, vapours and fumes is a factor for many people
- Indoor air pollutants such as dust and animal hair
- Outdoor air pollution is associated with increased symptoms among those with COPD, including shortness of breath; however, it plays a smaller role than indoor air pollutants
- Repeated episodes of respiratory tract infections during childhood could lead to reduced levels of respiratory function, which may predispose a person to COPD
- A genetic deficiency of the serine protease alpha-1-antitrypsin, an enzyme which protects lung tissue from damage, is also associated with an increased risk of COPD

Things you can do to prevent getting COPD

- Do not smoke
- If you smoke, get help quitting since smoking is the main cause of lung disease
- Avoid second-hand smoke
- Protect yourself from hazards at work, especially if the work environment contains dust, chemicals, vapours and fumes; wear a protective mask
- Manage air pollution inside your house by maintaining appliances like your furnace and air vents, ventilating the air and controlling dust
- On days with poor air quality, staying inside and avoiding vigorous outdoor exercise may help reduce symptoms and the risk of COPD exacerbation
- Speak with a health care provider for more information on COPD
- More information is available at Health Canada's *Air Pollution and Heart and Lung Disease* (http://hc-sc. gc.ca/ewh-semt/pubs/air/heart_lung-cardio_pulmon-eng.php)
- For more information on COPD, visit the Public Health Agency of Canada website (http://www.phac-aspc.gc.ca/cd-mc/crd-mrc/copd-mpoc-eng.php) or the Canadian Lung Association website (http://www.lung.ca/home-accueil_e.php)

33. SELF-REPORTED ASTHMA

Key Messages

- Asthma is a respiratory condition that includes coughing, shortness of breath, chest tightness and wheezing
- Asthma affects many children and adults worldwide
- Some environmental factors may increase or reduce the risk of asthma
- It is important to get the right medicine to control your asthma and to take it as directed
- Females are more likely than males to report that they suffer from asthma

What does this indicator measure?

This indicator measures the percentage of Canadians aged 12 years and older who reported that they have been diagnosed by a health professional as having asthma.

What are the limitations of this indicator?

Some asthma symptoms, such as wheezing, are not unique to asthma but are shared by other diseases such as bronchiolitis in children and chronic obstructive pulmonary disease (COPD) in the elderly.[159] Asthma is also variable over time so any or all of the symptoms may not be present at any particular point in time.[160]

Furthermore, even though this indicator appears to refer to a diagnosis made by a health professional, it is based on the respondents' self-report and is influenced by their capacity to remember or comprehend the health professional's diagnosis. In this case, self-reported data are never as accurate as they would be if they came from an actual clinical database.[32]

Who gets asthma?
Asthma affects about three million Canadians. While asthma is not contagious, it can be caused by both hereditary (inherited) and environmental factors.

Canadian females are more likely than males to report that they suffer from asthma

In 2009, 8.3% of Canadians aged 12 years and older reported having been diagnosed with asthma by a health professional. Overall, a greater percentage of females (9.6%) than males (7.0%) reported that they had asthma.

Figure 42 Self-Reported Asthma

Percentage of population aged 12 years and older who reported having asthma, by sex (age-standardized), Canada, 2003-09
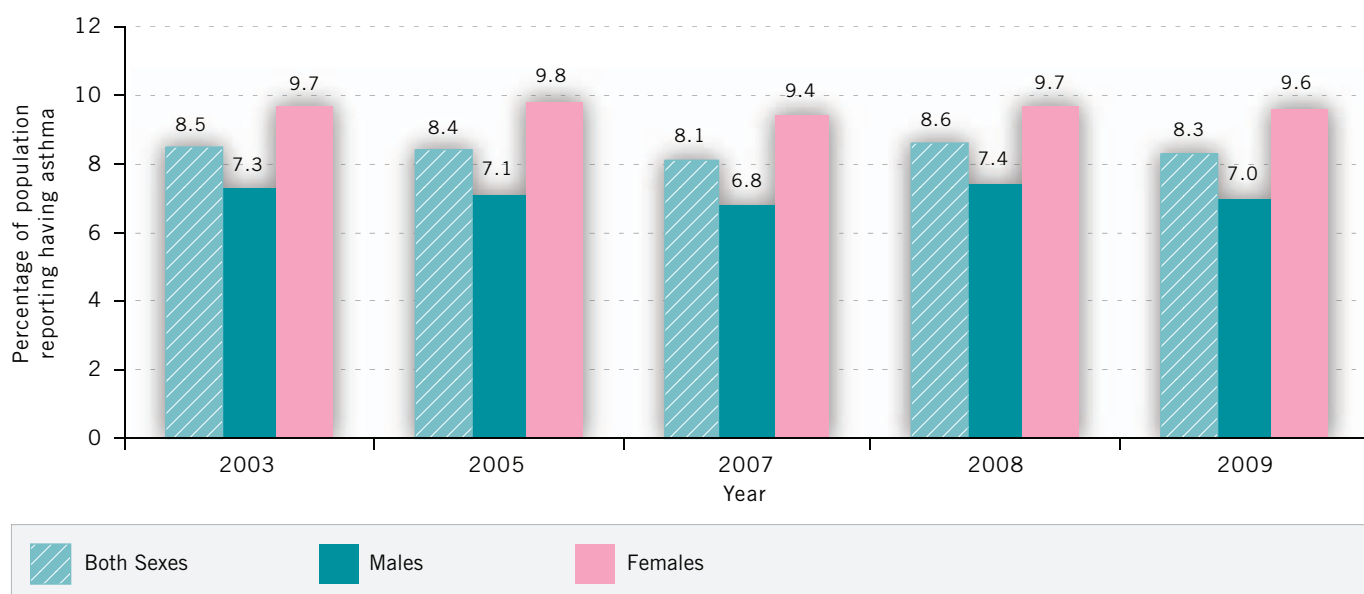
Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Population aged 12 years and older who reported that they have been diagnosed by a health professional as having asthma.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Health professionals define asthma as a chronic inflammatory disease of the airways that is characterized by coughing, shortness of breath, chest tightness and wheezing. Asthma symptoms and attacks (episodes of severe shortness of breath) usually occur after exercise or exposure to allergens, viral respiratory infections, irritant fumes or gases. These exposures cause an inflammation of the airway wall and an abnormal narrowing of the airways, which lead to asthma symptoms.[161]

Many health and social problems are associated with asthma, such as missing school or work,[162] sleep or cognitive impairment,[163] mental health problems,[164] other respiratory conditions,[165] and even death.

A family history or genetic predisposition to develop allergies and allergic disorders[161] is a significant cause of asthma. Other risk factors include humidity and dampness,[166] frequent respiratory infections early in life,[167, 168] low birth weight,[169] obesity[170, 171] and respiratory distress syndrome.[172]

There is also sufficient evidence to conclude that there is an association between environmental tobacco smoke and the development of asthma in younger children.[166] In addition, maternal smoking during and following pregnancy is associated with an increased risk of asthma in early life. For adults, the risk of asthma and environmental tobacco smoke exposures in the workplace are strongly related.[173]

Other studies suggest that exposure to certain environmental factors, such as the presence from before birth and onward of a dog or other pet in the home[174, 175] and attendance at day care during the first year of life[176] may protect against the development of allergic asthma in childhood.[177]

Benefits of breathing properly

- Provides you with more energy
- Helps you cope with and overcome stress
- Improves blood circulation and relieves congestion
- Increases the supply of oxygen and nutrients to cells throughout the body and the release of carbon dioxide (CO_2) and other gases

Problems related to asthma

- Missing days of school or work because of asthma symptoms
- Sleep deprivation and impairment of daytime cognitive performance
- Limitations in your daily and physical activities
- Higher risk of developing mood and anxiety disorders, such as depression
- Higher risk of developing chronic obstructive pulmonary disease as an adult
- Death

Things you can do to prevent and manage your asthma symptoms

- Warm up before playing sports or exercising to relax the airways
- Ask your friends and family to not smoke in your house or car
- Switch to non-toxic brands of cleaning products
- Keep your pet out of your bedroom and off the furniture
- Keep the humidity in your house below 50%
- Vacuum rugs and carpets at least once a week
- Close your windows to keep out pollen
- Avoid being outside in hot sunny weather, when pollen counts are high, or when outdoor air quality is poor
- Know your asthma triggers and avoid them
- Have a written asthma action plan
- Learn how to use medications properly
- Work with a Certified Respiratory Educator to learn about asthma control
- More information is available at Health Canada's *Air Pollution and Heart and Lung Disease* (http://hc-sc. gc.ca/ewh-semt/pubs/air/heart_lung-cardio_pulmon-eng.php)
- For more helpful tips on preventing and managing asthma symptoms, please visit the Public Health Agency of Canada's website on asthma (http://www.phac-aspc.gc.ca/cd-mc/crd-mrc/asthma-asthme-eng.php)

34. SELF-REPORTED TEENAGE SMOKING RATES

35. SELF-REPORTED ADULT SMOKING RATES

Key Messages

- Smoking is the leading cause of premature mortality in the developed world
- It is linked to several types of cancer
- Smoking rates are decreasing in Canada for teenagers and all Canadians
- Smoking remains an important health issue affecting Inuit

What do these indicators measure?

These indicators measure the proportion of the population aged 12 to 19 years (for teenagers), and 12 years and older (for Canadian population) who reported they were current (daily or occasional) smokers at the time of the interview. In the Canadian Community Health Survey (CCHS), current smokers included daily and occasional smokers; occasional smokers are individuals who do not smoke daily.

For Inuit, this indicator measures the percentage of the population aged 15 years and older who reported they were daily or occasional smokers.

> Smoking is the leading cause of preventable death in the world.

What are the limitations of these indicators?

The validity of self-reported smoking is often questioned because of the common belief that smokers are predisposed to underestimate the amount of cigarettes smoked or to deny smoking altogether. As more attention is paid to smoking in the media and in public places, smokers may become more sensitized to socially desirable forms of behaviour; thus, they may be more likely to understate the extent to which their behaviour deviates from the *perceived social norm* of "not smoking." In fact, research shows that self-reported smoking is about 2 to 4% lower than actual smoking rates among the population.[178, 179]

Furthermore, the accuracy of self-report versus actual smoking rates may be influenced by the way data were collected. Research suggests that interviewer-administered questionnaires yielded higher accuracy of self-report versus actual smoking rates than did self-administered questionnaires. This may reflect smokers' awareness of cues about their smoking that would be obvious to an interviewer, which would not be the case during a phone interview or self-administered questionnaires.[180] Half of the data for the Canadian population coming from the CCHS were collected over the phone and the other half were collected in person.

For the Aboriginal Peoples Survey (APS), the survey was conducted using personal interviews in Inuit regions, Labrador and in the Northwest Territories (except Yellowknife). Telephone interviews were conducted elsewhere in Canada.

Teenage smoking rates are declining overall but challenges remain

In 2009, 11.0% of Canadian teenagers reported being current smokers, a decline from 14.9% in 2003. The percentage of teenage females who are current smokers has decreased to 9.8% in 2009 from 15.3% in 2003. Also in 2009, 6.8% of Canadian teenagers reported being daily smokers, a decrease from 9.1% in 2003. The percentage of female daily smokers also decreased to 5.7% in 2009 from 9.3% in 2003.

Figure 43 Self-Reported Teenage Smoking Rates

Percentage of population aged 12 to 19 years reporting they are current and daily smokers, by sex, Canada, 2003-09
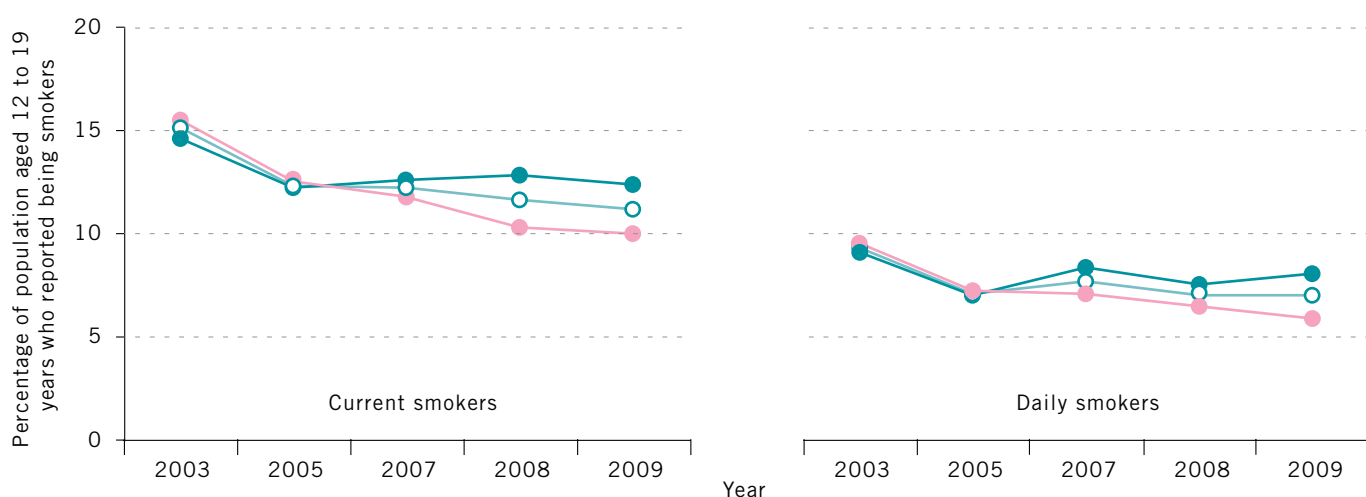
	2003	2005	2007	2008	2009		2003	2005	2007	2008	2009
Both sexes	14.9	12.1	12.0	11.4	11.0		9.1	6.9	7.5	6.8	6.8
Males	14.4	12.0	12.4	12.6	12.2		8.9	6.8	8.1	7.3	7.8
Females	15.3	12.3	11.6	10.1	9.8		9.3	7.0	6.9	6.3	5.7

○ Both Sexes   ● Males   ● Females

Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Current smokers include daily smokers and occasional smokers.
For additional exclusions/limitations, see Annex 2.

Canadian smoking rates are declining

In 2009, 20.5% of Canadians aged 12 years and older reported being current smokers, a decline from 23.4% in 2003 and 21.9% in 2008. In 2009, 23.1% of males 12 years and older were current smokers, a decrease from 25.6% in 2003 and 25.0% in 2008. Also in 2009, female current smokers also decreased, to 18.0% from 21.3% in 2003.

In 2009, 15.6% of Canadians aged 12 years and older reported being daily smokers, a decrease from 17.9% in 2003 and 16.9% in 2008. Male daily smokers decreased to 17.5% in 2009 from 19.6% in 2003 and 19.4 % in 2008. Female daily smokers decreased to 13.7% in 2009 from 16.3% in 2003.

Figure 44 Self-Reported Smoking Rates for All Canadians

Percentage of population aged 12 years and older reporting they are current and daily smokers, by sex (age-standardized), Canada, 2003-09
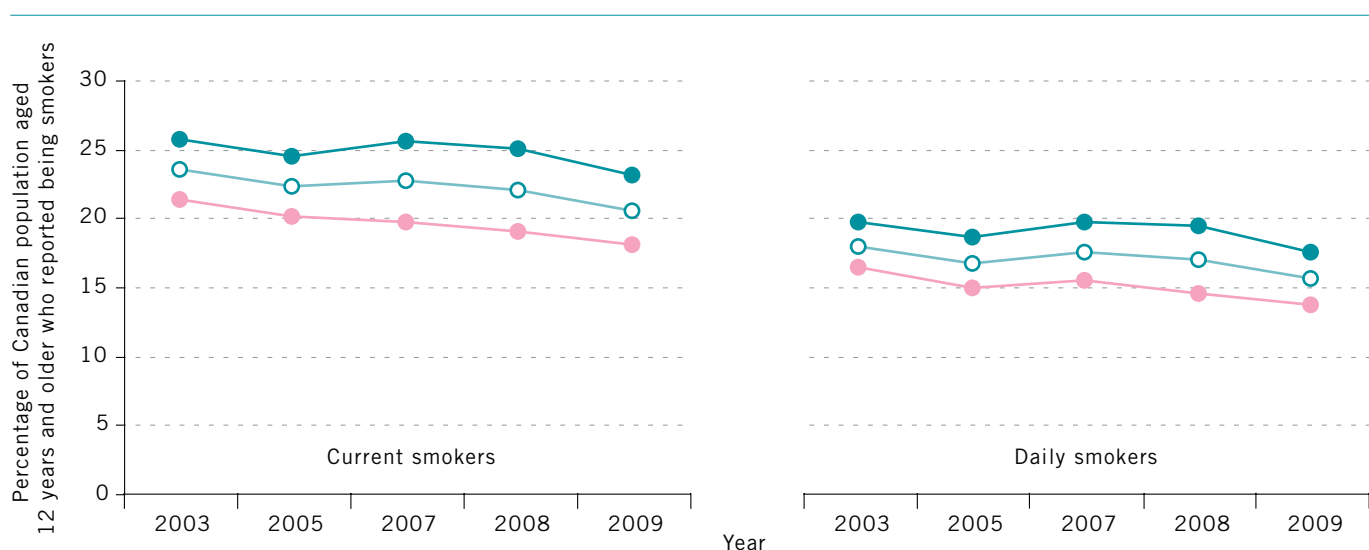
	2003	2005	2007	2008	2009	2003	2005	2007	2008	2009
Both Sexes	23.4	22.2	22.6	21.9	20.5	17.9	16.7	17.5	16.9	15.6
Males	25.6	24.4	25.5	25.0	23.1	19.6	18.5	19.7	19.4	17.5
Females	21.3	20.1	19.7	18.9	18.0	16.3	14.9	15.4	14.5	13.7

○ Both Sexes   ● Males   ● Females

Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Current smokers include daily smokers and occasional smokers.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Inuit smoking rates are very high

In 2006, 58% of Inuit aged 15 years and older reported that they were daily smokers. Also in 2006, 8% of Inuit aged 15 years and older reported they were occasional smokers. Data were similar between men and women.

Figure 45 Self-Reported Smoking Rates

Percentage of Inuit aged 15 years and older reporting they are daily or occasional smokers, by sex, Canada, 2006
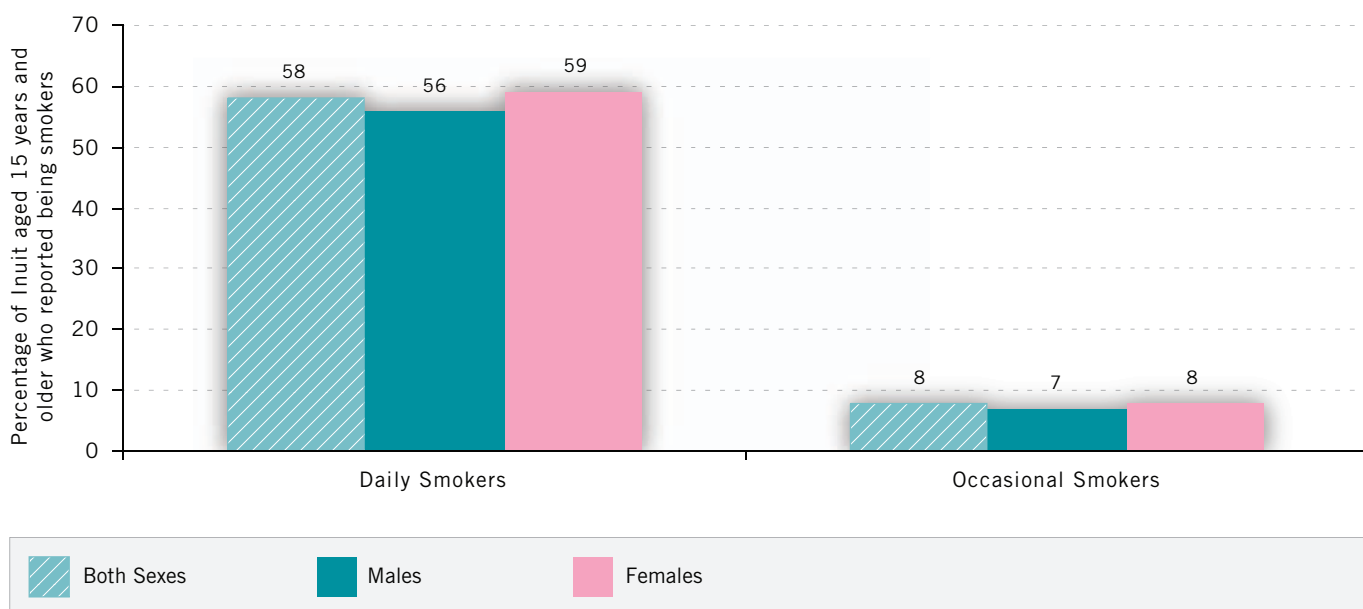
Source: Statistics Canada. Aboriginal Peoples Survey, 2006.

Notes: Based on household population aged 15 years and older who report that they are daily or occasional smokers. For additional exclusions/limitations, see Annex 2.

What these results mean for you

Smoking is the leading cause of preventable death in the world.[181] It was estimated that in 2000, 4.83 million people died from smoking-related causes and that this number will likely increase unless effective measures and interventions are implemented, especially in developing countries.[182] In Canada, it was estimated that in 2002, more than 37,000 people died from smoking-related causes.[183]

The evidence linking smoking to disease and the value of smoking cessation have been extensively documented.[184] Smoking harms nearly every organ of the body and reduces the health of smokers in general. For example, compared to nonsmokers, smoking is estimated to increase the risk of dying from chronic obstructive lung diseases (such as chronic bronchitis and emphysema) by 12 to 13 times.[184]

Smoking is associated with several types of cancer. In a recent meta-analysis, smoking was strongly linked to lung, larynx and pharynx cancers.[184] Compared to nonsmokers, smoking is estimated to increase the risk of developing lung cancer by 23 more times in men and 13 times in women.[184] For smoking-attributable cancers, the risk generally increases with the number of cigarettes smoked and the number of years of smoking and generally decrease after a person quits completely.

Smoking has also been causally associated with heart disease.[184] Smoking increases the risk of developing all major forms of cardiovascular disease. Coronary heart disease and stroke are the primary types of cardiovascular disease caused by smoking. Smoking is estimated to increase the risk of both coronary heart disease and stroke by 2 to 4 times, compared with nonsmokers.[184] Most cases of smoking-related heart diseases are caused by atherosclerosis, a hardening and narrowing of the arteries; smoking speeds up this process, even in young smokers.

Benefits of smoking cessation

- Decreased tobacco-related morbidity
- Longer life expectancy
- Improved lung function

Health risks associated with smoking

- Lung cancer
- Heart and vascular diseases
- Chronic obstructive pulmonary disease
- Increased risk of developing bronchitis, pneumonia or asthma
- Cancer of the larynx and pharynx

Things you can do to stop smoking

- Set a date to stop smoking
- Get support from family and friends
- If possible, quit at the same time as a friend
- Join a quit-smoking support group (available in many municipalities)
- Create an action plan for yourself including targets
- Delay lighting up when you get the urge to smoke
- Distract yourself until the cravings and urges stop with thoughts and activities that take your mind off smoking
- Drink water to occupy your hands and mouth
- Experiment with deep breathing to help you stay focussed and relaxed
- Start exercising
- Consider using nicotine replacement therapy (such as the patch, gum or inhaler) or other medications to help you quit
- Talk to your health care provider and/or your pharmacist about quitting
- Visit Health Canada's website for more information on the health benefits of quitting (http://www.hc-sc.gc.ca/hc-ps/alt_formats/pdf/pubs/tobac-tabac/orq-svr/cbns-gdnf-eng.pdf)
- For more information on tobacco laws, visit Health Canada's website (http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/index-eng.php)

36. SELF-REPORTED ARTHRITIS

Key Messages

- Arthritis is a term used to describe more than 100 rheumatic diseases and conditions that affect joints and their surrounding tissues, causing pain, swelling and stiffness which often lead to disability
- Symptoms can vary in severity and location, depending on the type of arthritis
- Arthritis is more common among women compared to men

What does this indicator measure?

This indicator measures the percentage of Canadians aged 15 years and older, who reported that they have been diagnosed by a health professional as having arthritis.

What are the limitations of this indicator?

Although this indicator appears to refer to a diagnosis made by a health professional, it is based on the respondents' self-report and is influenced by their capacity to remember or comprehend the health professional's diagnosis. Self-reported data are not always as accurate as they would be if they came from an actual clinical database.[32]

> **Arthritis** is a general term used to describe over one hundred conditions affecting joints and their surrounding tissues, as well as other connective tissues.

More women than men suffer from arthritis

In 2009, 13.2% of Canadians reported that they had been diagnosed by a health professional as having arthritis. Also in 2009, more females than males reported being diagnosed with arthritis.

Figure 46 **Self-Reported Arthritis**

Percentage of population aged 15 years and older who reported having arthritis, by sex (age-standardized), Canada, 2007-09
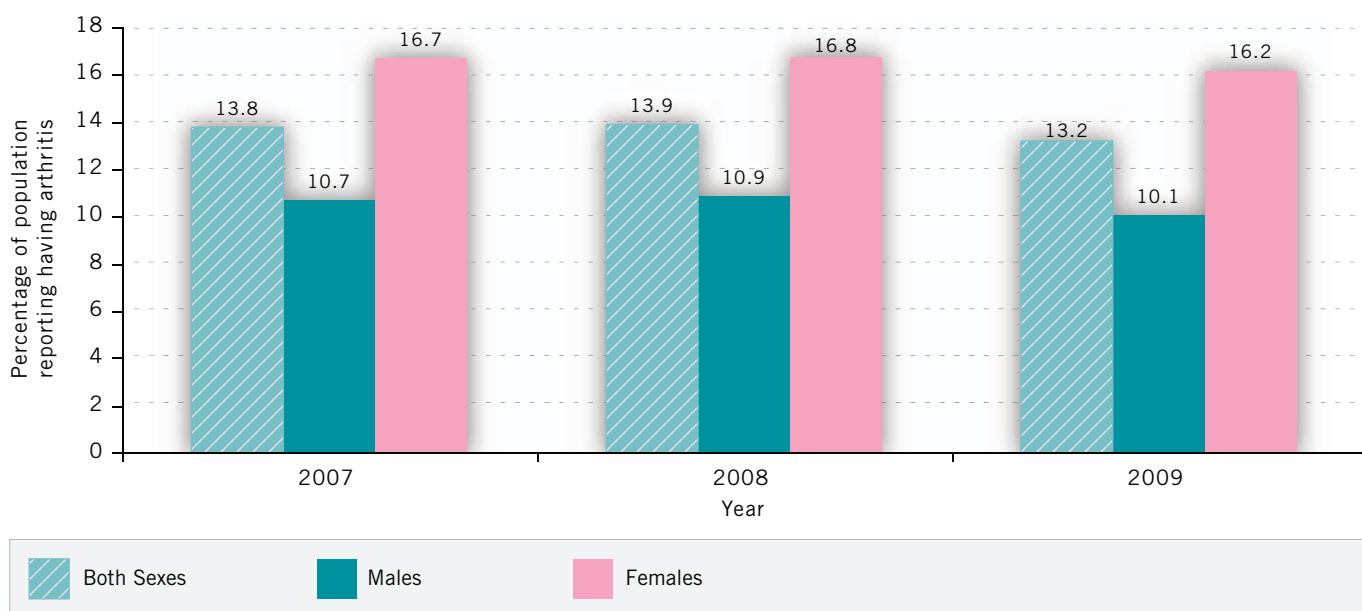
Source: Statistics Canada. Canadian Community Health Survey, 2007-09.

Notes: Includes household population aged 15 years and older who reported that they have been diagnosed by a health professional as having arthritis.
Since the wording of the question on arthritis changed in 2007, earlier data are not comparable and therefore not included.
We could not determine statistical significance for both sexes between 2008 and 2009 because the required p values were not available.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Arthritis is a general term used to describe over one hundred conditions affecting joints and their surrounding tissues, as well as other connective tissues. Generally, arthritis is characterized by inflammation, pain and stiffness in and around one or several joints. The effects are often mild but in some cases may be debilitating. The pattern, severity and location of symptoms greatly differ depending on the specific form of the disease. There are five main forms of arthritis: (1) Osteoarthritis; (2) Rheumatoid Arthritis; (3) Systemic Lupus Erythematosus; (4) Gout; and (5) Childhood Arthritis (or Juvenile Arthritis).

The Public Health Agency of Canada estimated that in 2007-08, over 4.2 million Canadians aged 15 years and older reported to have arthritis and on the basis of current projections, the number could increase to 6.7 million by 2031 due to the aging of the population.[185] Although arthritis is most common among seniors, people of all ages, including children and young adults, can also develop it. There is currently no known cure; however, improvements in the understanding of its causes continue to lead to improved medications and treatments. Research also shows that several steps could be taken to reduce the risk of developing some types of arthritis.[186, 187, 188, 189, 190] For osteoarthritis, maintaining a healthy body weight and healthy joints and muscles through physical activity while protecting joints from injuries or overuse may reduce the risk of developing this type of arthritis. For gout, a healthy body weight, daily exercise and a reduced intake of purine-rich foods and drinks (such as red meat, certain types of seafood and alcohol) can reduce the risk of developing this condition.

Benefits of healthy joints

- Better overall health
- Greater mobility, allowing for greater independence
- Less pain
- Less fatigue when performing a specific task

Known risk factors associated with the two most common forms of arthritis[191]

Osteoarthritis
- Aging
- Gender
- Genetic factors
- Joint deformity and laxity
- Bone abnormalities, fractures, diseases
- Fall-related injuries
- Physical inactivity
- Joint surgery
- Obesity
- Occupational stress, repetitive movements
- Sports and motor vehicle injuries
- Trauma

Rheumatoid Arthritis
- Gender
- Hormone levels
- Genetic factors
- Ethnicity
- Infectious agents
- Environment
- Diet
- Physical inactivity
- Obesity
- Smoking

Things you can do to prevent or manage arthritis

- Keep a healthy body weight
- Eat a healthy and balanced diet
- Be physically active
- Get an early diagnosis when pain first occurs, which will help get appropriate management of the condition
- Avoid high-impact loads
- Use assistive devices as necessary
- Speak with a health care provider for more information
- To know more about arthritis and its symptoms, please visit the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/cd-mc/musculo/arthritis-arthrite-eng.php)

37. SELF-REPORTED OSTEOPOROSIS

Key Messages

- Osteoporosis refers to bone density loss that leads to an increased risk of bone fracture
- There are usually no warning signs until a fracture occurs
- There are ways to help prevent, delay and treat this condition
- More women than men were diagnosed with osteoporosis in 2008-09

What does this indicator measure?

This indicator measures the percentage of Canadians aged 45 years and older who reported having been diagnosed with osteoporosis by a health professional in 2008-09.

What are the limitations of this indicator?

Although this indicator appears to refer to a diagnosis made by a health professional, it is based on the respondents' self-report and is influenced by their capacity to remember or comprehend the health professional's diagnosis. Self-reported data are not always as accurate as they would be if they came from an actual clinical database.[32]

> **Osteoporosis** is a loss of bone density that leads to an increased risk of bone fracture.

More women than men suffer from osteoporosis

In 2008-09, 10.0% of Canadians aged 45 years and older reported having been diagnosed with osteoporosis by a health professional. More women (16.2%) than men (3.2%) reported having been diagnosed with osteoporosis.

Figure 47 Self-Reported Osteoporosis

Percentage of population who reported having osteoporosis, by sex, (not age-standardized), Canada, 2008-09
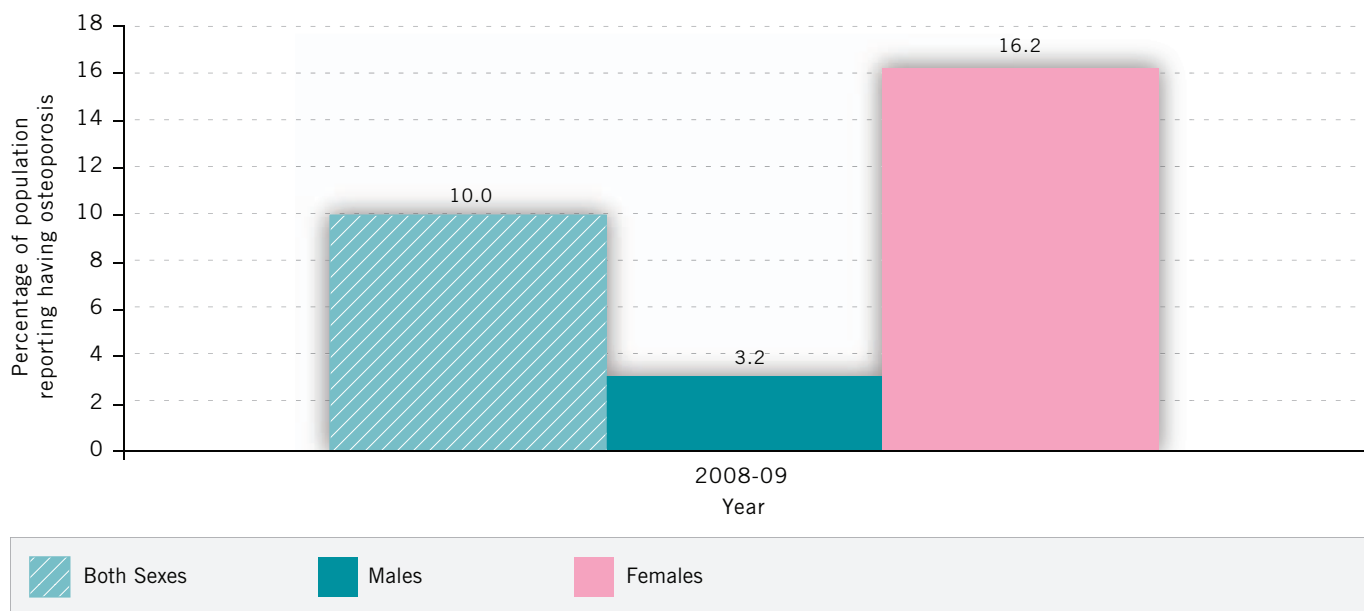
Source: Statistics Canada. Canadian Community Health Survey, Healthy Aging 2008-09.

Notes: Includes household population aged 45 years and older who have been diagnosed by a health professional as having osteoporosis. For additional exclusions/limitations, see Annex 2.

What these results mean for you

Osteoporosis refers to bone loss that leads to an increased risk of bone fracture, disability and deformity. Osteoporosis is often undertreated and under recognized, due in part to it being a clinically silent disease until a fracture occurs. One in three women over the age of 50 will experience osteoporotic fractures, as will one in five men.[192]

It is often possible to prevent, delay or reduce bone loss through balanced and healthy living habits, such as eating a balanced and healthy diet including calcium and vitamin D, being active every day, and refrain from smoking.[192] The optimization of bone density during childhood and adolescence can help reduce the risk of

developing osteoporosis. Peak bone mass is attained between the ages of 25 and 30 years. For men, a steady decline occurs in bone mass following age 30. For women, a steady decline also occurs in bone mass until menopause is reached, when bone mass loss is accelerated. This could last from several months to several years. After menopause, a slower rate of decrease in bone mass occurs.

Causes of osteoporosis

Osteoporosis occurs when there is an imbalance between new bone formation and existing bone resorption or degradation. The body may fail to form enough new bone, or too much existing bone may be broken down, or both. The main essential mineral for normal bone formation is calcium. If calcium intake is not sufficient, or if the body does not absorb enough calcium from the diet, bone production is slowed down and bone tissue may suffer. Thus, the bones may become weaker, brittle and fragile, breaking easily.

> Besides its role in bone formation, calcium is essential in helping the heart, brain and other organs to function properly.

The primary cause of osteoporosis is a lack of certain hormones, particularly estrogen in women and testosterone in men. Menopause is accompanied by lower estrogen levels and increases a woman's risk for osteoporosis.[193] Other factors that could contribute to osteoporosis include genetics (a family history of low bone mineral density and other determinants of fracture risk),[194] insufficient intake of calcium and vitamin D,[195] lack of weight-bearing exercise,[196] and other age-related changes in endocrine functions (in addition to lack of estrogen).[193] Caffeine and alcohol consumption may also play a role in the development of osteoporosis.[197, 198, 199]

Benefits of strong, healthy bones

- Stronger support system for the body
- Better posture, strength and balance
- Greater resistance to sustain shocks and blows, resulting in fewer fractures
- Better protection from trauma for several organs (e.g., brain, heart, lungs)
- Large storage site for vitamins and minerals, including vitamin D and calcium
- Stronger points of attachment for muscles

Risk factors for osteoporosis

- Being a woman, although men also suffer from it
- Your age: as you get older, the rate of bone degradation becomes faster than the rate of bone formation
- Your race: black people have lower incidence of osteoporosis than do other race/ethnic groups
- A family history of osteoporosis
- Low body weight
- A diet low in calcium
- Vitamin D deficiency
- Low levels of physical activity
- Smoking
- Excessive caffeine and/or alcohol intake

- People with eating disorders like anorexia nervosa and bulimia
- Long-term oral use of some medications such as cortisone, prednisone or anticonvulsants
- Removed ovaries or early menopause (before the age of 45) without hormone replacement
- Women who are postmenopausal and women with abnormal or absent menstrual periods over a long period of time, are at greater risk

Things you can do to prevent or manage osteoporosis

- Try to maintain a balanced diet by picking foods from the four basic food groups (fruit and vegetables; grain products; milk and alternatives; and meat and alternatives)
- Be active every day, and include weight-bearing physical activities
- Do not smoke
- Drink alcohol and/or caffeine moderately
- Speak with your health care provider about the benefits and risks of taking calcium and vitamin D supplements
- Women may want to consider hormone replacement therapy*
- To learn more about osteoporosis, please visit Health Canada's website (http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/diseases-maladies/seniors-aines-ost-eng.php)
- To learn more about osteoporosis and seniors, please visit the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/seniors-aines/publications/public/age/info/osteoporosis/osteo-eng.php)
- To learn more about *Canada's Food Guide*, please visit Health Canada's website (http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/basics-base/index-eng.php)

* Speak with your health care provider to learn more about the health risks (such as breast cancer, coronary heart disease and stroke) associated with hormone replacement therapy.[193]

38. INCIDENCE RATE FOR CHLAMYDIA

Key Messages

- Chlamydia is the most common bacterial sexually transmitted infection (STI) in Canada; it is caused by the bacterium *Chlamydia trachomatis*
- Chlamydia is known as the "silent disease," it is estimated that more than 70% of infected females and 50% of infected males have no symptoms and are unaware of their condition
- When left untreated, chlamydia can lead to health problems and infertility
- Urine testing is available to diagnose genital chlamydia infections
- There are effective antibiotics available to treat the infection
- The reported rate of chlamydia has been steadily increasing in Canada since 1998

What does this indicator measure?

This indicator measures the reported rate per 100,000 population, of new diagnosed infections, by calendar year.

Chlamydia trachomatis infections are reportable by laboratories and physicians to local public health authorities in all provinces and territories. A confirmed case is defined as laboratory confirmation of infection - detection of *Chlamydia trachomatis* by appropriate laboratory techniques in genitourinary or extra genital specimens.

What are the limitations of this indicator?

The Public Health Agency of Canada publishes provincial/territorial data by sex, and national data by age and sex. (http://www.phac-aspc.gc.ca/std-mts/sti-its_tab/index-eng.php)

Although the Public Health Agency of Canada verifies reportable disease data with the provinces and territories, updates may be made by the provinces/territories after verification that cause small discrepancies between national and provincial/territorial numbers. Provinces and territories always have the most up-to-date data for their respective jurisdictions.

The introduction of non-invasive (i.e., urine-based testing) tests for chlamydia, starting in the late 1990s, may have led to an increase in testing and thus may be contributing in part to the increased rates in a jurisdiction. The introduction of more sensitive tests (are able to more accurately identify those with an infection) may also be contributing in part to the increasing rates, through the detection of more cases. Timing of the implementation of such tests across jurisdictions should be noted when comparing reported rates.

Minor variations in data may occur when comparing indicator data with other federal and provincial/territorial publications because of reporting delays, different cut-off dates and date of access to Statistics Canada's population estimates.

Since most infected individuals are asymptomatic and may not seek testing, reported cases more than likely underestimate the true burden of disease in the Canadian population. Also, cases with symptoms compatible with a chlamydial infection may be treated without undergoing a laboratory test or people who are sexual partners/contacts of someone who has been diagnosed as having chlamydia through laboratory testing

may be treated without being tested and therefore would not be reported as a case. The surveillance system captures only those who are diagnosed through laboratory testing and reported to public health authorities.

Incidence rate of chlamydia is on the rise

The reported rate of chlamydia has increased to reach 248.9 per 100,000 population in 2008, from 150.9 per 100,000 population in 2000.

Figure 48 Incidence Rate of Chlamydia Trachomatis Infections
Canada, 2000-08

Source: Public Health Agency of Canada. *Hepatitis C and STI Surveillance and Epidemiology Section, Community Acquired Infections Division, Centre for Communicable Diseases and Infection Control, 2009.*

Notes: Although the Public Health Agency of Canada verifies reportable disease data with the provinces and territories, updates may be made by the provinces/territories after verification that cause small discrepancies between national and provincial/territorial numbers. Provinces and territories always have the most up-to-date data for their respective jurisdictions.
Minor variations in data will occur when comparing data with other federal and provincial/territorial publications because of reporting delays, different cut-off dates and date of access to Statistics Canada's population estimates.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Although the greatest number of chlamydia infections reported are in those aged 15 to 24 years,[200, 201] the rates among middle-aged adults (aged 30-39 years) have more than doubled since 2000.[202] A lack of awareness of risk among middle-aged adults may be contributing to the increased rates, as well as inconsistent use of safe sex practices such as condom use.[200, 203, 204] In addition, another possible contributor to the increased risk of chlamydia and other sexually transmitted infections among middle-aged adults is the initiation of new sexual partnerships as a result of divorce.[205]

The sexual practices which put someone at risk for chlamydia also put someone at risk for other sexually transmitted infections such as gonorrhea and HIV. It is also possible to have more than one STI at a time. In addition, having a STI such as chlamydia can increase the risk of acquisition and transmission of HIV infection.[206, 207]

Any sexually active person can be infected with chlamydia, if exposed. The greater the number of sex partners you have, the greater your risk of infection. It is also important to remember that you can be re-infected with chlamydia, as your body does not produce any long-term protection against re-infection as it can with some other infectious diseases. Considering the increasing reported rate of chlamydia in the past decade, and the fact that a significant portion of infected individuals have no symptoms and are unaware of their condition, if you are at high risk you should seek testing.

Problems associated with untreated chlamydia

As noted above, the majority of infected people have no symptoms of a chlamydia infection, and therefore may not know they have an infection unless they get tested. If symptoms do occur, they usually appear two to three weeks after infection, but it can take longer for symptoms to appear.

Symptoms of infection can include:

For women:
- A vaginal discharge
- A burning sensation when urinating
- Pain in the lower abdomen, sometimes with fever and chills
- Pain during sex
- Vaginal bleeding between periods and/or after intercourse

For men:
- A discharge from the penis
- A burning sensation when urinating
- Burning or itching at the opening of the penis
- Pain and/or swelling in the testicles

Symptoms of anal infection include rectal pain, bleeding and discharge. Those infected through oral sex generally have few symptoms.

Up to approximately 40 percent of women with untreated chlamydia may go on to develop pelvic inflammatory disease (PID). PID effects include abdominal pain, fever, internal abscesses and long-lasting pelvic pain; effects also include scarring of the fallopian tubes, which can cause infertility and increase the chance of potentially life-threatening ectopic (or tubal) pregnancies.

Men can develop scarring within the structures of their reproductive tract, which may lead to infertility. Although rare, both sexes are at risk of a type of arthritis known as reactive arthritis - an inflammation and swelling of the joints.

If a pregnant woman has chlamydia, her baby may be born prematurely, have eye infections or develop pneumonia.

Even without symptoms, chlamydia can be transmitted and can lead to serious health problems and possible infertility, especially in women. Anyone at high risk should therefore seek testing.

High risk behaviours associated with chlamydia

- Engaging in unprotected sexual intercourse (vaginal, anal or oral)
- Sexual contact with person(s) with chlamydia or a known STI
- Having a new sexual partner or more than two sexual partners in the past year
- Individuals who have had a series of one-partner relationships over time
- Not using a barrier method of contraception (i.e., condom)
- Anonymous sexual partnering

Any sexually active person can be infected with chlamydia, if exposed. The high rate of infection among youth and young adults (15 to 24 years) means that this age group is at high risk of being exposed if they are sexually active. As chlamydia can be transmitted by oral or anal sex, those who engage in these sexual activities are also at risk of infection.

Things you can do to prevent or manage chlamydia

- Consistent use of safe sex practices including the use of a latex or polyurethane condom when engaging in vaginal, anal or oral sex (although no form of protection is 100% effective, when used properly a condom can significantly reduce the risk of HIV and other sexually transmitted infections; use a water-based lubricant to reduce the risk of condom breakage and not Vaseline® or oil-based products as they weaken the effectiveness of latex condoms)
- If you are pregnant or planning to become pregnant, seek testing for chlamydia or talk with a health care professional about being tested
- The only way to be 100% sure you are protected against chlamydia is to abstain from sexual contact, or to be in a long-term mutually monogamous relationship with a partner who has been tested and is known to be uninfected
- If you have engaged in a high-risk behaviour, get tested to protect your health and to avoid infecting others
- Speak with a health care professional for more information on the prevention of chlamydia and other sexually transmitted infections and how to get tested
- If you are infected, all partners with whom you have had sexual contact within 60 days prior to symptom onset or date of specimen collection (if you do not have symptoms) should be notified and told to speak with a health care professional
- If you are infected with chlamydia, speak with your doctor about treatment options
- More information about chlamydia is available at Health Canada's website (http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/diseases-maladies/chlamyd-eng.php)
- More statistics on chlamydia are available at the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/sti-its-surv-epi/nat_surv-eng.php)

39. PREVALENCE RATE OF HUMAN IMMUNODEFICIENCY VIRUS (HIV)

Key Messages

- The Human Immunodeficiency Virus (HIV) attacks the immune system, resulting in a chronic, progressive illness that leaves people vulnerable to infections and cancers
- The constellation of diseases affecting an HIV-infected person is known as Acquired Immunodeficiency Syndrome (AIDS)
- On average, it takes more than 10 years to progress from an untreated HIV infection to AIDS
- The total number of Canadians infected with HIV continues to rise
- Globally, an estimated 33.4 million people were living with HIV in 2008. That same year, 2.7 million people were newly infected with HIV and 2.0 million people died due to AIDS

What does this indicator measure?

This indicator measures the estimated number of people living with HIV in Canada for a particular year, including new and previous cases.

As part of its mandate to monitor HIV/AIDS trends in Canada, the Public Health Agency of Canada (PHAC) generates periodic national estimates of HIV prevalence and incidence. Incidence, or the number of new infections in a one-year period, is calculated using a range of data sources, including surveillance data on number of people diagnosed with HIV in Canada, site-specific cross-sectional studies, and modelling techniques.

What are the limitations of this indicator?

Not all people infected with HIV are aware of their HIV status; in fact, an estimated 26% of HIV-positive individuals in Canada have not tested and been diagnosed for HIV. For this reason, it is impossible to have an exact, accurate figure of total new infections.

For more information on HIV data for Canada, see the Public Health Agency of Canada's surveillance report (http://www.phac-aspc.gc.ca/aids-sida/publication/survreport/2008/dec/pdf/survrepdec08.pdf) and estimate report. (http://www.phac-aspc.gc.ca/aids-sida/publication/survreport/estimat08-eng.php)

The total number of Canadians infected with HIV continues to rise

HIV/AIDS in Canada continues to be cause for concern. The number of people living with HIV (including AIDS) is still rising, from an estimated 57,000 in 2005 to 65,000 in 2008 (a 14% increase). The increase in the number of people living with HIV is due to two factors—treatments have improved the survival of HIV-infected persons and new infections continue to occur. In 2008, 3,300 (range: 2,300-4,300) new infections occurred in Canada.

Table 10   HIV Infections

Estimated number of prevalent HIV infections and associated ranges of uncertainty in Canada at the end of 2005 and 2008 by exposure category (data are rounded)

	2005			2008		
	Point	**Range**	**Percentage**	**Point**	**Range**	**Percentage**
Exposure category						
MSM	27,700	22,400-33,000	48%	31,330	25,400-37,200	48%
MSM-IDU	1,820	1,200-2,400	3%	2,030	1,400-2,700	3%
IDU	10,100	8,100-12,100	18%	11,180	9,000-13,400	17%
Heterosexual/ non endemic country	9,050	7,000-11,100	16%	10,710	8,300-13,100	17%
Heterosexual/ endemic country	7,860	5,800-9,900	14%	9,250	6,800-11,700	14%
Others	470	280-660	1%	500	300-700	1%

Source: Public Health Agency of Canada. *Estimates of HIV Prevalence and Incidence in Canada, 2005 and 2008*.

Notes: MSM (men who have sex with men); IDU (persons who inject drugs); Heterosexual/non-endemic (heterosexual contact with a person who is either HIV-infected or at risk for HIV or heterosexual as the only identified risk); Heterosexual/endemic (origin in a country where HIV is endemic); Others (recipients of blood transfusion or clotting factor, perinatal and occupational transmission).
For additional exclusions/limitations, see Annex 2.

What these results mean for you

In order to be infected, the Human Immunodeficiency Virus (HIV) must enter one's bloodstream. It then begins its attack on the immune system, resulting in a chronic, progressive illness that leaves people vulnerable to opportunistic infections and cancers. Once these infections take hold, the individual may be diagnosed with Acquired Immunodeficiency Syndrome (AIDS).[208]

On average, it takes more than 10 years to progress from an untreated HIV infection to AIDS. According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), AIDS is a deadly condition that has already killed more than 25 million people around the world.[209] There is no cure for it and currently no vaccine against HIV infection.[208] HIV/AIDS can affect anyone in society, regardless of their age, gender, sexual orientation or socio-economic status. However, stigma, discrimination, and violation of human rights make socially and economically marginalized groups and populations even more vulnerable to infection.

To prevent infection, a number of options appear to be successful, including adolescents acquiring more knowledge about safe sex practices,[210] minimizing or eliminating needle-sharing or sexual risk-taking among injection drug users,[211, 212] men who have sex with men,[213] women,[214] Aboriginal peoples,[215] prison inmates, and people from countries where HIV is endemic. In addition, in people who are infected with HIV, being aware of their status is essential as high-risk sexual behaviour is markedly lower in HIV positive persons who are aware of their infection status than in HIV positive persons who are unaware of their status.[216, 217]

A vaccine or cure for HIV infection does not currently exist, although there are treatment options that can significantly improve an infected individual's chances of survival and decrease the likelihood of infections.[218, 219] In recent years, however, resistance to some HIV medications has been occurring. To address this, testing is recommended to identify the specific medications to which the individual is resistant;[220] this tailored approach to treatment may benefit patients as they can receive treatment for the particular HIV strains with which they may be infected.

Problems associated with untreated HIV infection

- Increased morbidity
- Increased disabilities and loss of function
- Psychosocial issues such as depression and stigma
- AIDS
- Death

Risk behaviours associated with HIV infection

- Engaging in unprotected sexual intercourse (vaginal, anal or oral)
- Sharing needles or equipment for injecting drugs
- Using unsterilized needles for tattooing, skin piercing or acupuncture
- Pregnancy, delivery and breast feeding (i.e., from an HIV-infected mother to her infant)
- Occupational exposure in health care settings

Populations at risk of HIV infection

- Men who have sex with men
- Injection drug users
- Aboriginal Peoples
- Prison inmates
- Youth at risk
- Women at risk
- People from countries where HIV is endemic

Things you can do to prevent or manage HIV infection

• Practice safe sex
• Use a latex or polyurethane condom when engaging in vaginal, anal or oral sex (although no form of protection is 100% effective, when used properly a condom can significantly reduce the risk of HIV and other sexually transmitted infections; use a water-based lubricant to reduce the risk of condom breakage and not Vaseline® or oil-based products as they weaken the effectiveness of latex condoms)
• Never share needles or other drug use equipment
• If you are getting a tattoo, body piercing or acupuncture, ensure that the equipment being used is sterile (the safest way to get a tattoo or piercing is to go to a professional)
• Take precautions to prevent exposure to HIV if you work in an environment where you may come into contact with someone else's blood or with needles (e.g., a health care facility); wear protective medical gloves and handle used needles with care
• Ensure that you are not infected with other sexually transmitted infections that may increase your susceptibility to HIV (http://www.phac-aspc.gc.ca/publicat/std-mts/index-eng.php)
• Talk with your doctor about being tested if you are pregnant and concerned about HIV (early treatment with medication can prevent the transmission of HIV from mother to baby before birth; pre- and post-test counselling are also important)
• The only way to be 100% safe against HIV infection is to not engage in sexual or other activities where body fluids (blood, semen or vaginal fluids) are exchanged; if you have engaged in risky behaviours, get tested to protect your health and to avoid infecting others
• Speak with a health care provider for more information on HIV/AIDS and how to get tested (http://www.phac-aspc.gc.ca/aids-sida/info/4-eng.php)
• If you are infected with HIV, speak with your doctor about treatment options
• The Public Health Agency of Canada provides more information about HIV/AIDS (http://www.phac-aspc.gc.ca/aids-sida/index-eng.php)

40. INCIDENCE RATE FOR VEROTOXIGENIC E. COLI

Key Messages

- Verotoxigenic E. coli, or VTEC, is an infectious disease which affects the digestive system, and is commonly referred to as E. coli O157
- Infections with VTEC result in frequent cases of sporadic and outbreak-associated disease in humans
- The national incidence of VTEC has been relatively constant since 2001, after a large waterborne outbreak in 2000

What does this indicator measure?

This indicator measures the incidence rate of diagnosed Verotoxigenic E. coli cases per 100,000 population in Canada, from 2000 to 2009.

What are the limitations of this indicator?

The surveillance data used to calculate this indicator were developed from various provincial and national databases. Each system has inherent limitations, therefore interpretation of data should be done with caution. (http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s3/appendix_a-annexe_a-eng.php)

What is a food-borne illness?

Food contaminated by bacteria (such as E. coli), viruses and parasites can make you sick. Often called food poisoning, many people may have had food-borne illness and not even known it. Symptoms can start soon after eating the contaminated food, but they can also occur up to a month or later. More information about food-borne illnesses such as E. coli can be found in the Canadian Food Inspection Agency's website. (http://www.inspection.gc.ca/english/fssa/concen/causee.shtml)

The number of reported E. coli cases is stable since 2001

A lower number of reported cases of verotoxigenic E. coli were observed after 2000. A large number of cases were reported in 2000 due to a waterborne outbreak of E. coli in Walkerton, Ontario. As a result, the province reported both lab-confirmed and epidemiologically-linked cases.

Figure 49 Incidence Rate for Verotoxigenic E. coli
Per 100,000 population, Canada, 2000-09
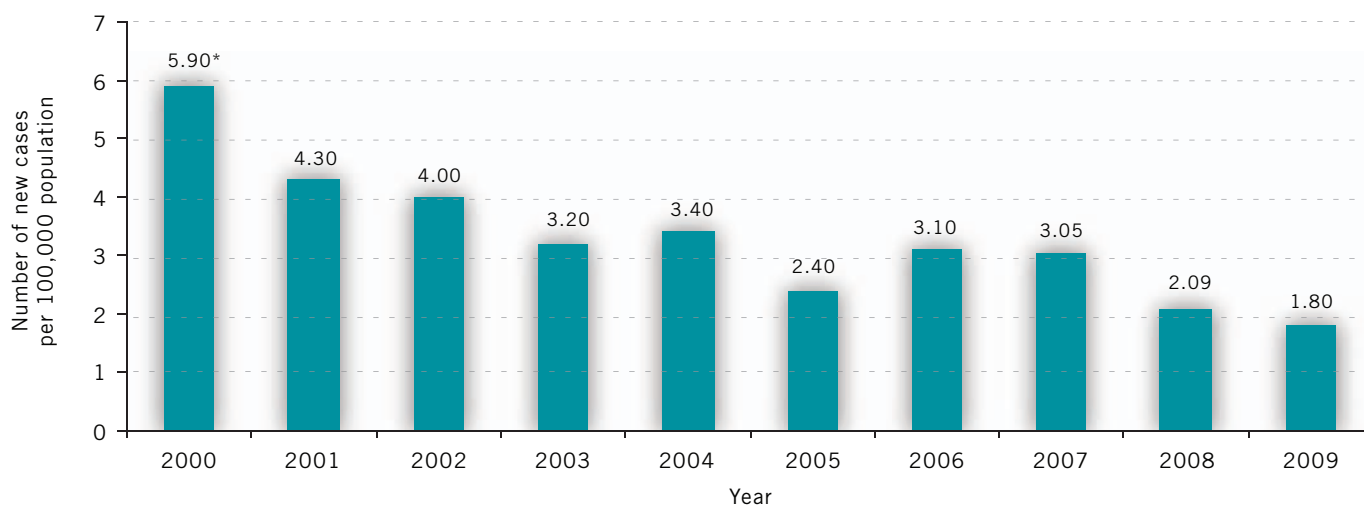
Source: Public Health Agency of Canada. *National Enteric Surveillance Program*. In Press.

Notes: Provinces/territories update their reportable disease data frequently, even after the Public Health Agency of Canada finalizes the data for a given period, so provinces/territories will always have the most up-to-date data for their respective jurisdictions.
Minor variations in data will occur when comparing data with other federal and provincial/territorial publications because of reporting delays, different cut-off dates and date of access to Statistics Canada's population estimates.
Values are laboratory-based identifications and should not be confused with incidence of disease.
*Values for 2000 are significantly higher due to the increased number of cases related to the E. coli waterborne outbreak in Walkerton, Ontario.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

E. coli bacteria are found naturally in the intestines of cattle, poultry and other animals. Despite precautions, E. coli bacteria can sometimes contaminate the surface of meat when animals are slaughtered. In highly processed or ground meat, the mechanical process can spread the bacteria through the meat. Raw fruit and vegetables can also become contaminated with pathogens while in the field by improperly composted manure, contaminated water, wildlife, and poor hygienic practices of farm workers.

The infection is usually acquired by eating undercooked, contaminated ground beef. If people become infected with these bacteria, this can result in serious illness. Some of the symptoms, such as severe abdominal cramping and diarrhea that may contain blood, can develop within hours and up to 10 days after ingesting the bacteria. Others infected with the bacteria may not get sick or show symptoms but may still carry the bacteria and spread the infection to others.[221] Other complications from E. coli infection include increased risk of high blood pressure[222] and increased risk of kidney damage.[222, 223, 224]

Proper hygiene such as hand-washing,[225] safe food handling and preparation practices are key to preventing food-borne illness.[226] If you think you are infected with E. coli bacteria or any other gastrointestinal illness, do not prepare food for other people. It is also a good idea to keep pets away from food storage and preparation areas.

Benefits of sanitary practices

- Decreased risk of infection
- Decreased risk of spreading the pathogen to others
- Decreased risk of E. coli-associated morbidity
- Decreased risk of E. coli-associated death

Health risks associated with VTEC infection

- Abdominal cramping
- Diarrhea, including bloody diarrhea
- Increased risk of high blood pressure
- Increased risk of kidney damage
- Death

Things you can do to prevent or manage VTEC infection

- Practise proper personal hygiene: frequent hand-washing with soap and water, as well as disposal of soiled diapers and human waste, and prevention of contamination of food and beverages
- Wash counters and utensils with hot soapy water after they have come in contact with raw meat
- Refrigerate food items at or below 4°C to slow down most bacterial growth. Freezing at or below -18°C will stop it completely
- Keep raw food away from ready-to-eat food while shopping, storing and preparing foods
- Cook meat to a safe internal temperature (at least 60°C) to destroy E. coli bacteria
- Visit the Canadian Food Inspection Agency's website for safe internal cooking temperature for different meat (http://www.inspection.gc.ca/english/fssa/concen/cause/ecolie.shtml)
- See your doctor when you are not feeling good and suspect that you may suffer from food-borne infections

41. INCIDENCE OF ANTIMICROBIAL RESISTANCE

Key Messages

- Antimicrobial resistance occurs when an antimicrobial substance or agent is no longer effective in killing or inhibiting the growth of a particular microorganism
- Organisms such as bacteria, viruses, fungi and parasites are becoming resistant to the drugs used to fight them
- Increasing resistance to antibiotics makes treatment of bacterial infections more difficult, leaving fewer antibiotics to prevent and treat infectious diseases
- Antimicrobial resistance leads to higher medical costs, longer hospital stays, and higher morbidity and mortality
- Canadians can help prevent the spread of antimicrobial resistance simply by general hygienic measures such as washing hands
- Incidence rates for methicillin-resistant *staphylococcus aureus* (MRSA), used in this report as indicator for antimicrobial resistance, have steadily been increasing since 2000

What does this indicator measure?

This indicator measures the incidence of infection and colonization rates of antimicrobial resistance to methicillin-resistant *staphylococcus aureus*, per 100,000 patient-admissions.

It measures how many patients out of 100,000 admitted in a hospital during a surveillance period are diagnosed with *staphylococcus aureus* that is resistant to methicillin (an antibiotic) treatment.

It could also be expressed as the number of patients diagnosed with *staphylococcus aureus* resistant to methicillin treatment over the total number of hospitalization days of all patients admitted during the surveillance period.

What are the limitations of this indicator?

Antimicrobial resistance is not limited to methicillin-resistant *staphylococcus aureus*. Resistant bacterial strains have been observed for most major infectious diseases, including malaria, tuberculosis, pneumonia and dysentery.

However, the Canadian Nosocomial Infections Surveillance Program (source of these data) does conduct surveillance on other resistant organisms such as vancomycin resistant *E. coli*, *clostridium difficile*, and *NDM-1* producing gram negative bacteria (since 2009).

> **Antimicrobial resistance** occurs when microorganisms become resistant to antimicrobials, such as antibiotics and disinfectants. Rather than being destroyed, the microorganisms survive and continue to propagate.

Infection and Colonization rates are increasing since 2000

The infection rate for methicillin-resistant *staphylococcus aureus* (MRSA) reached 294 per 100,000 patient-admissions in 2008, higher than the rates for 2000 (145 per 100,000 patient-admissions) and 2007 (254 per 100,000 patient-admissions). Also in 2008, the colonization rate for MRSA reached 676 per 100,000 patient-admissions, higher than the rates for 2000 (351 per 100,000 patient-admissions) and 2007 (564 per 100,000 patient-admissions).

Figure 50 Incidence of Antimicrobial Resistance: Methicillin-Resistant *Staphylococcus Aureus* (MRSA)

Canada, 2000-08

Source: Public Health Agency of Canada. Canadian Nosocomial Infection Surveillance Program (CNISP).

Notes: Provinces/territories update their reportable disease data frequently, even after the Public Health Agency of Canada finalizes the data for a given period, so provinces/territories will always have the most up-to-date data for their respective jurisdictions.
These values include substantial variations. For details, see Annex 2.

What these results mean for you

Antimicrobial resistance threatens our ability to fight bacterial infections affecting humans and animals, leading to significant economic and public health consequences. Antibiotic-resistant infections are associated with longer hospital stays, higher rates of sickness and death, and higher medical costs.[227, 228]

Causes of Antimicrobial Resistance

A major cause of resistance is believed to be overuse or inappropriate use of drugs such as antibiotics, in preventing or treating infections in people, animals and plants.[229]

Problems arise when not all microbes are killed by either the antimicrobial or the body's immune system, and a few stronger, more resistant mutants remain in the population due to insufficient treatment or an immuno-compromised patient.

Antimicrobial resistance has also been associated with giving drugs to animals and later development of resistance in humans. Antimicrobial resistance may result when a person does not take all of a prescription. It is further complicated by rapid international population movement.

Another major source of transmission of resistant organisms from one person to another is through a health care worker. It has been estimated that 30 to 40% of endemic institutional antibiotic resistance is caused by the unwashed hands of hospital personnel.[230] Studies have shown that health care workers and other caregivers neglect to wash their hands before and after patient contact, and that physicians were among the least compliant toward this sanitary act.[231] For instance, research from Brazil in 2007 reported that only 2.9% of doctors recognized that sanitary measures (such as hand washing, cleaning instruments, etc.) are important strategies for preventing the emergence of resistance.[232]

Benefits of proper prescribing practices by health professionals

- Health care professionals should clearly identify the type of pathogen before prescribing an antibiotic drug
- Good selection of antimicrobial drug, including its dose and duration will decrease side effects on patient
- Improved relationship with patient
- Quality care
- Greater success in healing the patient with the proper drug

Reasons and/or problems associated with poor prescribing practices by health professionals

- Doctors should not prescribe antibiotics for the treatment of colds, flu and other viral infections, because antibiotics don't work on viruses
- Overuse and/or overprescription of antibiotics is the main factor in the emergence and dissemination of antibiotic resistance
- Doctors prescribing antimicrobial drugs to patients who ask for them
- Desire of the physician to give the best possible treatment regardless of cost or subsequent effects
- Failure to consider alternative treatments
- Inappropriate use of diagnostic laboratory studies
- Inadequacy of the physician's knowledge and management of patients with infectious diseases

Problems associated with not following your prescription

- Not taking all of a prescription may lead to the strongest germs surviving
- May become sicker after germs have become resistant to antibiotics

Things you can do to prevent antimicrobial resistance

- Only use antimicrobial and antiviral drugs, whether for humans or animals, when needed
- Don't take antibiotics to treat colds, flu and other viral infections
- Take drugs as directed by your doctor or pharmacist. Do not stop taking a drug part way through; while symptoms may have disappeared, the bacteria may not be all gone, and the surviving bacteria can recover and become stronger and more resistant to the antibiotic
- Don't share prescription drugs with anyone
- Do not flush out-of-date or unused medication down the toilet, pour it down the sink or in the garbage
- Avoid the use of antibacterial soap and "bacteria-fighting" household cleaning products. These are no more effective than regular soap and can kill good bacteria. Cleaning with soap and water, and disinfecting with water and vinegar, is sufficient
- Wash your hands regularly with soap and water for at least 20 seconds
- Keep vaccinations up-to-date
- Store, handle and prepare food safely
- Speak with your health care provider about antimicrobial resistance
- More information on antimicrobial resistance is available on the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/cipars-picra/faq-eng.php)

42. BLOOD CHOLESTEROL LEVELS

Key Messages

- Cholesterol plays an important role in the human body
- Cholesterol can be "good" (HDL-cholesterol) or "bad" (LDL-cholesterol)
- For better health, HDL-cholesterol level should be over 1.0 mmol/L for men and over 1.3 mmol/L for women; LDL-cholesterol level should be below 3.4 mmol/L
- In 2009, 70% of Canadians were within a healthy range for HDL-cholesterol; 64% of Canadians were within a healthy range for LDL-cholesterol

> **A mmol** …
> … is a unit used to measure the concentration of substances in the blood.

What does this indicator measure?

This indicator measures the percentage of Canadian adults aged between 20 and 79 years who had healthy levels of HDL-cholesterol and LDL-cholesterol.

> HDL-cholesterol is considered "good" because it is transported away from the arteries to the liver where it is converted to bile. A level of HDL-cholesterol higher than 1.0 mmol/L for men and 1.3 mmol/L for women prevents coronary heart disease.

> LDL-cholesterol is considered "bad" because it is transported into the arteries where it can settle as plaque, resulting in a diminished blood flow and oxygen supply. Blocked arteries can lead to angina, heart attacks or strokes. Low levels of LDL-cholesterol are best.

Most Canadians are within a healthy range for HDL- and LDL-cholesterols

Cholesterol levels for HDL and LDL, respectively, were reported to be within a healthy range for about 70% and 64% of Canadians aged between 20 and 79 years. A higher percentage of Canadians between the ages of 20 to 39 years had LDL-cholesterol levels within a healthy range compared to Canadians in other age categories (40 to 59 and 60 to 79).

Figure 51 Blood Cholesterol Levels

Percentage of population within a healthy range for HDL-cholesterol and LDL-cholesterol, by age group, Canada, 2007-09
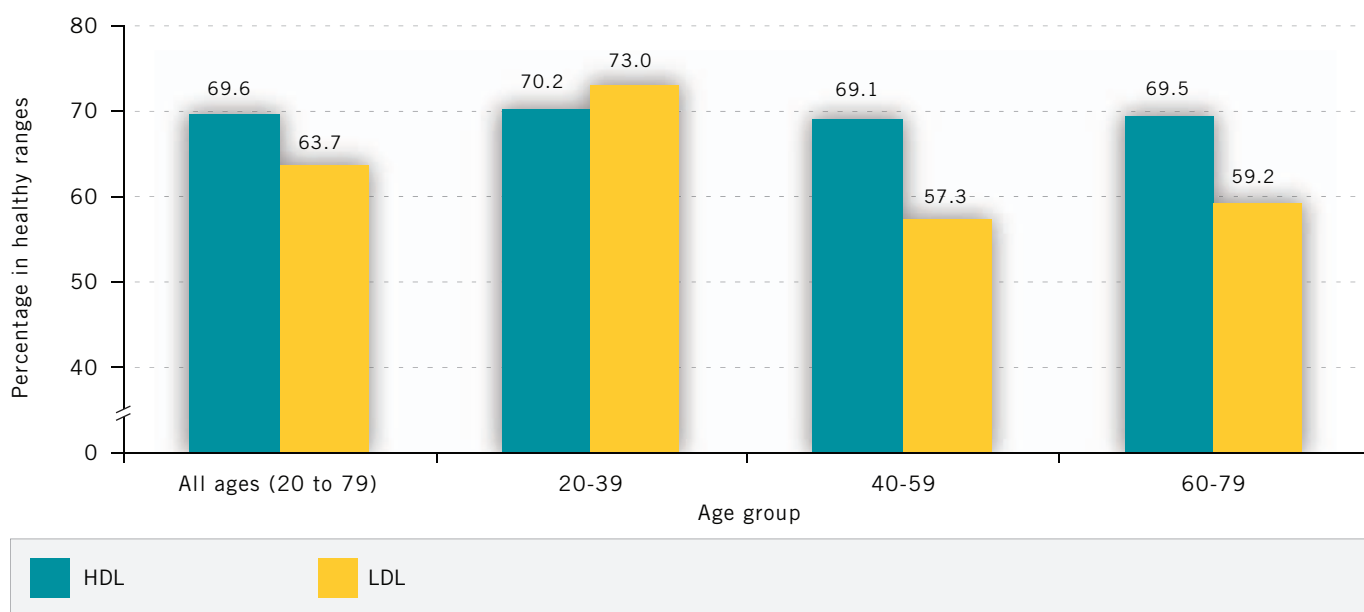
Source: Statistics Canada. Canadian Health Measures Survey, 2007-09.

Notes: Includes household population aged 20 to 79 years old.
            HDL levels must be above 1.0 mmol/L for men, and above 1.3 mmol/L for women to be in the healthy category.
            LDL levels must be below 3.4 mmol/L to be in the healthy category.
            For additional exclusions/limitations, see Annex 2.

What these results mean for you

Blood cholesterol is a lipid that occurs naturally in your body and is essential for proper functioning. A major part of all cell membranes, it is used to synthesize steroid hormones such as estrogen and testosterone, and bile salts to help digest the foods you consume.

There are two sources of cholesterol in the body: about 15-20% is found in foods (such as meat, fish, poultry, egg yolks and milk products), and 80-85% is synthesized by your liver. Eating high cholesterol foods can affect your blood cholesterol, but it is the consumption of saturated and trans fat foods that has the greatest impact on your cholesterol levels.

It is well documented that unhealthy blood cholesterol levels are detrimental to a person's health. For example, a low level of HDL-cholesterol is a risk factor for cardiovascular disease,[152, 233] whereas a high level of LDL-cholesterol is a major risk factor for cardiovascular disease and stroke.[234, 235]

Several strategies can be taken to improve your cholesterol levels. A diet low in cholesterol, saturated and/or trans fats has been shown to lower the level of LDL-cholesterol in the blood.[236] Furthermore, research shows that a diet rich in monounsaturated and polyunsaturated fats, eating plenty of vegetables and fruit, and little consumption of meat, can lower LDL-cholesterol, and may lower mortality rates from heart disease.[237, 238] Diets high in sources of soluble or viscous fibres are also associated with lower cholesterol.[239, 240] In addition, exercise is a potent agent to improve cholesterol levels since it increases HDL-cholesterol and decreases LDL-cholesterol.[241, 242, 243] Finally, medication therapies can be prescribed to decrease LDL-cholesterol.[244]

Benefits associated with healthy cholesterol levels

* Better health
* Prevention of disease, including cardiovascular diseases
* Better control of blood pressure

Health problems associated with unhealthy cholesterol levels

* Coronary heart disease
* Stroke
* Hypertension
* Diabetes
* Obesity

Things you can do to maintain healthy levels of cholesterol

* Choose monounsaturated and polyunsaturated fats including canola, olive and soybean oil
* Choose foods that are low in saturated and trans fats
* Eat foods that are naturally high in fibre
* Consume two portions of fish each week, such as char, herring, mackerel, salmon, sardines and trout
* Drink alcohol in moderation
* Exercise regularly
* Do not smoke
* Maintain a healthy weight
* Speak with your health care provider to learn more about how you can maintain or reach healthy levels of cholesterol
* Consult *Canada's Food Guide* (http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/food-guide-aliment/view_eatwell_vue_bienmang-eng.pdf)
* For more information on cholesterol and its effect on health, you can visit the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/cholesterol_fat-cholesterol_gras-eng.php)

43. SELF-REPORTED HIGH BLOOD PRESSURE

Key Messages

- High blood pressure is an important risk factor for cardiovascular diseases
- High blood pressure can be controlled by medication and/or lifestyle modification, based on your doctor's recommendations
- About 17% of Canadians with hypertension are unaware that they have high blood pressure
- The percentage of Canadians who reported having been diagnosed with high blood pressure increased from 13.0% in 2003 to 14.2% in 2009

What does this indicator measure?

This indicator measures the percentage of Canadians aged 12 years and older who reported that they have been diagnosed by a health professional as having high blood pressure.

Blood Pressure		
	Systolic blood pressure	**Diastolic blood pressure**
Normal blood pressure	<120 mm Hg	<80 mm Hg
Pre-hypertension	120-139 mm Hg	80-89 mm Hg
High blood pressure (hypertension)	≥140 mm Hg	≥90 mm Hg
High blood pressure among individuals with diabetes or renal disease	≥130 mm Hg	≥80 mm Hg

Systolic blood pressure (the highest or top number) is the pressure in the artery when the heart contracts.

Diastolic blood pressure (the lowest or bottom number) is the pressure in the artery when the heart relaxes between beats.

What are the limitations of this indicator?

Although this indicator appears to refer to a diagnosis made by a health care professional, it is based on the respondents' self-report and is influenced by their capacity to remember or comprehend the health professional's diagnosis. Furthermore, the question could be misinterpreted—for example, a respondent may say that he or she does not have high blood pressure, but only because he or she is currently on medications that are lowering blood pressure levels. In this case, self-reported data are not as accurate as they would be if they came from an actual clinical database.[32] Furthermore, approximately 17% of adults who have high blood pressure are unaware of their condition, because most individuals do not have any signs or symptoms until other serious problems arise.[245] Therefore, the number of Canadians with high blood pressure is possibly underestimated.

High blood pressure is on the rise in Canada

In 2009, 14.2% of Canadians aged 12 years and older reported having been diagnosed with high blood pressure by a health professional, an increase from 13.0% in 2003. From 2003 to 2009, a steady increase occurred for males (from 12.0% to 13.8%).

Figure 52 Self-Reported High Blood Pressure

Percentage of population aged 12 years and older who reported having high blood pressure, by sex (age-standardized), Canada, 2003-09
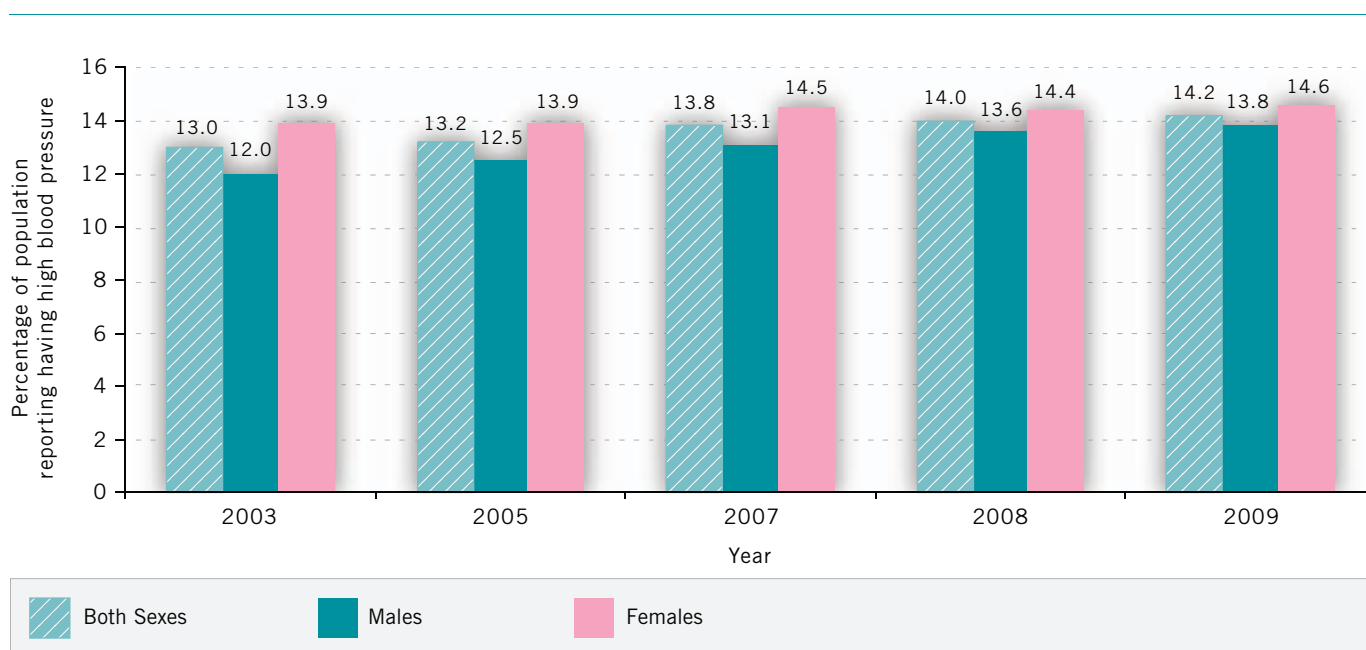
Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Includes household population aged 12 years and older who reported that they have been diagnosed by a health professional as having high blood pressure.
            Age-standardized to the 1991 Canadian population.
            For additional exclusions/limitations, see Annex 2.

What these results mean for you

Blood pressure (BP) is the pressure exerted by circulating blood upon the walls of blood vessels. Systolic BP is the pressure in the arteries when the blood is ejected by the contraction of the heart, while diastolic BP is the pressure in the arteries when the heart relaxes between beats. During each heartbeat, maximum (systolic) and minimum (diastolic) pressures vary; in addition, BP normally varies throughout the day. However, when either systolic or diastolic BP remains consistently high for an extended time period, an individual is considered to have high blood pressure, which is also known as hypertension. Elevated high blood pressure for a long period of time increases the strains and risks to your heart and blood vessels.

Although most people with this condition have no health symptoms, it can cause headache, dizziness, vision problems, or shortness of breath in some individuals. This is why high blood pressure is referred to as "a silent killer."

High blood pressure is a serious risk factor for several diseases. Research shows that each increase of 20 mm Hg in systolic and/or 10 mm Hg in diastolic BP is associated with more than a twofold increase in cardiovascular and stroke death rates.[150] Furthermore, when compared to normal BP below 120/80 mm Hg, values of 130-139/80-89 mm Hg are also associated with a twofold increase in the risk of cardiovascular diseases.[151]

BP tends to rise with age, and having a family history of high blood pressure may also have an effect on your BP later in life.[246] However, it can be reduced with medication and/or lifestyle modifications. Although several medications can help lower it, research shows that one drug alone is often insufficient in about two-thirds of hypertensive individuals who will then require two or more antihypertensive agents.[247] It is also proven that the efficacy of an antihypertensive drug can be enhanced when combined with lifestyle modifications.[247] For example, it is well established that proper diet, adequate levels of physical activity, loss of excess body weight, alcohol and sodium restriction, relaxation, and having a pet can have a significant positive effect on BP and health.[248, 249, 250, 251] In fact, even a small reduction of only 5 mm Hg in an individual's systolic BP would result in a 14% reduction in mortality due to stroke, a 9% reduction in mortality due to coronary heart disease, and a 7% decrease in all-cause mortality.[252] Two recent meta-analyses also showed that decreasing systolic BP by 10 mm Hg and/or diastolic BP by 5 mm Hg could lead to a 30 to 41% risk reduction in the number of subsequent strokes,[38, 253] and a 22 to 25% risk reduction for cardiovascular disease events.[38]

Benefits associated with normal blood pressure

- Better health
- Disease prevention, including cardiovascular diseases
- Lower stress on your heart and your blood vessels at rest and during exercise
- Prevention of kidney failure

Health problems associated with high blood pressure

- Damage to the walls of your arteries, causing tears or bulges (aneurysms) in the arteries of the brain, the heart, and other organs and body tissues
- Atherosclerosis or hardening of your arteries
- Coronary heart disease
- Stroke
- Enlarged heart and eventually heart failure
- Kidney disease
- Early death

Things you can do to maintain a healthy blood pressure

- Have your blood pressure checked regularly (at least once every two years) because when it is high it does not always present symptoms; high blood pressure is only diagnosed after BP has been taken on several occasions by a qualified health professional
- Eat a high fibre diet
- Eat foods low in saturated and trans fat
- Eat more fruit and vegetables
- Eat less salt, but remember that most salt that people consume is found in processed foods, not in the salt added at the table or in cooking
- If you drink, drink in moderation
- Be physically active 30 to 60 minutes most days of the week
- Maintain a healthy weight
- Do not smoke
- Manage your stress by practicing relaxation techniques and avoiding things that are stressful
- Speak with your health care provider to learn more about how you can maintain or reach a healthy blood pressure
- Consult *Canada's Food Guide* (http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/food-guide-aliment/view_eatwell_vue_bienmang-eng.pdf)
- For more information on blood pressure and its effect on health, visit the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension-eng.php)

44. SELF-REPORTED STRESS

Key Messages

- Stress can affect some people more than others
- It can be either good or bad
- Prolonged stress can have major consequences on your health
- Most Canadians do not report "quite a lot" of stress
- In 2009, females were more stressed than males

What does this indicator measure?

This indicator measures the percentage of the population aged 15 years and older who reported their level of life stress as "quite a lot."

What are the limitations of this indicator?

Self-reported stress is influenced by an individual's perception of a stressor. While stressors such as death and disease will increase the perceived stress level for all individuals, many minor stressors such as the hassles and uplifts of everyday life have also been found to be strong predictors of psychological symptoms. Research on stress shows that relatively small, every day stressors can have a significant impact on mental health.[254, 255] Hence, data on this indicator may vary among the population depending on things such as one's particular coping skills, position in the social structure, or socio-economic status.

There are two main types of stress:

(1) **eustress** prepares you to meet certain challenges and thus is productive;

(2) **distress** is harmful and may lower resistance to infection by temporarily inhibiting certain components of the immune system.

The majority of Canadians do not report "quite a lot" of stress

In 2009, 23.3% of Canadians aged 15 years and older reported that their level of life stress was "quite a lot." The rate for males was lower in 2009 (21.6%) than in 2003 (23.3%). Also in 2009, more females than males reported feeling "quite a lot" of stress (25.0% versus 21.6%, respectively).

Figure 53 Self-Reported Stress

Percentage of population aged 15 years and older who reported their level of life stress as "quite a lot," by sex (age-standardized), Canada, 2003-09

Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Based on household population aged 15 years and older who reported their level of life stress as "quite a lot."
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Stress is the normal physiological response to events that make you feel threatened or upset your homeostasis (i.e., the co-ordinated control of physiological regulatory processes that restore and maintain normal body equilibrium). When sensing danger—whether real or imagined—the body's defences kick into a rapid, automatic process known as the "fight-or-flight" reaction or the stress response. During this response, the nervous system reacts by releasing stress hormones including the catecholamines epinephrine and norepinephrine as well as cortisol. These hormones rouse the body for immediate action by increasing your heart and breathing rates, blood pressure, muscle strength and endurance, and sharpening your senses and focus, all of which prepare you to fight or run away from the perceived danger. This stress response is the body's way of protecting itself by staying focused, energetic and alert. In emergency situations, it can be lifesaving. It can also help you rise to meet life's challenges.

However, after a certain period of time is reached, stress starts causing major damage to your health, mood, productivity, sleep patterns, quality of life and lifestyle.[256, 257, 258, 259, 260] Long-term exposure to stress can lead to serious health problems because it disrupts nearly every system in your body. It can suppress the immune system,[261] raise blood pressure,[262] increase the risk of heart attack[261, 263] and stroke,[264] cause atherosclerosis,[265] contribute to infertility,[266] and speed up the aging process.[261, 267]

There are several ways to decrease your stress level. For example, it is now well established that physical activity can play a key role in stress management.[268, 269] In addition, flexibility and yoga exercises have been shown to be helpful.[270] Other effective relaxation techniques include listening to music,[271, 272] laughter,[273] breathing exercises[274] and meditation.[275] Having a pet may also be beneficial in reducing anxiety, stress and blood pressure.[251]

Benefits of maintaining a low stress level

- Better health
- More energy
- Ability to cope with life's challenges
- Improved mood

Health problems associated with high level of stress

- Depression
- Obsessive-compulsive or anxiety disorders
- Insomnia
- Migraine headaches
- Hair loss
- Diabetes
- Heart disease, hypertension, stroke and atherosclerosis
- Hyperthyroidism
- Suppression of the immune system leading to a decreased capacity to fight infections
- Severe weight-gain or weight-loss
- Sexual dysfunction
- Tooth and gum disease
- Digestive problems
- Ulcers
- Cancer
- Asthma
- Rheumatoid arthritis

Things you can do to reduce your stress level

- Exercise daily
- Practice yoga
- Listen to relaxing music
- Limit your alcohol and coffee consumption
- Schedule breaks throughout the day
- Experiment with stress management techniques
- Take deep breaths when you feel stressed
- Laugh
- Increase your social support by doing activities with your friends and/or family
- Get a pet
- Make time for yourself
- Do things that you like

45. DIABETES

Key Messages

- In 2006-07, about 2.1 million Canadians had diagnosed diabetes, and by 2012, almost 2.8 million Canadians will be living with it
- Type 2 diabetes is often associated with obesity, a poor diet and lack of exercise
- Males are more likely than females to have diabetes

What does this indicator measure?

This indicator measures the prevalence and incidence rates of diabetes among health care system users per 100 population (for prevalence) and per 1,000 population (for incidence).

Prevalence rate …	**Incidence rate …**
… refers to the number of people with the condition at the specified point in time divided by 100 (often expressed as a percentage).	… refers to the number of *new* cases identified with the condition at the specified point in time divided by 1,000.

What are the limitations of this indicator?

Many people who have type 2 diabetes display no symptoms.[276] Some people have not been diagnosed with diabetes but, in fact, have the disease. Because diabetes data are age-standardized to the 1991 Canadian population, age-standardized rates will underestimate the true prevalence and burden of diabetes in the population. Also, since this indicator uses an administrative database as its source, misclassification is possible.[277]

Canadian males are more likely to be diagnosed with diabetes

In 2006–07, the year for which the most recent data were available, 5.2% of Canadians had diagnosed diabetes, an increase from 3.8% in 2000–01 (all age-standardized rates). Prevalence rates for males and females also increased, from 4.3% for males and 3.4% for females in 2000–01, to 5.8% for males and 4.7% for females in 2006–07. The true prevalence of diabetes is likely higher as some people with diabetes are unaware of their condition. Rates increased with age for both sexes, peaking in the 75 to 79 age group then decreasing in the oldest age groups. This phenomenon, while possibly due to mortality associated with diabetes, could also be due to data limitations.

Figure 54 Prevalence of Diabetes

Prevalence rate of diagnosed diabetes among health care system users per 100 population, by sex (age-standardized), Canada, 2000-01 to 2006-07

Source: Public Health Agency of Canada. Canadian Chronic Disease Surveillance System.

Notes: Three types of diabetes are included in the database: type 1, type 2 and gestational diabetes. Note that gestational diabetes is only included when coded as diabetes mellitus (ICD-9, code 250 or ICD-10, codes E10-E14). An adjustment is in place to exclude incorrectly coded gestational diabetes. Age-standardized to the 1991 Canadian population; age-standardized percentages will underestimate the true prevalence of diabetes in the population. The prevalence of diabetes has been recalculated from 2000-01 onwards. As a result, the data will not match those reported in *Healthy Canadians 2008*. For additional exclusions/limitations, see Annex 2.

Figure 55 Prevalence of Diabetes

Prevalence rate of diagnosed diabetes among health care system users per 100 population, by sex and selected age group, Canada, 2006-07
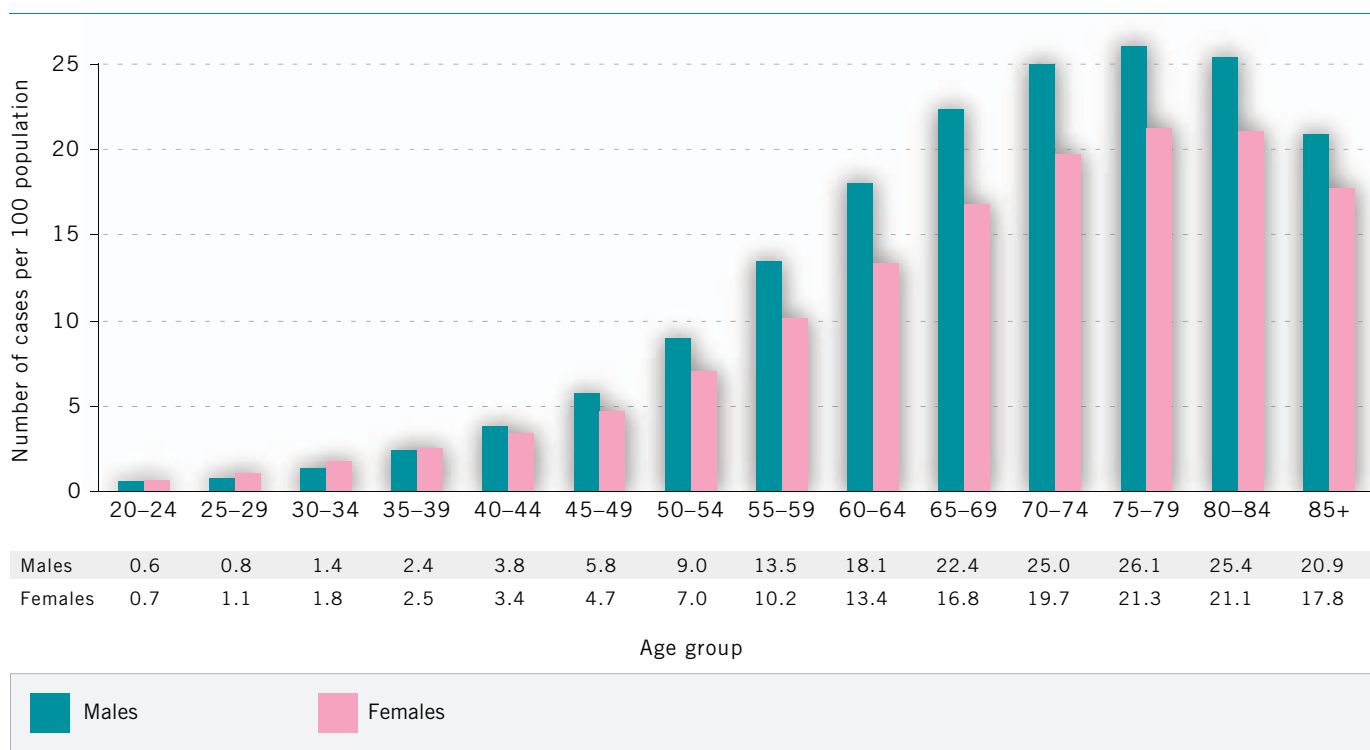
Age group	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Males	0.6	0.8	1.4	2.4	3.8	5.8	9.0	13.5	18.1	22.4	25.0	26.1	25.4	20.9
Females	0.7	1.1	1.8	2.5	3.4	4.7	7.0	10.2	13.4	16.8	19.7	21.3	21.1	17.8

Age group

■ Males   ■ Females

Source: Public Health Agency of Canada. Canadian Chronic Disease Surveillance System.

Notes: Three types of diabetes are included in the database: type 1, type 2 and gestational diabetes. Note that gestational diabetes is only included when coded as diabetes mellitus (ICD-9, code 250 or ICD-10, codes E10-E14). An adjustment is in place to exclude incorrectly coded gestational diabetes. For additional exclusions/limitations, see Annex 2.

In 2006-07, age-standardized incidence rates for diabetes were 6.9 cases per 1,000 males and 5.4 cases per 1,000 females, with an average of 6.1 cases per 1,000 population overall. These rates represent increases from the rates in 2000-01 (6.0 cases per 1,000 males, 4.7 cases per 1,000 females, and 5.3 cases per 1,000 population overall).

Figure 56 Incidence of Diabetes

Incidence rate of diagnosed diabetes among health care system users per 1,000 population, by sex (age-standardized), Canada, 2000-01 to 2006-07
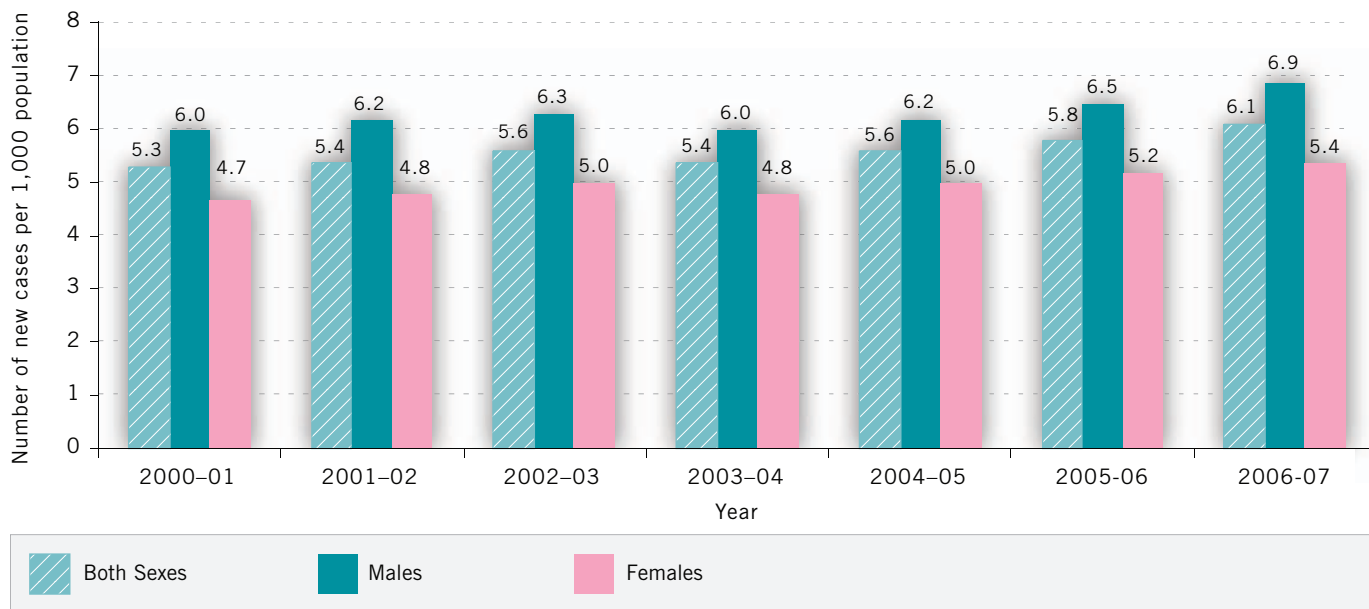
	Both Sexes	Males	Females
2000–01	5.3	6.0	4.7
2001–02	5.4	6.2	4.8
2002–03	5.6	6.3	5.0
2003–04	5.4	6.0	4.8
2004–05	5.6	6.2	5.0
2005-06	5.8	6.5	5.2
2006-07	6.1	6.9	5.4

Source: Public Health Agency of Canada. Canadian Chronic Disease Surveillance System.

Notes: Three types of diabetes are included in the database: type 1, type 2 and gestational diabetes. Note that gestational diabetes is only included when coded as diabetes mellitus (ICD-9, code 250 or ICD-10, codes E10-E14). An adjustment is in place to exclude incorrectly coded gestational diabetes. Age-standardized to the 1991 Canadian population; age-standardized rates will underestimate the true burden of diabetes in the population. The incidence of diabetes has been recalculated from 2000-01 onwards. As a result, the data will not match those reported in *Healthy Canadians 2008*. Readers should interpret these data with caution: see Annex 2.

What these results mean for you

Diabetes is a chronic condition that stems from the body's inability to sufficiently produce and/or properly use insulin which the body needs to use sugar as an energy source. Symptoms of diabetes include unusual thirst, frequent urination, weight change (gain or loss), extreme fatigue or lack of energy, blurred vision, frequent or recurring infections, cuts and bruises that are slow to heal and tingling or numbness in the hands or feet.[276]

There are two types of diabetes. Type 1 diabetes occurs when the beta cells of the pancreas are destroyed by the immune system and no longer produce insulin. Individuals with type 1 diabetes rely on an external supply of insulin for their body to function. Type 1 diabetes usually develops in childhood or adolescence and there is no known way to prevent it.[277]

Type 2 diabetes represents more than 90% of all cases in the general population.[278] It occurs when the body does not make enough insulin and/or does not respond well to the insulin it produces. People are usually diagnosed with type 2 diabetes after the age of 40, although it is now being seen in younger adults, as well as children and adolescents.[277, 279]

Many health and psycho-social problems are related to diabetes such as heart and kidney disease, loss of vision, erectile dysfunction in men, severe coping difficulties such as stress, depression, even death.[277, 278, 280, 281]

Several factors contribute to a person's risk of developing diabetes. Scientists do not know exactly what causes type 1 diabetes but they believe that both genetic factors and exposure to viruses may be involved.[276] Studies suggest that half of the risk of type 2 diabetes can be attributed to environmental exposure and the other half to genetics.[276, 279, 282] Today, type 2 diabetes is mainly due to the growing obesity epidemic.[283] Other risk factors that contribute to developing type 2 diabetes include pre-diabetes,[276, 284] being overweight,[279, 283] aging,[277, 285] physical inactivity,[279, 286, 287] having high blood pressure and/or high cholesterol[283] and belonging to certain high-risk ethnic populations (e.g., Aboriginal, African, Hispanic, Asian).[276, 288]

Research suggests that males are more likely to suffer from diabetes due to sedentary lifestyles and a higher risk of obesity.[279] Fathers are also more likely to transfer the risk of type 1 diabetes to their children while mothers are more likely to transfer the risk of type 2 diabetes.[289]

Benefits of healthy blood glucose levels

- Allows your body to get the energy it needs
- Reduces the risk of type 2 diabetes, hypoglycaemia and hyperglycaemia
- Reduces the risk of health problems such as cancer, strokes, dementia and gout

Health problems related to diabetes

- Heart disease
- Kidney disease
- Blindness
- Erectile dysfunction
- Nerve damage
- Reduced ability to fight infections
- Depression
- Stress
- Death

Things you can do to reduce your risk of developing diabetes or help you to manage your diabetes

- Attain a healthy weight
- Eat a healthy, balanced diet
- Be screened or tested regularly
- Engage in physical activity everyday
- Quit smoking if you smoke
- Reduce your stress
- Get enough sleep and rest
- If you have type 1 diabetes, control your insulin levels
- Take medication to control cholesterol and blood pressure, if they are prescribed by your physician
- For more helpful tips on preventing and managing diabetes symptoms, please visit the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/cd-mc/diabetes-diabete/index-eng.php)

46. BODY MASS INDEX (BMI)

Key Messages

- Being overweight or obese increases risks to health
- Nearly half of adult Canadians were either overweight or obese in 2009
- More adult males than females were either overweight or obese in 2009

What does this indicator measure?

This indicator measures the percentage of Canadian adults aged 18 years and older, excluding pregnant women, who reported a weight and height corresponding to a body mass index (BMI) in specified categories ranging from underweight to obese.

Underweight	BMI of less than 18.5
Normal weight	BMI of 18.5 to 24.9
Overweight	BMI of 25.0 to 29.9
Obese (Classes I to III)	BMI of 30.0 +

Body mass index (BMI) …
. . . is calculated as a person's weight (in kilograms) divided by height (in metres) squared. For example, the BMI for a person who weighs 75 kilograms and is 1.65 metres tall is 27.5 (overweight).

What are the limitations of this indicator?

Self-reported weight and height often underestimate the prevalence of overweight and obese individuals in the population.[290] This indicator, whether self-reported or measured, may not be appropriate depending on the age of the person, body composition, or ethnicity.[291]

Visit Health Canada's website to calculate your BMI (http://www.hc-sc.gc.ca/fn-an/nutrition/weights-poids/guide-ld-adult/bmi_chart_java-graph_imc_java-eng.php)

Obesity continues to increase among Canadians

In 2009, 47.5% of Canadians reported a weight and height corresponding to a BMI in the "normal weight" category. While more females than males were "underweight", more males than females were "overweight" and "obese" (class I). Meanwhile, females were more likely than males to be in the highest classes of obesity (classes II and III).[292]

Figure 57 Self-Reported Body Mass Index (BMI) (All Categories)

Percentage of population who reported weight and height corresponding to a BMI in specified categories, by sex (age-standardized), Canada, 2009
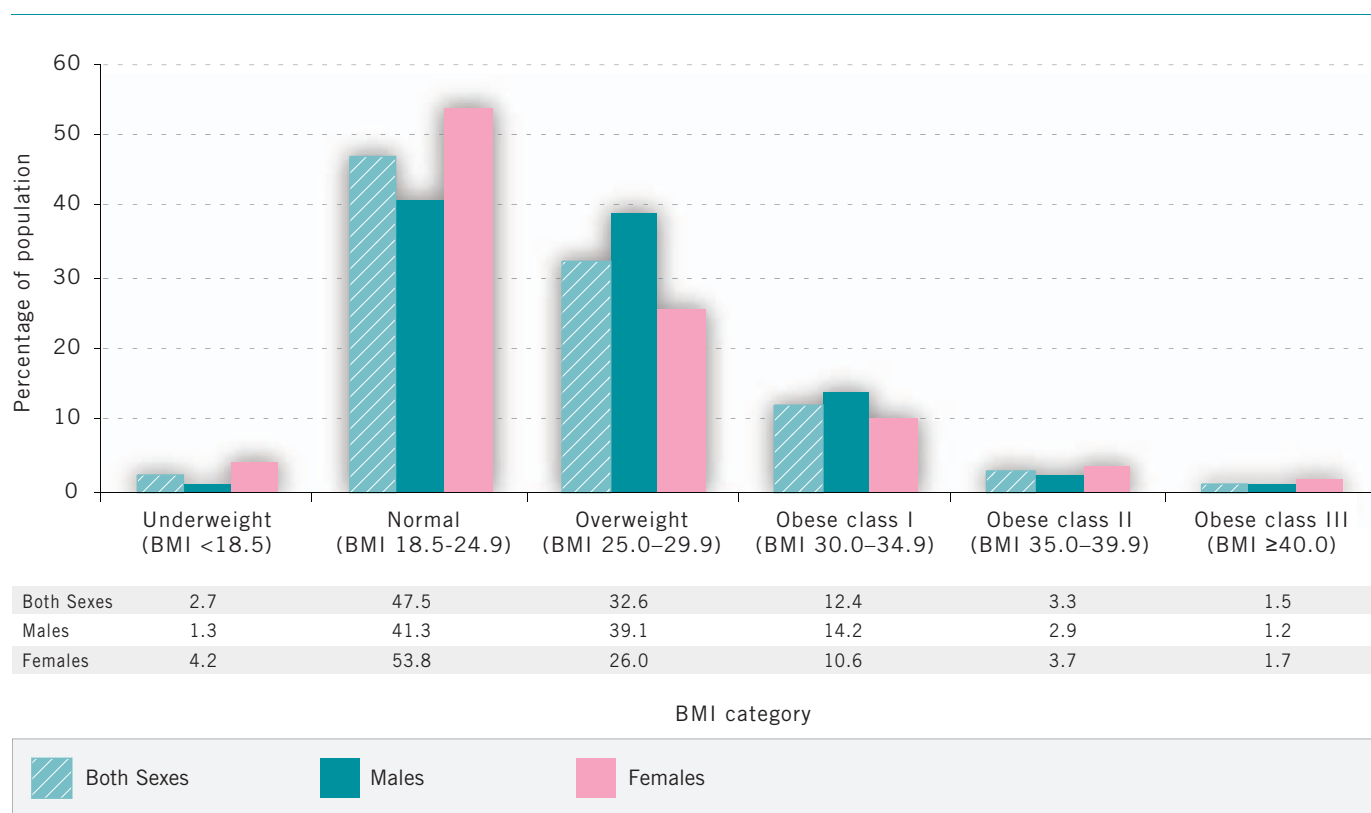
	Underweight (BMI <18.5)	Normal (BMI 18.5-24.9)	Overweight (BMI 25.0–29.9)	Obese class I (BMI 30.0–34.9)	Obese class II (BMI 35.0–39.9)	Obese class III (BMI ≥40.0)
Both Sexes	2.7	47.5	32.6	12.4	3.3	1.5
Males	1.3	41.3	39.1	14.2	2.9	1.2
Females	4.2	53.8	26.0	10.6	3.7	1.7

BMI category

Both Sexes ■ Males ■ Females

Source: Statistics Canada. Canadian Community Health Survey, 2009.

Notes: Includes household population 18 years and older who reported their weight and height.
Data exclude pregnant women and persons measuring less than 91.4 centimetres (three feet) or greater than 210.8 centimetres (six feet, 11 inches) in height.
Results should be treated with caution because self-reported body mass index may underestimate the true prevalence of overweight and obesity in the population.
Figures for obese classes I, II and III may not sum up to the totals in the graph *Self-reported body mass index (obese category)* due to rounding.
"Not stated" rate not shown.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

In 2009, 32.6% of Canadians reported a weight and height corresponding to a BMI in the "overweight" category. Rates for males and females were 39.1% and 26.0%, respectively. Rates for males were higher than those of females.[293]

Figure 58 Self-Reported Body Mass Index (BMI) (Overweight Category)

Percentage of population who reported weight and height corresponding to a BMI in the overweight category (BMI 25.0-29.9), by sex (age-standardized), Canada, 2003-09

Also in 2009, 17.2% of Canadians reported a weight and height corresponding to a BMI in the "obese" categories, an increase from 2003. The obesity rate increased for both males and females from 2003 to 2009. Higher rates of obesity were observed in males (18.4%) than in females (15.9%).[294]

Figure 59 **Self-Reported Body Mass Index (BMI) (Obese Category)**

Percentage of population who reported weight and height corresponding to a BMI in the obese category (BMI ≥ 30.0), by sex (age-standardized), Canada, 2003-09
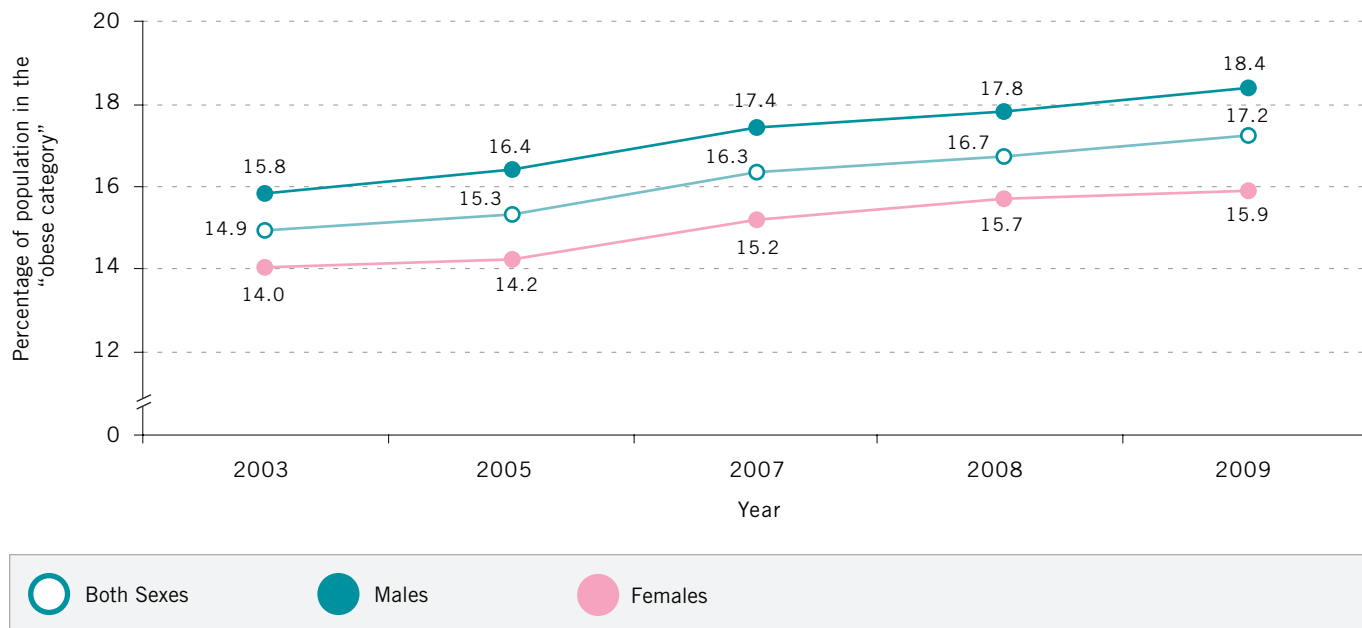
Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Includes household population 18 years and older who reported their weight and height.
Data exclude pregnant women and persons measuring less than 91.4 centimetres (three feet) or greater than 210.8 centimetres (six feet, 11 inches) in height.
Results should be treated with caution because self-reported body mass index may underestimate the true prevalence of overweight and obesity in the population.
Totals for the obese category may not equal the sum of obese classes I, II and III in the graph *Self-reported body mass index (all categories)* due to rounding.
"Not stated" rate has changed significantly over time.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

This indicator is useful in identifying links between weight and height and the risk of developing health problems (such as type 2 diabetes, coronary heart disease and other weight-related chronic diseases).[295, 296] A review of the medical literature shows that achieving and maintaining a healthy weight can lead to many health benefits, whereas being overweight and obese can lead to health problems.[249, 297, 298]

Benefits of maintaining a healthy weight

- Better overall health
- Lower risk of diseases, including cardiovascular diseases
- More energy
- Feeling better
- Continued independent living in old age

Health problems associated with weight

Underweight
- Anaemia
- Osteoporosis and fractures
- Hair loss
- Amenorrhea (loss of menses for women)
- Arrhythmia (irregular heart beat)
- Weakened immune system
- Higher rate of infertility

Overweight
- Premature aging and death
- Cardiovascular conditions such as heart disease, high blood pressure and stroke
- Diabetes
- Certain cancers
- Arthritis and Osteoarthritis
- Other chronic diseases

Things you can do to maintain or achieve a healthy weight

- Start slowly and build up to 30 to 60 minutes of moderate physical activity most days
- Limit foods and beverages high in calories, fat, sugar and salt (sodium)
- Eat vegetables and fruit at all meals and as snacks
- When eating out, order smaller portions or share with a friend
- Speak with a health care provider for more information
- To learn more about physical activity, visit the Public Health Agency of Canada's website (http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/pag-gap/index-eng.php)
- To learn more about healthy eating, visit Health Canada's website (http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php)
- To learn more about how to use the Nutrition Labelling table on pre-packed foods to make informed choices, visit Health Canada's website (http://www.hc-sc.gc.ca/fn-an/label-etiquet/nutrition/index-eng.php)
- To learn more about obesity, visit Health Canada's website (http://www.hc-sc.gc.ca/hl-vs/alt_formats/pacrb-dgapcr/pdf/iyh-vsv/life-vie/obes-eng.pdf)

47. SELF-REPORTED PHYSICAL ACTIVITY

Key Messages

- Physical activity has many health benefits
- It is linked to a lower incidence of morbidity and mortality for several diseases
- About half the Canadian population was physically active in 2009
- Males were more active than females

What does this indicator measure?

This indicator measures the percentage of the population aged 12 years and older who reported themselves as being either "physically active" or "physically inactive."[299]

What are the limitations of this indicator?

Self-reported physical activity levels are shown to be inconsistent when compared to direct measures. In a review of the literature on the subject of self-reported versus direct measurements, Prince et al. (2008) concluded that "self-report measures of physical activity were both higher and lower than directly measured levels of physical activity, which poses a problem for both reliance on self-report measures and for attempts to correct for self-report–direct measure differences."[300]

This indicator only captures activity levels in *leisure* time.

> About $5.3 billion, or 2.6% of the total health care costs in Canada, were attributable to physical inactivity in 2001.[301]

Physical activity levels are increasing

In 2009, 53.2% of Canadians reported being "active" or "moderately active", an increase from 51.3% in 2008. Rates for males and females were higher in 2009 than in 2008. Males continued to report higher rates (57.3%) of "active" or "moderately active" physical activity levels in 2009 compared to females (49.2%).

Figure 60 Self-Reported Physical Activity

Percentage of population reporting being "physically active" and "physically inactive," by sex (age-standardized), Canada, 2003-09

	2003	2005	2007	2008	2009		2003	2005	2007	2008	2009
Both Sexes	52.3	52.7	51.0	51.3	53.2		47.7	47.3	49.0	48.7	46.8
Males	55.9	55.4	54.2	55.3	57.3		44.1	44.6	45.8	44.7	42.7
Females	48.9	50.1	47.9	47.4	49.2		51.1	49.9	52.1	52.6	50.8

○ Both Sexes ● Males ● Females
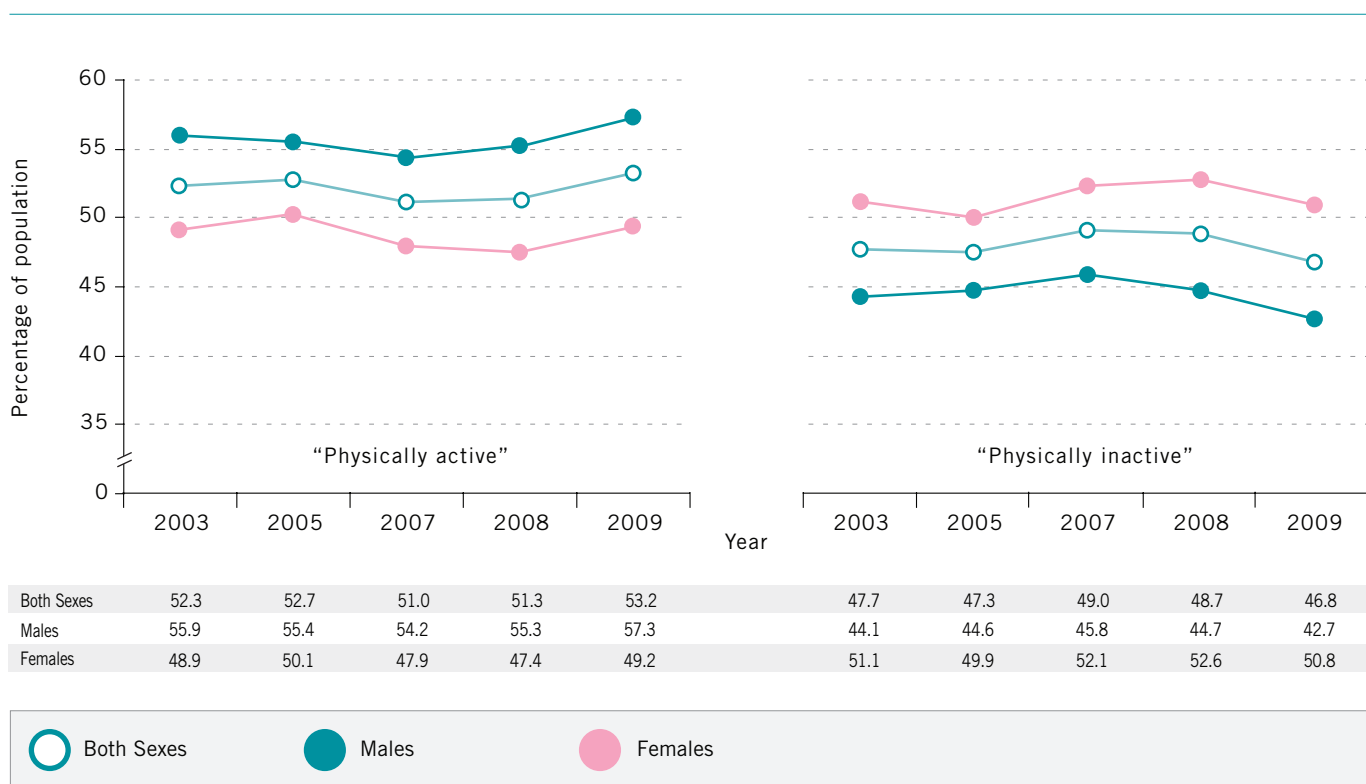
Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Results should be treated with caution as there is variation in the number of non-respondents.
Results should be treated with caution because self-reported physical activity may overestimate or underestimate the true prevalence of activity in the population.
Includes household population aged 12 years and older reporting level of physical activity, based on their responses to questions about frequency, duration and intensity of their leisure-time physical activity.
"Physically active" includes individuals reporting either active or moderately active levels of physical activity. "Physically inactive" includes those reporting a physical activity level of inactive.
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Being physically active is important for maintaining physical fitness and can contribute positively to: maintaining a healthy weight, building and maintaining healthy bone density, muscle strength and joint mobility, promoting physiological well-being, reducing chronic disease incidence, and strengthening the immune system. In fact, research shows that physical activity leads to numerous health benefits.[146, 302, 303, 304, 305]

Benefits of physical activity

- Improved overall health
- Increased energy
- Control of body weight
- Stronger heart, lungs, muscles and bones
- Improved cardiovascular health
- Increased metabolism to better digest food and to more efficiently expend calories
- Disease prevention
- Reduced risk for several cancers
- Improved flexibility, balance and coordination, reducing the risk of falls in older individuals
- Improved mental health, reduced stress and anxiety, improved self-esteem and confidence and increased feelings of well-being
- Increased quality of life
- Continued independent living in old age

Health risks of physical inactivity

- Premature aging and death
- Cardiovascular conditions such as heart disease, high blood pressure and stroke
- Diabetes
- Increased risk of cancer, especially breast and colon cancers
- Increased incidence of arthritis and osteoporosis
- Depression
- Overweight or obesity
- Other chronic diseases

Things you can do to maintain or adopt an active lifestyle

- Start slowly and build up to 30 to 60 minutes of moderate physical activity most days
- Take any opportunity you have to be active: take the stairs instead of the elevator; walk or cycle to work; take a walk with your kids and/or pets
- If you want to be physically active with other people, join a club
- Decrease screen time (televisions, computers, cell phones and handheld gaming consoles) and replace it with some physical activity
- Always consider safety and security before undertaking any type of physical activity
- For more information about the specific health benefits physical activity may have for you, please consult your health care provider
- For more information about active living and physical activity, see the Public Health Agency of Canada's Physical Activity Guide (http://www.phac-aspc.gc.ca/pau-uap/paguide/index.html)

48. PERCEIVED HEALTH

Key Messages

- Self-reported health is an important predictor of morbidity and mortality
- It is known to correlate highly with other health status measures
- About 62% of Canadians rated their health as either "excellent" or "very good" in 2009
- Ratings of perceived health have increased since 2003
- Half of Inuit rated their health as "excellent" or "very good"

What does this indicator measure?

This indicator measures the percentage of the population aged 12 years and older who rated their overall health as either "excellent" or "very good."

It also measures the percentage of Inuit people aged 15 years and older who rated their overall health as either "excellent" or "very good."

What are the limitations of this indicator?

Studies indicate that self-reported health can predict the incidence of chronic diseases, loss of ability to function and, ultimately, survival, especially among older individuals.[306] However, the predictive value of self-reported health on mortality may not be uniform across all population groups, as variations have been noted in the strength or significance of the association by specific age and gender subgroups.[307]

> **Self-rated health** is a good predictor of morbidity and mortality.

Ratings of perceived health increased since 2003

In 2009, 62.2% of Canadians aged 12 years and older reported their health as "excellent" or "very good," an increase from 59.7% in 2003 and 60.6% in 2008. Increases for males and for females have also occurred since 2003.

Figure 61 Perceived Health

Percentage of population aged 12 years and older who reported "excellent" or "very good" health, by sex (age-standardized), Canada, 2003-09
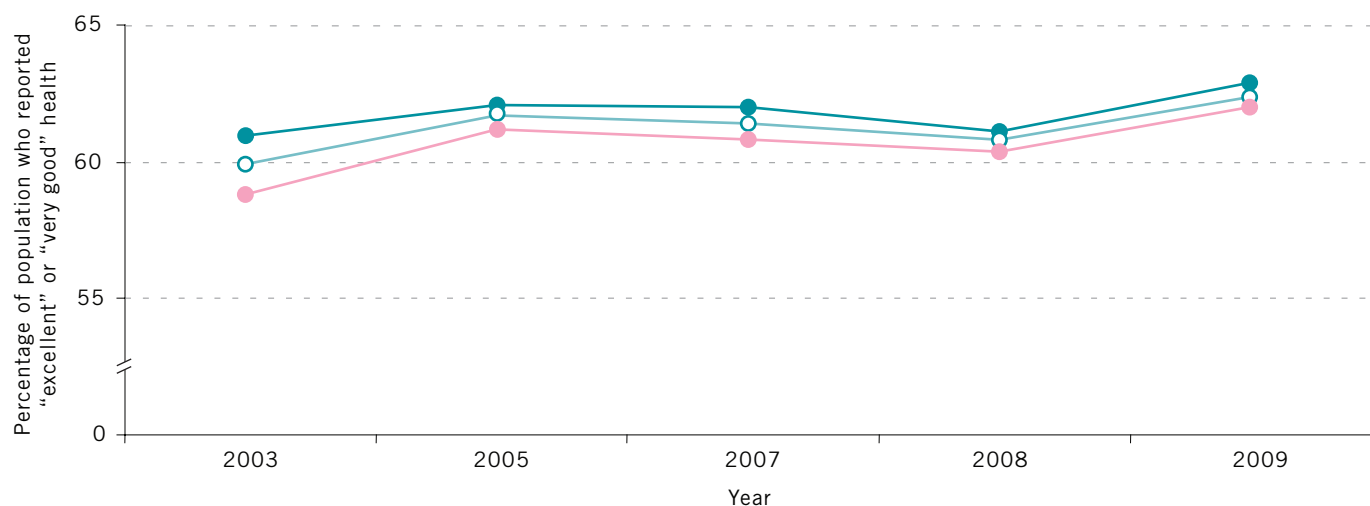
	2003	2005	2007	2008	2009
Both Sexes	59.7	61.5	61.2	60.6	62.2
Males	60.8	61.9	61.8	60.9	62.7
Females	58.6	61.0	60.6	60.2	61.8
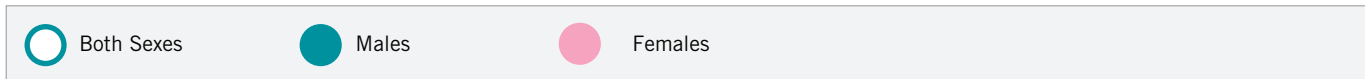
○ Both Sexes　　● Males　　● Females

Source:　Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes:　Based on household population aged 12 years and older who reported that their health was "excellent" or "very good."
Age-standardized to the 1991 Canadian population.
For additional exclusions/limitations, see Annex 2.

Half of Inuit rated their health as "excellent" or "very good"

In 2006, 50% of Inuit aged 15 years and older reported their health as "excellent" or "very good." The proportions of males and females who reported their health as "excellent" or "very good" were 52% and 48%, respectively.

Figure 62 Perceived Health

Percentage of Inuit reporting "excellent" or "very good" health, by sex, Canada, 2006
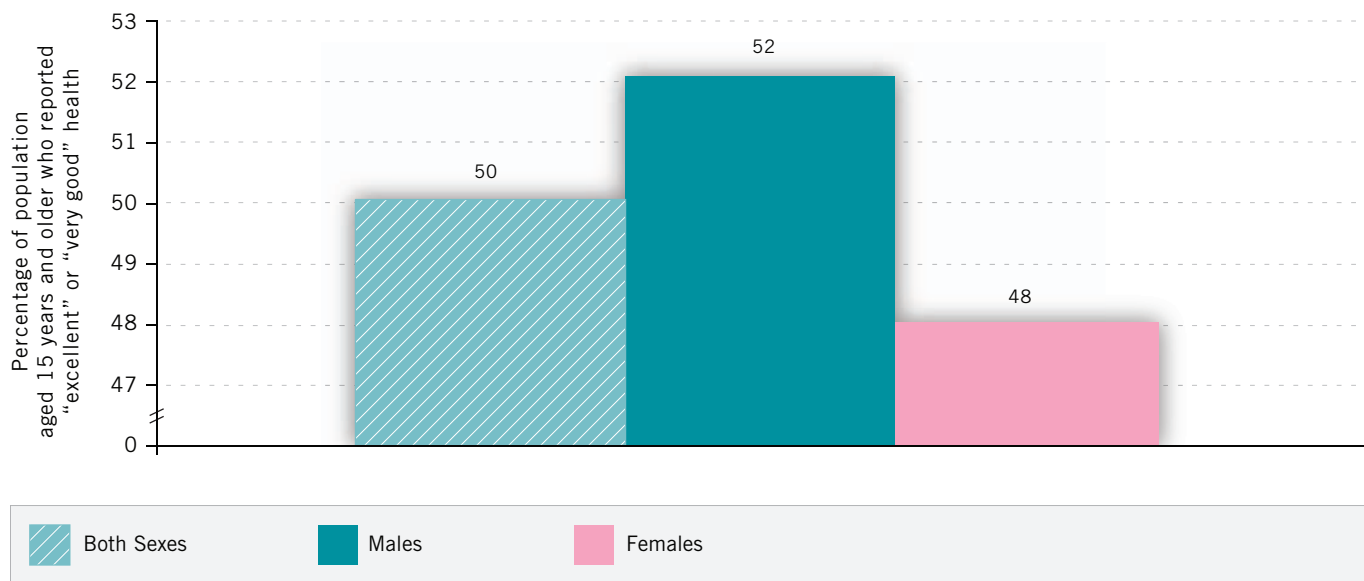
Source: Statistics Canada. Aboriginal Peoples Survey, 2006.

Notes: Based on household population aged 15 years and older who reported that their health was "excellent" or "very good." For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country. Also, OECD data are not age-standardized while Canadian data (presented in the graph *Perceived Health*) are age-standardized to the 1991 Canadian population. Furthermore, the OECD indicator measures the percentage of the population who reported being in "good" or better health, while the Canadian indicator measures the percentage of the population who rated their overall health as either "excellent" or "very good." OECD data (including the information on Canada) also encompass individuals who are 15 years and older, whereas data in the Canadian graph include individuals who are 12 years and older. Thus, data are not directly comparable between Canadian and international graphs.

Of the G7 countries, Canada had the highest score for perceived health, with 88.1% of Canadians rating their health as "good" or better.

Figure 63 Perceived Health Status

Percentage of population who reported being in "good" health or better, by sex, selected countries and years
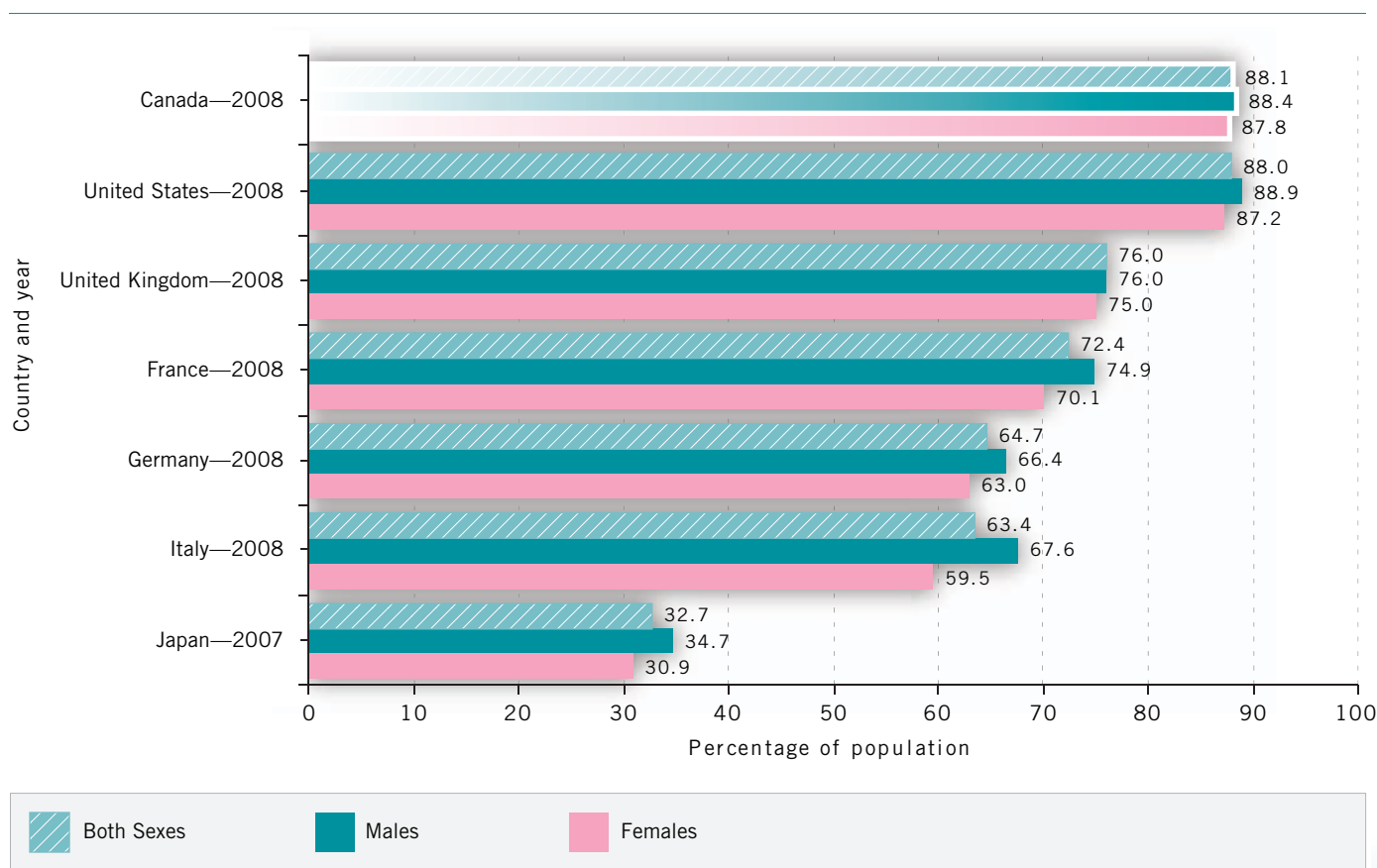
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.

Notes: Data are for selected years.
Data are not comparable to Canadian trend data for the indicator *Perceived health* because OECD data are not age-standardized, while Canadian data are age-standardized to the 1991 Canadian population. In addition, this indicator reports on "good" health or better, which is not the same as the grouping "excellent" or "very good," that is reported for Canada, and reports on Canadians 15 years and older rather than 12 years and older.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Self-rated health has been found to be a strong predictor of morbidity and mortality.[306, 308, 309] It has also been highly correlated with other health status measures.[310] For instance, strong associations have been found between a decline in self-reported health status and a decrease in functional capacity and physical activity.[306, 311, 312] Elderly people who reported being physically inactive were twice as likely to experience functional deterioration than those who were more active.[306] Furthermore, physical tiredness and poor physical and mental health,[306, 310] use of health care services, number of hospitalizations, increase in the number of chronic conditions, depression and lack of social support have also been linked to lower ratings of self-reported health.[311, 313] Finally, socio-demographic and economic characteristics such as age, income, education and work environment influence self-reported health.[311, 314, 315, 316]

It should be noted that individuals can sometimes perceive illnesses that are not there. For example, individuals diagnosed with hypochondriasis or psychosomatic disorders (people who have a tendency to worry about having a serious illness) are more likely to hold dysfunctional medical and illness-related beliefs than people who do not have these disorders. Contrary to what these individuals might believe, there is no evidence to suggest that they suffer from more illnesses than lower health-anxiety persons.[317] Research also shows that these types of patients use outpatient and inpatient services twice as much and at twice the annual health care cost compared to patients who do not have these disorders.[318] Therefore, judgement is essential in assessing your health status.

Benefits of being in touch with your health

- Better insight into your health, leading to faster responses to address potential health problems
- Better communication with your health care provider
- Faster diagnosis

Health risks of not being in touch with your health

- Poor perception of actual health status
- Longer time between doctor's visits, leading to less timely diagnoses and increased health-related complications
- Increased morbidity and mortality

Things you can do to be more aware of your health

- Increase your knowledge and awareness of different signs and symptoms of poor health by reading, courses, etc.
- Do not dismiss what your body is telling you
- Speak with your health care provider about methods to improve your ability to detect health-related complications

49. LIFE EXPECTANCY

Key Messages

- Life expectancy is the number of years a person may be expected to live
- This indicator concerns quantity rather than quality of life
- Life expectancy has been increasing in Canada, reaching 80.7 years in 2005-07
- Women live longer than men

What does this indicator measure?

This indicator measures the number of years a person would be expected to live starting from birth and is based on mortality statistics for a given observation period, typically for a three-year period.

What are the limitations of the life expectancy indicator?

Increases in life expectancy are sometimes associated with increases in the presence of serious disease. Thus, life expectancy on its own does not tell us whether or not an individual's life is lived in good health. As a result, life expectancy is more related to the quantity (number of years) than the quality (good health) of life. Furthermore, life expectancy does not refer to the number of years a particular newborn can actually expect to live. This is because mortality rates are averages for the entire population.

Life expectancy continues to increase

Since 1999-2001, life expectancy continues to increase for males, females and both sexes combined. In 2005-07, life expectancy for Canadians averaged 80.7 years, with males and females averaging 78.3 and 83.0 years, respectively. In 2005-07, males continued to have a lower life expectancy than females. However, the difference between males and females has gotten smaller, from a difference of 5.3 years in 1999-2001 to 4.7 years in 2005-07.

Figure 64 Life Expectancy

Life expectancy at birth, by sex, Canada, 1999-2001 to 2005-07

Notes: Statistics Canada uses a new method to calculate life expectancy which presents an average of a three-year period.
Non-residents of Canada are excluded from the death and population estimates.
For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data vary according to the country. Caution is therefore required in the interpretation of OECD data.

Of the G7 countries, Canada had the fourth highest average life expectancy (third highest for males at 78.3 years and fourth highest for females at 83.0 years).

Figure 65 Life Expectancy at Birth

In years, by sex, selected countries and years
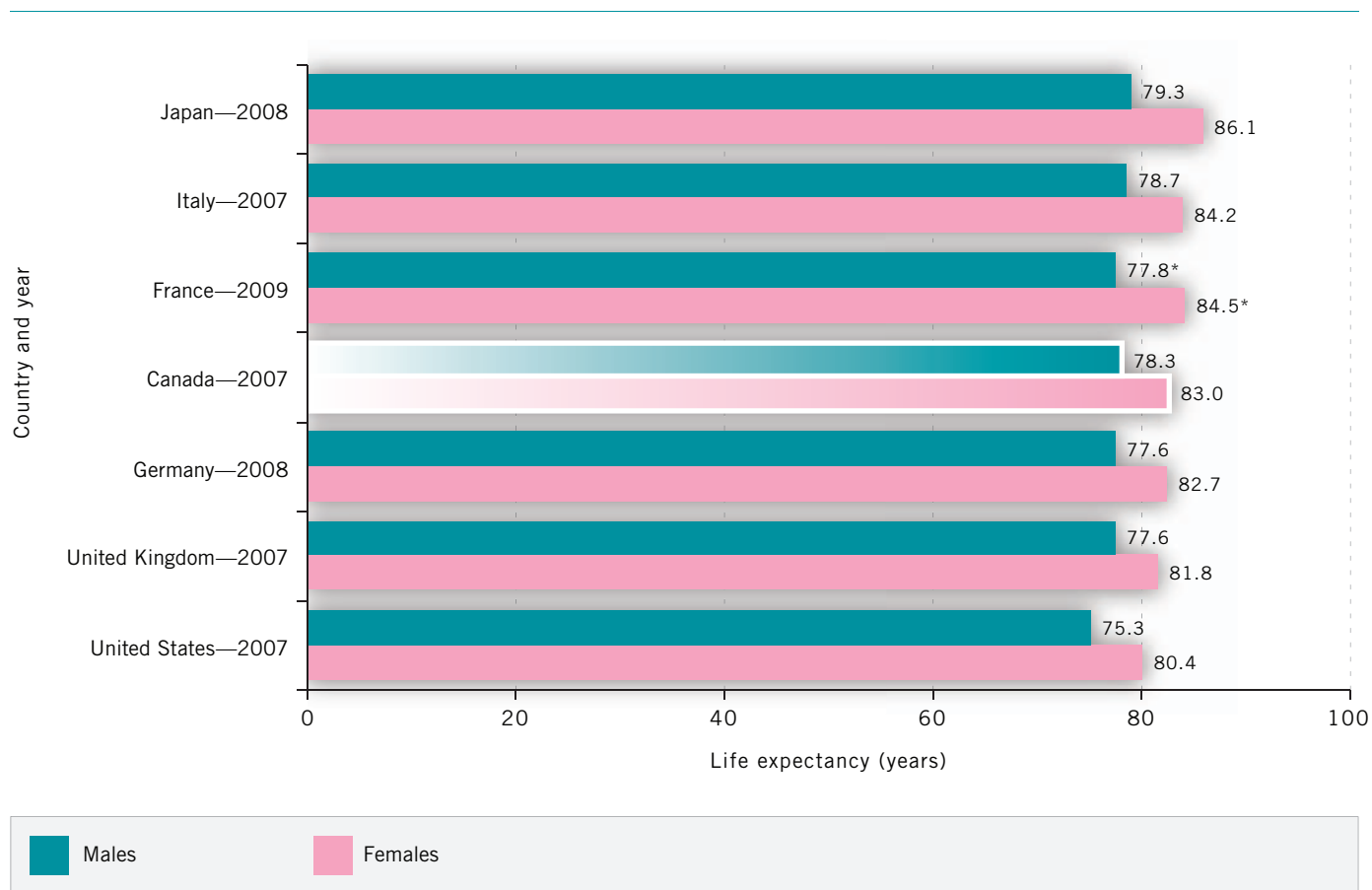
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.

Notes: *Data for France are estimates.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Numerous factors or determinants of health (income and social status, social supports, education, employment and working conditions, health services, biology and genetic endowment, child development, physical and social environment, personal health practices and coping skills) can influence a person's longevity and quality of life.[319] For example, a long-time smoker may have a life expectancy that is different from a non-smoker.

Furthermore, several studies have shown that avoiding some health risk factors not only increases the quantity of life (and therefore life expectancy), but also the quantity of *active* life (known as "active life expectancy," "health expectancy," or "disability-free life expectancy").[320, 321] To illustrate this, consider physical activity which is an important factor affecting active life expectancy. Research shows that older persons who are physically active are more likely to survive to very old age, resulting in a longer life with a lower risk for disability before death.[321] In fact, physical activity may be stronger than not smoking as a predictor of quality of life in old age.[320] Moreover, improvements in four preventable risk factors (smoking, high blood pressure, high blood glucose and adiposity) may increase life expectancy by several years.[322] It is worth noting that obesity may have a much larger effect on active life expectancy than on life expectancy.[323]

Diet also has a significant influence on mortality and thus on life expectancy. A Mediterranean diet—which is low in saturated fat, high in monounsaturated and/or polyunsaturated fat, high in fruit and vegetables, low in meat and meat products, and moderate in milk and dairy products—is known to decrease mortality rates for coronary heart disease and several types of cancers. As a result, this diet may increase life expectancy.[324] Doubling the amount of fruit and vegetables consumed each day (from 250 to 500 g) may increase life expectancy by 1.3 years.[325] Finally, since obesity plays a significant role in the development of disability in later life, any lifestyle changes such as diet and exercise could have an effect on obesity and hence on active life expectancy.[323, 326, 327]

People suffering from one or more chronic conditions are more likely to have a reduced active life expectancy. In a study of seniors 65 years and older, those who were free of chronic diseases such as diabetes, asthma, chronic obstructive pulmonary disease, arthritis, hearing problems and/or cancer, were more likely to have an active life expectancy after a 6-year follow-up period.[328]

Benefits of aging successfully

- Better health
- Better quality of life
- Greater independence
- Care giving costs are lower, benefiting individuals and society
- Greater capacity to perform physical and social activities

Health risks affecting life expectancy

- Physical inactivity
- Smoking
- Unhealthy diet
- Obesity
- Excessive drinking

- Excessive stress
- Deficiency in personal coping skills

Things you can do to age successfully

- Avoid risky behaviours such as drinking too much alcohol, smoking, eating too much fat, driving too fast
- Take protective measures when engaging in risky behaviours (for example, wear a life jacket when boating)
- Increase your physical activity
- Decrease your stress
- Have a good social network of friends and family
- Have regular check-ups with your family doctor
- Focus on what you can change to improve your health and quality of life

50. INFANT MORTALITY

Key messages

- Infant mortality is considered the single most comprehensive measure of health in a society
- It reflects the level of health care available to a population, the effectiveness of preventive care, and the attention paid to maternal and child health
- Immaturity is the leading cause of infant death in Canada, followed by congenital anomalies
- Although infant mortality in Canada has decreased dramatically over the last century, disparities in the risk of infant death across subpopulations still remain

What does this indicator measure?

This indicator measures the number of live born babies who die in the first year of life, expressed as a rate (per 1,000 live births) for that year.

> This indicator *excludes* babies weighing less than 500 g.

What are the limitations of this indicator?

The infant mortality rate reflects the level of mortality, the health status and health care of a population, the effectiveness of preventive care and the attention paid to maternal and child health, as well as broader social factors such as maternal education, smoking and deprivation. Although infant mortality in Canada has decreased dramatically over the last century, disparities in risk of infant death across subpopulations remain. Immaturity and congenital anomalies are the leading causes of infant death in Canada. Moreover, the rate of preterm birth has been increasing in Canada, and this may be due to increases in obstetric interventions (for example, medically indicated labour induction and/or caesarean delivery), multiple births, older maternal age, and increases in the use of ultrasound-based estimates of gestational age.[329]

Infant mortality continues to decrease in Canada

In 2007, the infant mortality rate was 4.2 deaths per 1,000 live births. The infant mortality rates for males and females were 4.7 and 3.7 per 1,000 live births, respectively.

Figure 66 Infant Mortality

Birth weights 500 g or more, by sex, Canada, 2000-07

Sources: Statistics Canada. Vital Statistics — Birth and Death Databases.
Institut de la Statistique du Québec.

Notes: Infants born outside the province/territory of residence of their mothers or infants who die outside the province/territory of residence of their mothers are included in the rates for the mother's province/territory of residence.
For additional exclusions/limitations, see Annex 2.

Reference years for the Organisation for Economic Co-operation and Development (OECD) data differ according to the country in question. Furthermore, interpretation of international comparisons of infant mortality should be made with caution as there are international variations in the registration of stillbirths and live births.[329]

Internationally, Canada had the second highest infant mortality rate of the G7 countries.

Figure 67 Infant Mortality

Deaths per 1,000 live births, both sexes, selected countries and years
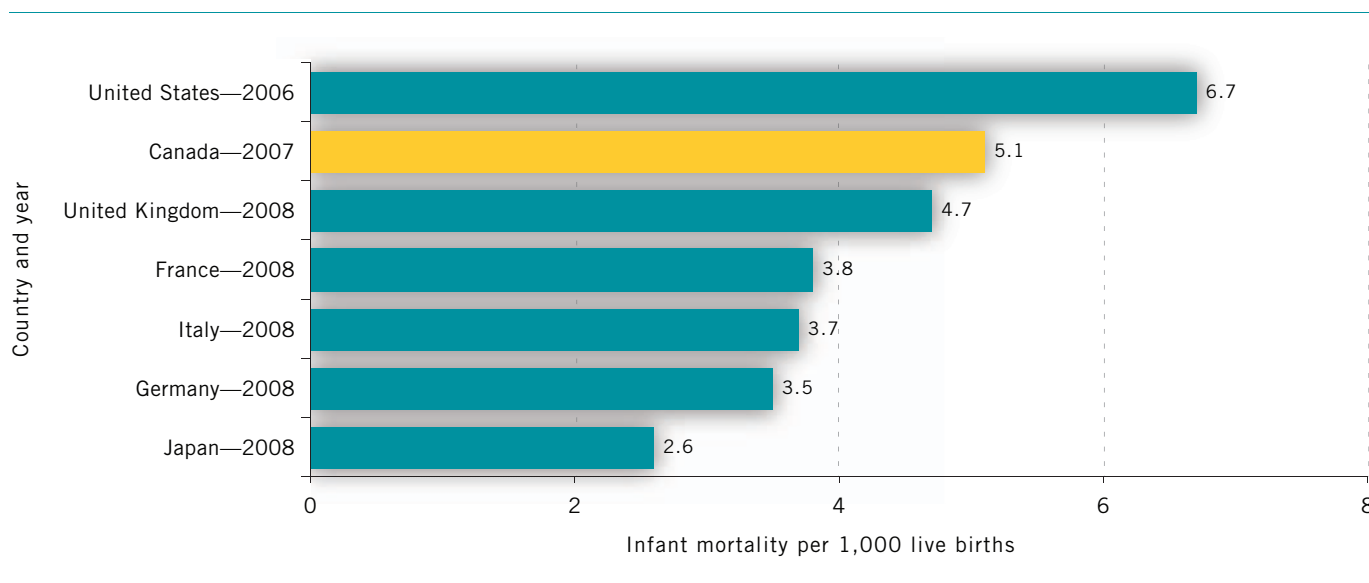
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010*.

Notes: Data are for selected years.
Data are not comparable to Canadian trend data for the indicator *Infant mortality* because OECD data are for all live births, while the Canadian indicator is for births with weights greater than or equal to 500 g.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

It is well known that infant mortality is an important indicator of a nation's health status and well-being.[330, 331, 332] Over the last century, infant mortality has decreased substantially in almost all countries as a result of improvements in sanitation, nutrition, infant feeding, and maternal and child health care.[329]

In Canada, immaturity due to preterm birth is the leading cause of infant mortality, accounting for 31.9% of all infant deaths in 2004.[333] Many factors are associated with the risk of preterm birth, including (but not limited to): smoking, maternal overweight and obesity,[334] stress, medical treatments, environmental exposures, biological factors and genetics,[335] and infertility treatments.[336, 337] The rate of preterm birth has been increasing in Canada, and this may be due to increases in obstetric interventions (for example, medically indicated labour induction and/or caesarean delivery), multiple births, older maternal age, and increases in the use of ultrasound-based estimates of gestational age.[329]

To help decrease the risk of infant death, several approaches have been studied and are recommended, including: identifying the risk level of a pregnancy and assessing fetal health such as monitoring fetal movements and heart rates in all high-risk pregnancies where heart disease, diabetes, smoking, alcohol, drug abuse or inadequate nutrition is present;[338] ensuring adequate nutrition[339] and maternal social supports;[340] and providing adequate prenatal care (whether to individuals or groups).[341, 342, 343]

Benefits of a healthy pregnancy

- Reduced risk of preterm birth
- Improved fetal growth
- Reduced risk of infant death
- Healthy baby
- Improved health later in life

Risks factors for pregnancy complications

- Smoking, alcohol and drug use
- Maternal health problems
- Inadequate prenatal care

What you can do to improve your baby's health and to reduce the risk of infant death

- Prior to and during pregnancy:
    - Plan your pregnancy and start your prenatal care early
    - Lead a healthy lifestyle (e.g., eat a healthy diet including folic acid and other vitamins, engage in physical activity, manage stress)
    - Strive for a healthy weight gain (http://www.hc-sc.gc.ca/fn-an/nutrition/prenatal/qa-gest-gros-qr-eng.php)
    - Avoid engaging in risky health behaviours (e.g., smoking, drinking, illicit drug use)
- Speak to your primary health care provider about:
    - vitamin supplementation prior to and during pregnancy (e.g., folic acid)
    - how to reduce the risk of multiple births if you are seeking fertility treatment
    - prenatal care
    - how you can recognize the signs of preterm labour and what to do if it happens to you
    - what you can do to reduce the risk of Sudden Infant Death Syndrome (SIDS) (http://www.phac-aspc.gc.ca/dca-dea/prenatal/sids-eng.php)
- Learn about the various programs available in your community to support and improve maternal and fetal health (http://www.phac-aspc.gc.ca/hp-gs/prov-eng.php)

51. LOW BIRTH WEIGHT

Key Messages

- Low birth weight reflects the general health of newborns since weight is a key determinant of infant survival, health and development
- It can result from being born too early and/or inadequate fetal growth, which are associated with increased infant morbidity and mortality
- A greater proportion of females are born with low birth weight, compared to males
- A higher proportion of low birth weight is observed in Inuit regions

What does this indicator measure?

This indicator measures the proportion of live births (where birth weight is known) with a birth weight of at least 500 grams to less than 2,500 grams.

Mortality data specific to Inuit are not consistently collected in administrative databases across the country. However, a method has been developed which allows the use of geographic identifiers to inform the health of Inuit in Canada. Certain communities in northern Canada have a high proportion of Inuit residents. These communities can be organized into four Inuit Regions (Inuvialuit region, Nunavut, Nunavik and Nunatsiavut). Health indicators for residents of these regions can serve as a proxy for Inuit-specific health indicators. It should be noted that because these data also include non-Inuit residents of these regions, who tend to have better health outcomes than the Inuit population living in the same area, caution should be used when interpreting these results. While this information is not Inuit-specific, it can be used to infer the health of Inuit in Canada.

> This indicator includes babies weighing at least 500 g to less than 2,500 g.

What are the limitations of this indicator?

Low birth weight is an indicator of the general health of newborns, and is a key determinant of infant survival, health and development. Low birth weight can result from being born too early (preterm birth) and/or inadequate fetal growth (small-for-gestational age), both of which are associated with increased infant morbidity and mortality. As preterm births and small-for-gestational age births have differing causes and trends, it is important to examine these two components of low birth weight rate separately to better understand and monitor perinatal health in Canada.

Inaccuracies in the rate of preterm birth may occur due to errors in the reporting of gestational age, particularly when it is based on menstrual dates. However, errors have diminished in recent decades because ultrasound, which can more accurately confirm gestational age, has become widely used in Canada. In addition, variations in the ethnic composition of the population may play a role in birth weight because some ethnic groups tend to have babies of lower weight even though these infants are otherwise healthy.[344]

More females than males are born with low birth weight

In 2007, the proportion of live births weighing at least 500 grams but less than 2,500 grams was 5.9%. The low birth weight rates for females and males were 6.3% and 5.5%, respectively.

Figure 68 Low Birth Weight

Proportion of live births with a birth weight of at least 500 g but less than 2,500 g, by sex, Canada, 2000-07
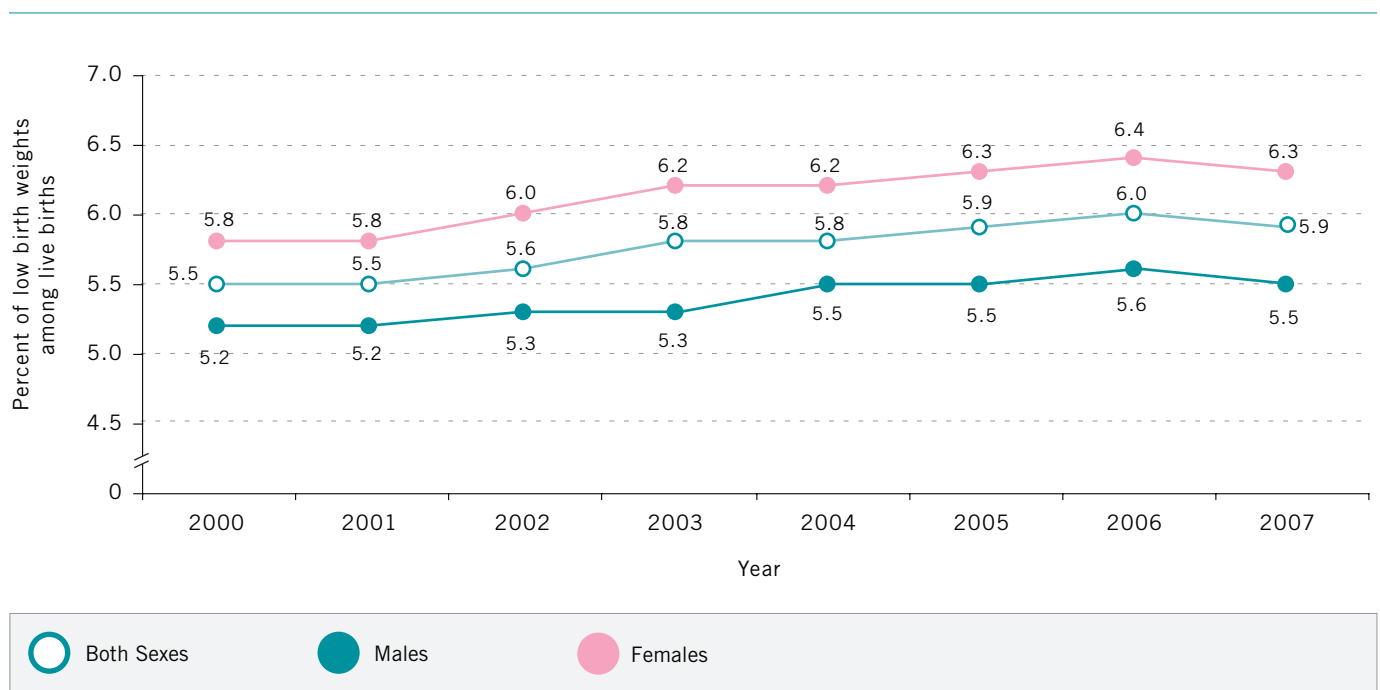
Sources: Statistics Canada. Vital Statistics — Birth and Death Databases.
Institut de la Statistique du Québec.

Notes: Over time, there has been increased registration of live births with birth weight less than 500 grams. To improve comparability of this indicator over an extended time period, low birth weight birth rates are calculated excluding live births with birth weight under 500 grams.
Infants born outside the province/territory of residence of their mothers are included in the rates for the mother's province/territory of residence.
For additional exclusions/limitations, see Annex 2.

Higher proportion of low birth weight in Inuit regions

In 1999-2003, the proportion of low birth weight weighing at least 500 grams but less than 2,500 grams in Inuit regions was 7.0%, higher than the 5.6% for Canadians overall. The proportion of low birth weight for male and female residents of Inuit regions were 6.9 and 7.1%, respectively, higher than for overall male (5.2%) and female (5.9%) Canadians.

Figure 69 Low Birth Weight

By sex, five-year average, Canada and Inuit regions, 1999-2003
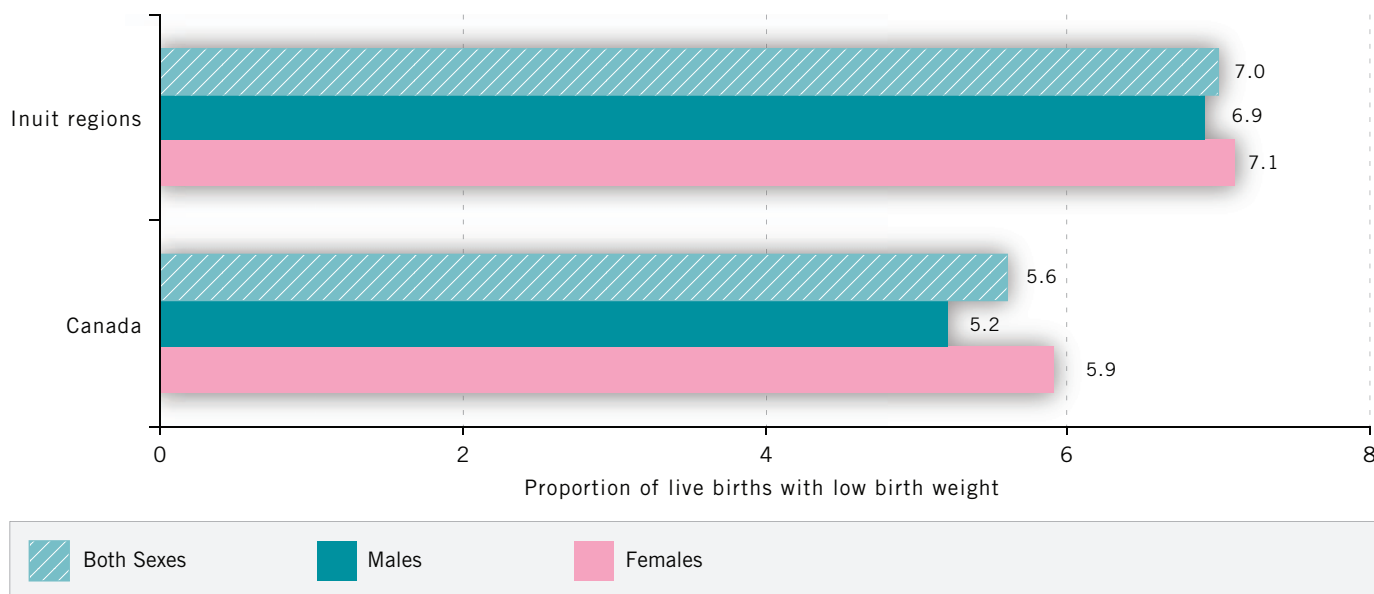
Source: Statistics Canada. Vital Statistics — Birth Database.

Notes: Counts and rates on this graph are based on the summation of five consecutive years of data.
The geographic distribution of live births in this graph is based on the mother's usual place of residence.
Numbers and rates for Canada include births for Inuit Nunangat.
Inuit Nunangat is comprised of four regions created through the signing of land claims agreements and from west to east includes the Inuvialuit Region in the Northwest Territories, Nunavut, Nunavik north of the 55th parallel in Québec and Nunatsiavut in northern Labrador (Inuit Tapiriit Kanatami, 2008).
Low birth weight rates are adjusted to show only the rate of viable low birth weights. In this table they are calculated as follows: (subtract the number of live births with a birth weight of less than 500 grams from the standard low birth weight birth counts in the same year) and divide by (live birth counts for the same year with a known birth weight greater than 499 grams).

Reference years for the Organisation for Economic Co-operation and Development (OECD) data vary according to the country. Moreover, international variations exist in the registration of stillbirths and live births. Therefore, interpretation of international comparisons of infant low birth weight should be done with caution. OECD data include all live births weighing less than 2,500 grams, while data in the previous graph on low birth weight in Canada include only live births weighing between 500 grams and 2,499 grams.

Internationally, Canada had the lowest rate of low birth weight births of the G7 countries, with only 6.0% of live births weighing less than 2,500 grams.

Figure 70 Low Birth Weight

Percentage of live births weighing less than 2,500 g, both sexes, selected countries and years
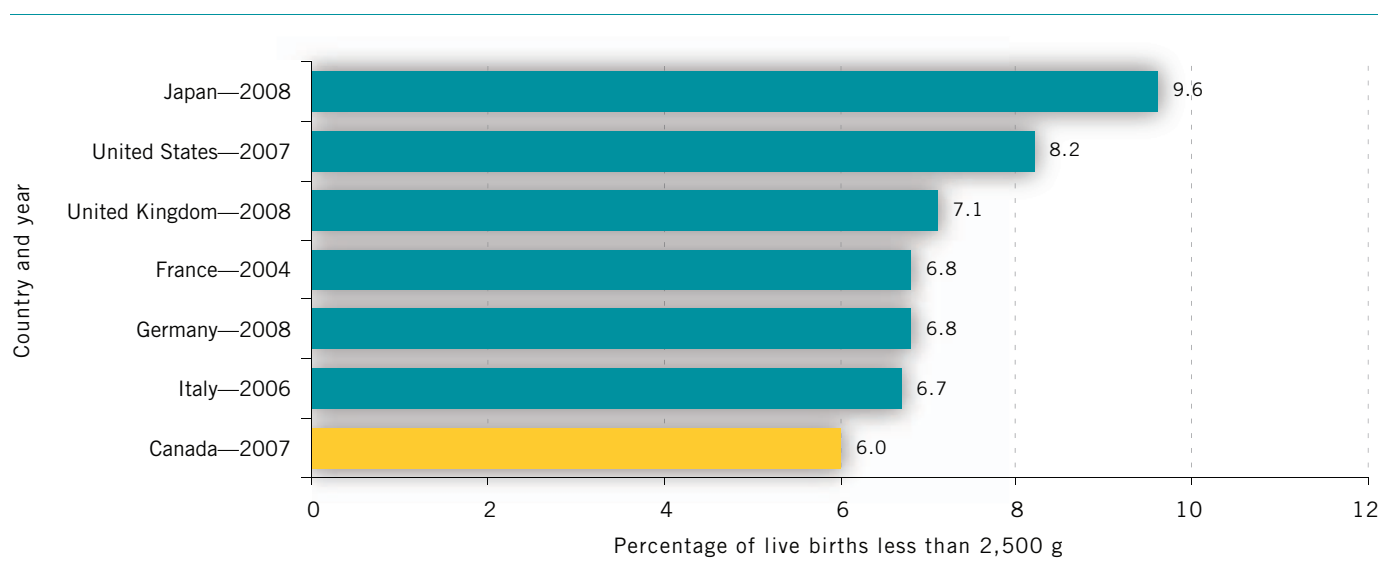
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010.*

Notes: Data are for selected years.
Data are not comparable to Canadian trend data for the indicator *Low birth weight* because OECD data are for births weighing less than 2,500 g, while the Canadian indicator is for births with weights greater than or equal to 500 g but less than 2,500 g.
For additional exclusions/limitations, see Annex 2.

What these results mean for you

Low birth weight, including preterm birth and small-for-gestational age, is associated with a number of factors such as poor maternal health and lifestyle (e.g., smoking[345] and poor diet[346]), low pre-pregnancy body mass index (BMI),[347, 348] multiple gestation (e.g., twins, triplets),[349] maternal age,[350] short inter-pregnancy intervals,[351, 352] previous preterm deliveries[353] and economic circumstances.[354] The causes and trends of preterm births and small-for-gestational age births differ and so these two components of low birth weight should be examined separately to better understand and monitor perinatal health.

Low birth weight is associated with many health risks, including the development of type 2 diabetes,[355] cognitive and learning difficulties,[356] obesity,[357] ischemic heart disease[358] and hypertension.[359]

Benefits of a healthy birth weight

Relative to low birth weight babies, babies born at healthy weights are more likely to:

- Be healthier in their first year of life
- Have fewer health problems as they age
- Have fewer learning problems
- Achieve developmental milestones with fewer difficulties

Risks associated with a low birth weight

- Risk of more health problems during the first year of life
- Risk of chronic health problems later in life
- Potential physical and cognitive disabilities and difficulty in achieving developmental milestones
- Infant death

What you can do to improve your baby's preterm health and to reduce the risk of a preterm birth or a baby that is small for its gestational age

- Prior to and during pregnancy:
  - Plan your pregnancy and start your prenatal care early
  - Lead a healthy lifestyle (e.g., eat a healthy diet including folic acid and other vitamins, engage in physical activity, manage stress)
  - Strive for a healthy weight gain (http://www.hc-sc.gc.ca/fn-an/nutrition/prenatal/qa-gest-gros-qr-eng.php)
  - Avoid engaging in risky health behaviours (e.g., smoking, drinking, illicit drug use)
- Speak to your primary health care provider about:
  - how you can recognize the signs of preterm labour and what to do if it happens to you
  - vitamin supplementation prior to and during pregnancy (e.g., folic acid)
  - how to reduce the risk of multiple births if you are seeking fertility treatment
  - prenatal care
- Learn about the various programs available in your community to support and improve maternal and fetal health (http://www.phac-aspc.gc.ca/hp-gs/prov-eng.php)

52. SELF-REPORTED IMMUNIZATION FOR INFLUENZA, AGED 65 PLUS ("FLU SHOT")

Key Messages

- Influenza (or flu) is a common respiratory illness that affects millions of Canadians every year
- Seniors are at greater risk for more severe and longer-lasting complications
- Immunization is one of the most effective ways to protect against influenza
- Two thirds of Canadians aged 65 years and older received the flu shot in the 12 months prior to being surveyed

What does this indicator measure?

This indicator measures the percentage of the adult population aged 65 years and older who reported that they had received a flu shot in the 12 months prior to being surveyed.

Why get a flu shot?
After you get a flu shot, your immune system produces antibodies against the strains of virus in the vaccine. When you are exposed to the flu virus, these antibodies will help to prevent infection or to reduce the severity of the illness.

What are the limitations of this indicator?

This indicator is based on the respondents' self-report and is influenced by their capacity to remember. Self-reported data are never as accurate as they would be if they came from an actual clinical database.[32]

Two thirds of Canadians aged 65 years and older received Influenza immunization

In 2009, 66.5% of seniors aged 65 years and older reported having received a flu shot in the 12 months prior to being surveyed. In 2009, the rates were 67.2% and 66.0% for males and females, respectively.

Among G7 countries, immunization among seniors appears to be higher in the United Kingdom, France and the United States than in Canada. In 2008, Canada had the fourth highest percentage (66.6%) of seniors aged 65 years and older who reported having been immunized against influenza in the 12 months prior to being surveyed.

Figure 71 Self-Reported Influenza Immunization

Percentage of population aged 65 years and older who reported being immunized less than one year ago, by sex, Canada, 2003-09

Source: Statistics Canada. Canadian Community Health Survey, 2003-09.

Notes: Includes household population aged 65 years and older reporting when they had their last influenza immunization ("Flu Shot").
Data are not comparable to those presented in previous *Healthy Canadians* because data in *Healthy Canadians 2010* were not age-standardized.
For additional exclusions/limitations, see Annex 2.

Figure 72 Influenza Immunization

Percentage of population aged 65 years and older having been immunized during the past 12 months, both sexes, selected countries and years
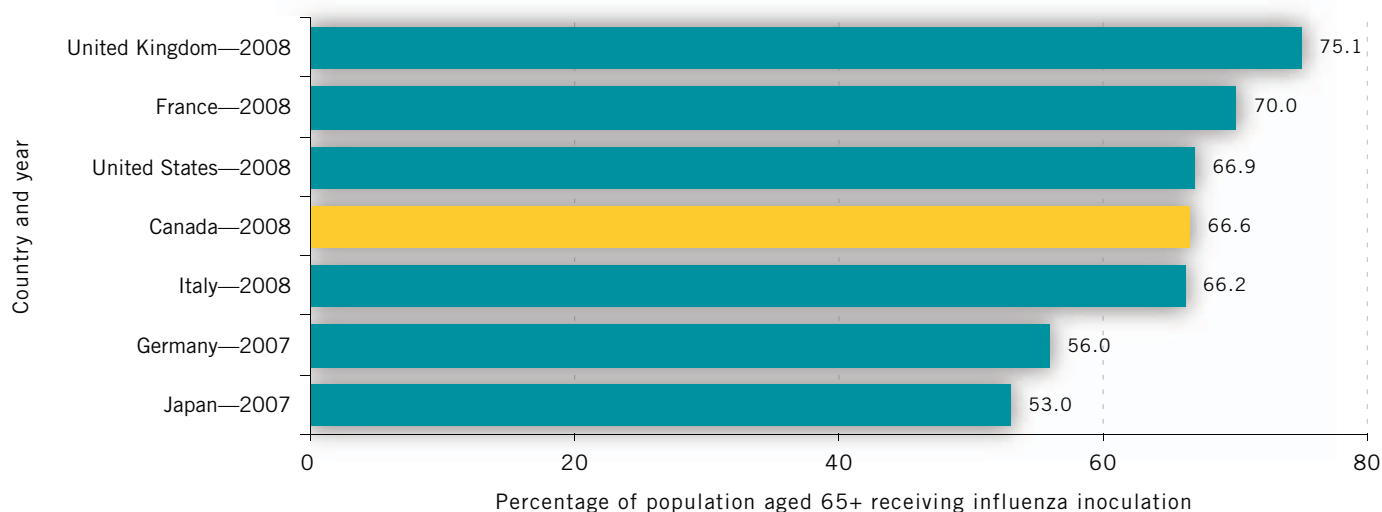
Source: Organisation for Economic Co-operation and Development. *OECD Health Data 2010.*

Note: For additional exclusions/limitations, see Annex 2.

What these results mean for you

Influenza (or flu) is a common respiratory illness that affects millions of Canadians every year. In Canada, an estimated 10-25% of Canadians could have the flu each year.[360] Although most people recover within a week, the value of time lost at work, at school, and in household production due to influenza-related illness can be considerable.[361] While it may be associated to health risks for some,[362, 363] immunization is one of the most effective ways to protect against influenza.

The groups at higher risk of severe disease or complications following influenza infection include: very young children, people over 65 years old, pregnant women, people with underlying medical conditions such as chronic respiratory disease, heart or kidney disease, diabetes or a weakened immune system due to cancer, HIV infection, or some other cause.[360] Although most recover completely, an estimated 4,000 to 8,000 Canadians—mostly seniors—die every year from pneumonia related to flu.

Seniors have the highest rate of hospitalization and death from the flu.[364] Common complications of the flu for seniors include bacterial infection and pneumonia. Getting the flu shot helps to reduce the risk of serious complications and life-threatening illness.[365] Research shows that the flu vaccine may be less effective in preventing infection in seniors, although still reducing the risk of severe illness.[366, 367] This means that it is important for all members of the family, health professionals and caregivers to get the flu shot to better protect seniors.[365]

Benefits of getting influenza immunization

- Improve your chances of having a flu-free winter
- Avoid transmitting the virus to others
- Reduce the severity of your symptoms if you do get sick
- Reduce activity limitations due to influenza symptoms

Health risks associated with influenza immunization

- Soreness where the shot was given (common, 50 or more cases per 100 people)[368]
- Redness or swelling where the shot was given (common, 10 to 49 cases per 100 people)[368]
- Aches and fever within six to 12 hours after receiving the shot (common, > 1 case per 100 people)[368]
- Mild ocular and respiratory symptoms (infrequent, 1 to 9 cases per 1,000 people)[368]
- Guillain-Barré syndrome (very rare, 1 case per 1,000,000 people)[360]
- Severe allergic reactions (very rare, < 1 case per 100,000 people)[369]
- Death (very rare, undefined)[370]

Things you can do to minimize the spread of the influenza virus

- Get an annual flu shot
- Keep your immune system strong - eat well, stay active, sleep well
- Wash your hands frequently
- Cover up when you cough or sneeze
- Keep shared surface areas clean
- If you get sick, stay home!
- Talk to a health professional if you experience severe flu-like symptoms
- For more helpful tips on preventing and managing influenza symptoms, please visit the Public Health Agency of Canada's website on influenza (http://www.phac-aspc.gc.ca/influenza/index-eng.php)

IV Health Information—Challenges and Next Steps

In any modern health care system, health information is essential to help stakeholders monitor changes in health system performance and health status. Timely, coordinated and responsive health information facilitates decision-making that ultimately benefits Canadians by improving their health and quality of life.

The federal government has invested significant resources to improve data collection, allowing the health sector to better respond to the needs of Canadians. Federal investments have helped develop CIHI's Health Human Resources Database Development Project, along with Statistics Canada's Canadian Community Health Survey and Canadian Health Measures Survey. In addition, the Government of Canada is investing $500 million in the continued development of Canada's electronic health record system. Other benefits of these investments include the improvement of data quality, national data standards, and the use of data to foster greater accountability to Canadians.

While investments and progress have been made, gaps in data infrastructure and availability remain. Specifically, data infrastructure varies across the country, affecting the capacity of provinces and territories to collect, analyze and publish data. The Government of Canada continues to work with its partners in order to make improvements to these data systems.

Aboriginal data currently lag behind data on the general Canadian population, and this may impede the federal government's ability to adequately understand and respond to Aboriginal health issues. Challenges exist in the collection and reporting of health information on Aboriginal peoples. As is also true for other groups within Canada, it is difficult to extract health data regarding Aboriginal peoples (or specifically on First Nations, Inuit or Métis) from administrative databases. For Aboriginal health reporting, this challenge is further complicated by overlapping jurisdictional responsibilities for health between federal, provincial/territorial and local governments. Data on First Nations and Inuit peoples are included in many provincial and territorial databases (e.g., vital statistics, notifiable diseases and hospital discharges), but there is no mechanism to identify Aboriginal individuals.

Without a mechanism to consistently identify and access First Nations and Inuit data collected in vital statistics databases, *Healthy Canadians 2010* relies on work that links the Census Aboriginal identifier with the Canadian Mortality Database to produce mortality statistics. Tjepkema, Wilkins, Senécal, Guimond and Penney (2009) used a two-part linkage to produce age-standardized mortality statistics for Registered Indians for a number of diseases cited in this publication. For Inuit, a method has been developed linking geographic identifiers to vital statistics databases to generate data for health indicators. Certain communities in northern Canada have a high proportion of Inuit residents. These communities are organized into four Inuit Regions. Health indicators for residents of these regions serve as a proxy for Inuit-specific health indicators. It should be noted that these data also include non-Inuit residents of these regions, who are thought to have better health outcomes than the Inuit population living in this area. As such, caution should be used when interpreting these results.

Statistics Canada collects Aboriginal-specific health information through the Aboriginal Peoples Survey (APS). The 2006 off-reserve APS was used to report on smoking rates and perceived health for Inuit in this publication. However, the 2006 on-reserve component of the APS was not undertaken so it does not provide data for First Nations communities.

Along with the research cited in this publication, the First Nations and Inuit Health Branch (FNIHB) has contributed over $11.7 million toward the development of the 2002–03 First Nations Regional Longitudinal Health Survey (RHS) and continues to support it, committing $12.5 million to infrastructure, data collection and dissemination for the 2007–08 wave of the survey through 2011.

Plans for the future

Statistics Canada and CIHI will continue to develop and improve their Health Indicator Framework, which is a valuable instrument for measuring and reporting on health status and health system performance. In addition, the federal government will continue to analyze and interpret indicator data, with the goal of providing practical information to Canadians on health system performance and health status.

Annexes

Annex 1: Supplement to Selected Federal Health Services

Health Canada—Helps ensure that Canada's food supply is safe. Although maintaining safety is a shared responsibility among government, industry and consumers, Health Canada's role is to establish policies, set standards and provide advice along with information on the safety and nutritional value of food. It promotes the nutritional health and well-being of Canadians by collaboratively defining, promoting and implementing evidence-based nutrition policies and standards. It administers the provisions of the *Food and Drugs Act* that relate to public health, safety and nutrition, and evaluates the safety, quality and effectiveness of veterinary drugs.

Health Canada plays an active role in ensuring that Canadians have access to safe and effective drugs and health products. Before drug products (such as prescription and non-prescription pharmaceuticals, disinfectants and sanitizers with disinfectant claims) are authorized for sale in Canada, Health Canada reviews them to assess their safety, efficacy and quality. The Department strives to maintain a balance between the potential health benefits and risks posed by all drugs and health products, and its highest priority in determining this balance is public safety. To accomplish this, it works with other levels of government, health care professionals, patient and consumer interest groups, and research communities and manufacturers. These efforts help minimize the health risks to Canadians.

Health Canada helps protect the Canadian public by researching, assessing and collaborating in the management of health risks and safety hazards associated with the many consumer products, including pest management products, that Canadians use everyday. Health Canada is also actively involved in injury prevention by supporting the development of safety standards and guidelines, enforcing legislation by conducting investigations, inspections, seizures and prosecutions, along with testing and conducting research on consumer products. In addition, it provides importers, manufacturers and distributors with hazard and technical information, publishes product advisories, warnings and recalls, and promotes safety as well as the responsible use of products.

The Department works to protect the health of Canadians from environmental risks, by offering information and advice on some of the most common environmental factors that affect human health: air, noise, soil and water pollution, climate change, environmental contaminants, occupational health and safety, pest control, and radiation. Furthermore, it promotes initiatives to reduce and prevent the harm caused by tobacco and the abuse of alcohol and/or other controlled substances.

Furthermore, the department consults with the Canadian public, industry and other interested parties in the development of laws that protect health and safety (such as the previously mentioned *Food and Drugs Act*). It also prepares guidelines and policies in order to help interpret and clarify the legislation surrounding drugs and health products. Health Canada develops and enforces numerous regulations (such as *Food and Drugs Regulations* or *Medical Devices Regulations*) under Government of Canada legislation.

Improving the health of Aboriginal people is a shared responsibility among the federal, provincial, and territorial governments and Aboriginal partners. Health Canada delivers or funds a range of health programs and services to First Nations and Inuit to supplement and support the services that provincial, territorial, and regional health authorities provide. Primary health care services are provided through nursing stations and community health centres in remote and isolated First Nations communities, and home and community care is provided in First Nations and Inuit communities. Disease prevention and health promotion programs, public health, environmental health, and alcohol/drug addiction treatment are also provided on-reserve. In addition, Health Canada administers targeted health promotion programs for all Aboriginal people regardless of residence (such as the Aboriginal Diabetes Initiative), and other programs that support the development

and implementation of activities to promote healthy lifestyle choices and contribute to the prevention of chronic disease and injuries. The Department's Non-Insured Health Benefits (NIHB) Program provides approximately 830,000 eligible First Nations and Inuit with a limited range of medically necessary health-related goods and services. The NIHB Program provides benefits that are not otherwise insured by private insurance plans, provincial/territorial health or social programs, or private insurance plans, such as coverage for prescription medication, dental care, vision care, and medical transportation. In 2010-11, resources of approximately $2.2 billion were made available for federal First Nations and Inuit Health Programs.

Visit Health Canada's website for more information on their programs and services. (http://www.hc-sc.gc.ca/)

Public Health Agency of Canada—Focuses on understanding the factors that underlie our collective health, preventing injuries, infectious and chronic disease, and effectively preparing for and responding to public health emergencies and infectious disease outbreaks.

Working with partners at the local, regional, national and international levels, the Agency's primary role is to lead federal efforts and mobilize pan-Canadian action in preventing disease and injury, and promoting and protecting national and international public health by:

- anticipating, preparing for, responding to and recovering from threats to public health
- carrying out surveillance, monitoring, researching, investigating and reporting on diseases, injuries, other preventable health risks and their determinants, as well as the general state of public health in Canada and in the international community
- using the best available evidence and tools to advise and support public health stakeholders nationally and internationally as they work to enhance the health of their communities
- providing public health information, advice and leadership to Canadians and stakeholders
- building and sustaining a public health network with stakeholders

The Public Health Agency of Canada manages numerous centres, including the Centre for Chronic Disease Prevention and Control, the Centre for Communicable Diseases and Infection Control, and the Centre for Emergency Preparedness and Response.

The work of the Agency's numerous program centres, laboratories and directorates contribute to the Agency's vision: "healthy Canadians and communities in a healthier world."

The **Infectious Disease Prevention & Control Branch** works to prevent, eliminate and control infectious diseases, and to maintain the safety and health security of people both nationally and internationally.

The Branch is composed of three program centres, two laboratories, and a corporate directorate:

- the **Centre for Food-Borne, Environmental & Zoonoses** aims to assess and reduce the risk of food-borne, water-borne, environmental and zoonotic disease in Canada
- the **Centre for Immunization and Respiratory Diseases** has four key objectives: prevent, reduce or eliminate vaccine-preventable and infectious respiratory diseases; reduce the negative impact of emerging and re-emerging respiratory infections; facilitate pandemic preparedness and response activities; and maintain confidence in immunization programs in Canada
- the **Centre for Communicable Disease & Infection Control** aims to decrease the incidence and transmission of communicable diseases and infections; and improve the health status of those already infected

- the **National Microbiology Laboratory** contributes to infectious disease control at the provincial/territorial, national and international levels. The lab combines four public health service laboratory programs; undertakes research on established, emerging and rare pathogens; and provides internationally recognized leadership, scientific excellence and public health innovation
- the **Laboratory for Food-Borne Zoonoses** focuses on the early mitigation of public health risks for infectious and chronic diseases and illnesses arising from the interaction between humans, animals, and the environment
- the **Policy Integration Planning, Reporting and International Directorate** provides support and direction to the entire Infectious Disease Prevention & Control Branch, including responsibility for the Travel and Migration Health Program for the Agency

The **Health Promotion and Chronic Disease Prevention (HPCD) Branch** of the Agency provides leadership in health promotion and undertakes programs designed to help Canadians stay healthy through all stages of life, to reduce their risks for developing chronic illnesses, and to prevent disease progression for those living with chronic diseases.

HPCD undertakes health promotional activities to support:

- better health for Canadians
- reduced health inequalities between Canadians
- increased knowledge to help people increase control over their health and the factors that determine health
- public policy that considers public health
- effective public health interventions
- supportive environments that promote and encourage good health

Additionally, this branch works with stakeholders at national and international levels and provides accurate information to help understand how chronic diseases can be prevented and treated for use in the development of health policies and programs aimed to prevent and manage chronic diseases in Canada.

The **Centre for Emergency Preparedness and Response** aims to maintain the safety and national health security of Canadians through emergency preparedness and response, and through protection from all hazards, including natural and human-caused disasters.

To achieve these goals, the Centre undertakes several key activities:

- provides national leadership and coordination for public health emergencies, in collaboration with other federal departments and agencies, and with provinces, territories and municipal officials
- provides support and coordination, through the Government of Canada's Health Portfolio Operations Centre, for preparing for and responding to national and international health events
- initiates and participates in emergency management exercises, within Canada and internationally
- administers legislation governing laboratory safety and security, travel health and quarantine, and implements in Canada the International Health Regulations of the World Health Organization

The **Office of Public Health Practice (OPHP)** aims to strengthen the practice of public health in Canada by increasing workforce capacity and improving information, knowledge and tools through leadership, innovation and concerted action.

OPHP focuses on:

- increased workforce capacity internationally, across Canada and internally through training, placements and mobilization of staff
- improved tools, systems and networks for more effective exchange of information and knowledge
- development of information and knowledge products to improve competencies in public health (e.g., ethical decision making, surveillance methods)
- development of synthesized information on the state of public health in Canada (e.g., CPHO reports, population health assessment, economic analyses)

Visit the Public Health Agency of Canada's website for more information on their programs and services. (http://www.phac-aspc.gc.ca/)

Canadian Institutes of Health Research (CIHR)—Responsible for funding health research in Canada by:

- funding more research on targeted priority areas
- building research capacity in under-developed areas such as population health and health services research
- training the next generation of health researchers
- focusing on knowledge translation, so that the results of research are transformed into policies, practices, procedures, products and services

CIHR consists of 13 "virtual" institutes (Aboriginal Peoples' Health; Aging; Cancer Research; Circulatory and Respiratory Health; Gender and Health; Genetics; Health Services and Policy Research; Human Development, Child and Youth Health; Infection and Immunity; Musculoskeletal Health and Arthritis; Neurosciences, Mental Health and Addiction; Nutrition, Metabolism and Diabetes; Population and Public Health). These bring together all partners in the research process—the people who fund research, those who carry it out and those who use its results—to share ideas and focus on what Canadians need—good health and the means to prevent disease and fight it when it happens. Each institute supports a broad spectrum of research in its topic areas and, in consultation with its stakeholders, sets priorities for research in those areas.

CIHR supports nearly 13,000 researchers and trainees in universities, teaching hospitals and other health organizations and research centres in Canada.

Visit the Canadian Institutes of Health Research for more information on research. (http://www.cihr-irsc.gc.ca/e/9466.html)

Department of National Defence—Provides health care for approximately 100,000 Canadian Forces members (Regular Forces and full-time Reservists) while they are at home or abroad in order to optimize their health and support Canadian Forces operations. A comprehensive range of clinical services is available to individuals through a network of Canadian Forces health care clinics or by purchasing services from the provinces/territories. Public health and health promotion programs are offered at a population-level primarily through Force Health Protection, Canadian Forces Health Services Group. Total health care expenditures were estimated to be $680 million in 2009-10.

Royal Canadian Mounted Police (RCMP)—Provides a comprehensive range of health care entitlements and benefits to ensure that its members are medically and emotionally fit to perform their duties. Health care entitlements comprise three categories of health care: *Basic*, *Supplemental* and *Occupational*. Due to the RCMP's national scope and for the sake of consistency in offering appropriate care, Basic health care entitlements are derived from a combination of five public provincial plans (the *Canada Health Act* excludes RCMP regular members from funding under provincial health care plans). Supplemental health care, which is similar to a standard employer/employee health benefit insurance plan, provides at no cost to regular members benefits such as drugs, aids to daily living, ambulance services, hospitalization fees, medical supplies, and therapies. As of November 1, 2009, the number of RCMP (regular members and special constables) covered under RCMP Basic and Supplemental health care was 19,192. Additionally, RCMP regular and civilian (3,649) members may receive Occupational health care benefits/services arising from a workplace injury or illness. Total health care expenditures were approximately $77.6 million in 2008-09.

Citizenship and Immigration Canada—Provides, through the Interim Federal Health Program, coverage for essential health/dental care, medical screening for immigration purposes, and pre-departure screening and treatment for persons for whom the immigration authorities are responsible (e.g., asylum seekers, refugees and persons detained for immigration purposes). This represents approximately 115,000 clients. The coverage extends from pre-departure or arrival in Canada until the client qualifies for provincial health programs or is removed from Canada. Total health expenditures were approximately $65 million in 2008-09.

Veterans Affairs Canada—Provides health care to war and Canadian Forces veterans who meet service and income requirements, or who have been awarded disability pensions or disability awards resulting from military service. The department provides a comprehensive range of health care benefits not provided provincially, including institutional care for eligible clients in community care facilities. In 2008-09, 132,700 clients were eligible for health care benefits, resulting in expenditures of $912 million.

Correctional Service of Canada—Provides inmates with essential health care services (medical, dental and mental health) as well as reasonable access to non-essential mental health care that will contribute to their rehabilitation and successful reintegration into the community. Health services are provided in 57 federal institutions, which include regional hospitals and mental health treatment centres. Community specialists and diagnostic and hospital services are used as required. Health services were available to approximately 20,475 offenders in 2009-10, resulting in expenditures of $196 million. This figure includes all health care costs such as salaries, medication, hospitalization, medical tests/examinations, and physician, specialist and dental appointments.

Annex 2: Data Source Exclusions and Limitations

The indicators featured in *Healthy Canadians—A Federal Report on Comparable Health Indicators 2010* are derived from databases, surveys and surveillance data. The data sources used for each indicator, as well as exclusions and limitations, are presented below. This will help the reader assess the reliability and validity of the information presented in this report.

Strengths and Limitations of Self-Reported Data

Healthy Canadians—A Federal Report on Comparable Health Indicators 2010 often refers to information that is derived from self-reported data. Self-reported data can be used to provide information on various health-related issues, although they are subject to some known limitations. In a systematic review evaluating the accuracy of self-reported utilization data, researchers showed that self-reported information may be influenced by factors such as a respondent's socio-demographic characteristics, cognitive ability or memory, stigma related to health care utilization, questionnaire design and/or the mode of data collection (e.g., whether respondents were interviewed by phone or in person).[32] In a report on adult obesity in Canada, Statistics Canada noted that variations in the methods used to collect information on weight and height yield different data. For example, self-reported measures of weight and height generate lower overweight and obesity rates than do direct physical measurements.[290]

In *Healthy Canadians 2010*, some indicators that rely on self-reported information may be subject to the limitations of the method of data collection (i.e., interviews conducted by phone or in person). These indicators include *body mass index* and *physical activity*.

Additionally, non-response bias may occur when using self-reported data. If some individuals within a sample have different characteristics and are less likely to answer a survey or a particular survey question, a bias may emerge in the overall responses. For the indicator *Body mass index*, a noticeable change was observed in the pattern of non-responses which may obfuscate actual trends in BMI. However, in *Healthy Canadians 2010*, survey response rates overall are very good, reducing the likelihood of non-response bias and the potential impact of non-responders.

Statistics Canada

Canadian Community Health Survey (CCHS)

Exclusions/Limitations: Persons living on First Nation reserves and on Crown lands, residents of institutions, full-time members of the Canadian Forces and residents of certain remote regions. CCHS coverage is in the range of 98% in the provinces, while in the Territories, it is about 90% in Yukon, 97% in the Northwest Territories and 71% in Nunavut, primarily due to the fact that some remote regions are excluded. In Nunavut, the CCHS collects information in the 10 largest communities: Iqaluit, Rankin Inlet, Cambridge Bay, Kugluktuk are always in the sample, plus one community from Cape Dorset, Pangnirtung, Igloolik or Pond Inlet is selected; as well as the community from Baker Lake or Arviat.

Details about the Canadian Community Health Survey. (http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3226&lang=en&db=imdb&adm=8&dis=2)

Canadian Health Measures Survey

Exclusions/Limitations: Persons living on Indian Reserves or Crown lands, residents of institutions, full-time members of the Canadian Forces and residents of certain remote regions.

Details about the Canadian Health Measures Survey. (http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=5071&lang=en&db=imdb&adm=8&dis=2)

Survey of Household Spending

Exclusions/Limitations: Persons living on Indian reserves and on Crown lands; official representatives of foreign countries living in Canada and their families; members of religious and other communal colonies; members of the Canadian Forces living in military camps; people living in residences for senior citizens; and people living full-time in institutions (e.g., inmates of penal institutions and chronic care patients living in hospitals and nursing homes).

Details about the Survey of Household Spending. (http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3508&lang=en&db=imdb&adm=8&dis=2)

Aboriginal Peoples Survey

Exclusions/Limitations: Persons living in Indian settlements or on-reserves; and people living in institutions. Although individuals living on-reserve were not included in the provinces, all Aboriginal people living in the territories were included.

Details about the Aboriginal Peoples Survey. (http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3250&lang=en&db=imdb&adm=8&dis=2)

Vital Statistics — Birth Database

Exclusions/Limitations: The actual (survey) population of the Birth Database refers to births to Canadian resident women and non-resident women in Canada, and births to Canadian resident women in some American states.

Since the registration of births is a legal requirement in each Canadian province and territory, reporting is virtually complete. Undercoverage is thought to be minimal but is being monitored. Undercoverage may occur because of late registration which, if not completed soon after birth, is needed for school registration. Statistics Canada does receive late registrations (typically 1,000 to 1,500 cases, five years after the year of the event). Incomplete registration is also a source of undercoverage. For example, some provinces require that a notarized statement be completed when a mother declines to name the father on the application for birth registration. Until the statement is notarized, the application is not registered.

Out-of-country births are incompletely reported. There is no reporting of births to Canadian resident women occurring in countries other than the United States; although there is a reciprocal agreement with the U.S., some states may not report births to Canadian resident women occurring in their state.

The Health Statistics Division continues to monitor developments in the field of assisted reproductive technology and medical technology as they relate to the reporting of extremely low birth weight and/or low gestation babies. There is some inconsistency in the practice of registering these babies even though there is a

legal requirement to do so. Statistically, this problem has resulted in alternative indicators for infant mortality being calculated, where the denominator is composed of live births weighing 500 grams or more.

Details about the Vital Statistics — Birth Database. (http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function= getSurvey&SDDS=3231&lang=en&db=imdb&adm=8&dis=2)

Vital Statistics — Death Database

Exclusions/Limitations: The actual (survey) population of the Death Database refers to deaths of Canadian residents and non-residents in Canada, and deaths of Canadian residents in some American states.

Since the registration of deaths is a legal requirement in each Canadian province and territory, reporting is virtually complete. Undercoverage is thought to be minimal but is being monitored. Undercoverage may occur because of late registration but this is much less common than with birth registration. Death registration is necessary for the legal burial or disposal of a body, as well as for settling estate matters, so there is a strong incentive for relatives or officials to complete a registration in a timely manner. Some deaths are registered by local authorities, but the paperwork is not forwarded to provincial or territorial registrars before a cut-off date. These cases for 2000 data represented approximately 200 deaths, 7 years after the year of death (accumulated late records), or less than one-tenth of a percent of the total records.

For out-of-country deaths, only deaths in the United States are regularly reported to Statistics Canada, and of these, Statistics Canada receives abstracted death records from approximately 20 American states. Data from the National Center for Health Statistics (NCHS) in the United States indicate that in 2004 there were 572 deaths of Canadian residents in the United States, compared with 259 death records received by Statistics Canada via the state registrars.

Details about the Vital Statistics — Death Database. (http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function =getSurvey&SDDS=3233&lang=en&db=imdb&adm=8&dis=2)

Canadian Cancer Registry

Exclusions/Limitations: All primary malignant tumours (except squamous cell skin cancer and basal cell skin cancer) are reported to the Canadian Cancer Registry (CCR). Each provincial and territorial cancer registry records all cases of cancer in its population by combining information from sources such as: cancer clinic files and radiotherapy reports; records from in-patient hospitals, out-patient clinics and private hospitals; pathology and other laboratory/autopsy reports; radiology and screening program reports; reports from physicians in private practice; and reports on cancer deaths from Vital Statistics registrars. Periodically, some provincial and territorial cancer registries experience problems in submitting data to Statistics Canada on a timely basis.

To avoid overcoverage, the CCR accepts tumour records only when the reporting provincial and territorial cancer registry is the same as the province or territory of residence of the cancer patient. Each provincial and territorial cancer registry is required to return records for residents of other jurisdictions to the appropriate provincial and territorial cancer registry. Undercoverage remains a stronger concern than overcoverage because of the following reasons: some provincial and territorial cancer registries do not use, or have had periods in the past where they have not used, death certificates as a source of cancer incidence; differing definitions of what is a cancer among the provincial and territorial cancer registries; differing definitions of

what constitutes a malignant neoplasm; some cancers are difficult to diagnose because of their location (or site) in the body; differences among provincial and territorial cancer registries in coding practices, data entry or processing procedures; and failure to report cancer cases treated in a province, territory or country outside of the residence province or territory.

As of 2007, the CCR adopted Surveillance Epidemiology and End Results (SEER) Multiple Primary Histology rules for determining multiple primaries. Some differences in incidence between the years 2006 and 2007 may be attributed to this change. As well, due to technical issues in updating systems to adhere to these new rules, not all registries were able to report according to the new requirements for 2007. This may result in inconsistencies between provinces and territories.

Finally, designed studies are used by the provincial and territorial cancer registries to assess the completeness of case ascertainment (check for under and over-registration of cases). Re-abstraction is used to evaluate accuracy and completeness of reported items.

Details about the Canadian Cancer Registry. (http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3207&lang=en&db=imdb&adm=8&dis=2)

Canadian Institute for Health Information (CIHI)

Hospital Morbidity Database (HMD)

Exclusions/Limitations: Visits not resulting in an inpatient admission—such as diagnostic testing, consultations and emergency visits—are excluded from the HMD population.

Details about the Hospital Morbidity Database. (http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=services_hmdb_e)

Discharge Abstract Database (DAD)

Exclusions/Limitations: Because Québec does not participate in the DAD, all discharges from Québec hospitals are not included.

As the coding of discharges has changed over time, care must be taken not to compare between time periods using different coding. Prior to 2001–02, the ICD-9 and ICD-9-CM classifications (International Classification of Diseases) were in use. The ICD-10-CA and Canadian Classification of Health Interventions (CCI) classification systems were first implemented in 2001–02 in British Columbia, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, Yukon and parts of Saskatchewan. Full implementation of ICD-10-CA and CCI (with the exception of Québec) was achieved in 2004–05 when Manitoba made the transition from ICD-9-CM. The classification scheme change since fiscal year 2001–02 resulted in a number of challenges for users wishing to trend data over time. For more information, see *Coping with the Introduction of ICD-10-CA and CCI: Impact of New Classification Systems on the Assignment of Case Mix Groups/Day Procedure Groups,* which is based on data (for fiscal years 2001–02 and 2002–03) that can be found on CIHI's website. Appendix C of that report provides the coding classifications that were used by provinces/territories. Users are strongly advised to analyze data with the correct classification scheme.

Details about the Discharge Abstract Database. (http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=services_dad_e)

Scott's Medical Database (SMDB)

Exclusions/Limitations: Residents and non-licensed physicians who requested that their information not be published in the *Canadian Medical Directory* as of December 31 of the reference year.

SMDB includes the number of general/family physicians (family medicine and emergency medicine specialists) and specialist physicians (medical, surgical and laboratory specialists) on December 31 of the reference year, per 100,000 population. The data include active physicians in clinical practice and those not working in a clinical practice. Active physicians are defined as physicians who have an MD degree, are registered with a provincial or territorial medical college and have a valid mailing address. Generally, specialist physicians include certificants of the Royal College of Physicians and Surgeons of Canada (RCPSC) and/or the Collège des médecins du Québec (CMQ) with the exception of Saskatchewan, Newfoundland and Labrador, Nova Scotia, New Brunswick and Yukon, where specialists also include physicians who are licensed as specialists but who are not certified by the RCPSC or the CMQ (that is, non-certified specialists). For all other jurisdictions, non-certified specialists are counted as general practitioners. With the exception of the criteria just noted, all other physicians are counted as family practitioners, including certificants of the College of Family Physicians of Canada. For further methodological information, please see *Supply, Distribution and Migration of Canadian Physicians* (www.cihi.ca). Physician-to-population rates are useful indicators and are published by a variety of agencies to support health human resource planning. However, due to differences in data collection, processing and reporting methodology, CIHI results may differ from provincial and territorial data. Readers are cautioned to avoid inferences regarding the adequacy of provider resources based on supply ratios alone.

Rates are produced using the most recent Statistics Canada population estimates and may differ slightly from those in previous CIHI publications.

Details about the Scott's Medical Database. (http://www.cihi.ca/CIHI-ext-portal/internet/en/document/spending+and+health+workforce/workforce/physicians/hhrdata_smdb)

Health Personnel Database (HPDB)

Exclusions/Limitations: HPDB includes registered nurses (RNs), licensed practical nurses (LPNs), pharmacists (with the exception of Québec, Manitoba, Yukon and Nunavut), physiotherapists and occupational therapists (with the exception of Québec). Rates reflect health professionals registered with active-practising status and who are employed in these health professions. For other health professionals, data reflect personnel regardless of employment status and include the number of active registered dentists, registered dental hygienists, registered dieticians, registered chiropractors, active registered optometrists and active registered psychologists.

Data on RNs for the territories include secondary registrations. Personnel-per-population rates are revised annually using the most recent Statistics Canada population estimates and therefore may differ slightly from previously published figures. Rates may differ from data published by provincial or territorial regulatory authorities due to the CIHI collection, processing and reporting methodology. Please consult *Canada's Health Care Providers, 1997 to 2006: A Reference Guide* and the HPDB *Technical Report* for more detailed methodological notes, data quality issues and profession-specific information.

Details about the Health Personnel Database. (http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=hhrdata_personnel_e)

National Survey of Selected Medical Imaging Equipment

Exclusions/Limitations: Inventories were conducted annually by CIHI from 2003 to 2009, except for 2008. The survey is supplemented by information from provincial ministries of health for 2003 to 2009. Inventories include all computed tomography (CT) and magnetic resonance imaging (MRI) scanners in Canadian health care facilities (both public and private) that were identified as having these types of equipment. While the aim was to have a complete inventory, some scanners might have failed to be captured in the survey or failed to be identified through other means such as the validation process by the provincial/territorial ministries of health. Number of exams was imputed for some scanners.

Details about the National Survey of Selected Medical Imaging Equipment. (http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types+of+care/specialized+services/medical+imaging/release_22jul2010#)

Public Health Agency of Canada (PHAC)

Canadian Chronic Disease Surveillance System (CCDSS) (Diabetes)

Exclusions/Limitations: Persons younger than 1 year of age.

Note to Readers: Readers should be cautious when interpreting these data.

Disclosure of Limitations: Three types of diabetes are included in the database: type 1, type 2 and gestational diabetes. Note that gestational diabetes is only included when coded as diabetes mellitus (ICD-9, code 250 or ICD-10, codes E10–E14). An adjustment is in place to exclude incorrectly coded gestational diabetes.

Using administrative data for surveillance, as in the CCDSS, often requires a compromise when trying to identify cases of a disease. It is necessary to balance the possibility of misclassifying people who actually have been diagnosed with diabetes but have not been identified by the CCDSS as such (false negatives), with the reverse where people who do not have diabetes but have been identified as having it (false positives). Validation studies have indicated that the case definition used by the CCDSS is reliable at minimizing both false negatives and false positives in order to depict a relatively accurate picture of diagnosed diabetes in Canada.

Additionally, there are some people who have not been diagnosed with diabetes but who, in fact, have the disease. Estimates for the number of people in this category are outside the scope of the CCDSS.

Given that the data reported in *Healthy Canadians 2010* have been standardized using the 1991 Canadian population, age-standardized figures will underestimate the true prevalence (and burden) of diabetes in the population.

The time span presented, seven fiscal years, is insufficient for trend analysis.

Data are based on administrative data; therefore, their quality is constrained by the accuracy of those systems. Minor variations in data will occur when comparing data with other federal and provincial/territorial publications because of reporting delays, as well as different sources and dates of access to Statistics Canada's population estimates.

Laboratory Surveillance Data for Enteric Pathogens in Canada: Annual Summary, 2006

Exclusions/Limitations: E. coli data are based largely on isolations reported to the National Enteric Surveillance Program (NESP) and supplemented with identifications from National Microbiology Laboratory (NML) reference services. Except for serogroup O157, few provinces routinely report fully antigenically characterized verotoxigenic E. coli (VTEC) isolations and, therefore, the represented values are largely those that have been forwarded to the NML.

Details about the *Laboratory Surveillance Data for Enteric Pathogens in Canada: Annual Summary, 2006*. (http://www.nml-lnm.gc.ca/NESP-PNSME/assets/pdf/2006AnnualReport.pdf)

Brief Report on Sexually Transmitted Infections in Canada: 2007

Exclusions/Limitations: Currently, some jurisdictions report to PHAC using aggregate case counts instead of case-by-case reporting. Selected variables submitted by all 13 jurisdictions are: age at diagnosis, year of diagnosis, province/territory of diagnosis, and sex. As such, national reporting is limited to analyses of these variables.

A time delay may occur between when a person is tested positive for a sexually transmitted infection (STI) and when the report is received at PHAC. This time lag is referred to as the reporting delay. In cases where there are discrepancies between data reported by PHAC and those reported by individual provinces and territories, provincial/territorial data should be considered to be more accurate as they are the most current. The 2007 data presented in this brief report are also preliminary and subject to change.

The number of reported cases likely underestimates the true burden of infection in a given population for one or more of the following reasons:

- many people who are infected with STIs do not exhibit symptoms
- an infected individual may not interact with the medical system to get tested for a bacterial STI

Observed trends must be interpreted with caution since there are a number of factors that contribute to changes:

- rates based on small numbers are more prone to fluctuation over time
- there may be changes to testing patterns due to improved diagnostic capabilities, improved duplicate removal, and reporting delay

Details about the *Brief Report on Sexually Transmitted Infections in Canada: 2007*. (http://www.phac-aspc.gc.ca/publicat/2009/sti-its/index-eng.php)

HIV and AIDS in Canada: Surveillance Report to December 31, 2008

Exclusions/Limitations: The number of reported AIDS cases and positive HIV test reports at any point in time is not necessarily a true reflection of the total number of people with a diagnosis of AIDS or HIV infection. This is because some individuals with a diagnosis of HIV infection or AIDS are never reported to PHAC, which leads to an under-reporting of cases.

There may be a delay between the time when a person tests positive for HIV or is given a diagnosis of AIDS and the time when the report is received by PHAC. This time lag is referred to as the reporting delay. AIDS cases that are adjusted for reporting delay are usually presented in year-end surveillance reports. However, as outlined in a previous surveillance report, enhanced emphasis on HIV surveillance in a number of provinces has contributed to a growing uncertainty associated with the current methods used to estimate the AIDS reporting delay. PHAC is currently working on an improved process of estimating under and delayed reporting of AIDS diagnoses and expects to publish findings using these methods in upcoming reports.

Details on *HIV and AIDS in Canada: Surveillance Report to December 31, 2008*. (http://www.phac-aspc.gc.ca/aids-sida/publication/survreport/2008/dec/pdf/survrepdec08.pdf)

Canadian Nosocomial Infection Surveillance Program (CNISP)

Exclusions/Limitations: Only tertiary care centres (acute care hospitals) are currently participating in the surveillance program.

Disclosure of Limitations: Over 94% of the hospitals participating in the CNISP are tertiary-care teaching hospitals; therefore, they are only truly representative of the university-affiliated medical centres in the country.

CNISP hospitals have an active Methicillin-resistant *Staphylococcus aureus* (MRSA) surveillance program with screening policies that vary from site to site. Thus, it is likely that the system does miss some cases of MRSA colonization. MRSA colonization is assumed to be present in the absence of clinical signs or symptoms of infection. This diagnostic approach may lead to a misclassification of latent cases of MRSA infection, although this is thought to be relatively insignificant.

While a standardized case definition is used to classify MRSA cases as community- or healthcare-associated, it does still bear some subjectivity, which is also thought to be insignificant.

From 1995 to 2005, isolates recovered from all patients were submitted for further laboratory testing at the National Microbiology Laboratory in Winnipeg, whereas from 2006 to 2008, only "clinical" (i.e., non-screening) isolates recovered from patients suspected to be infected with MRSA were considered.

With the exception of 1995 and 1996, only subsets of geographically representative isolates were considered for further laboratory characterization (i.e., molecular typing). Therefore, it is recommended that readers take this into consideration when comparing annual results.

Organisation for Economic Co-operation and Development (OECD)

OECD Health Data 2010

Exclusions/Limitations: All users of cross-national comparisons of health care data are advised that there are still important gaps with respect to international agreements on statistical methods. The same term can refer to very different things among the 30 OECD countries. Despite efforts to develop homogeneity, standardized health statistics is still a goal, not a reality. The statistics contained in *OECD Health Data 2010* reflect the situation at the time of release; they have been refined and improved year after year. The aim of the files and the accompanying sources and methods is to provide an objective working tool. The cooperation and, indeed, the criticism of the various national data providers and users will enable improvements in the future.

Details on OECD Health Data 2010. (http://www.oecd.org/document/30/0,3343,en_2649_34631_12968734 _1_1_1_1,00.html)

References

1   Details on the *First Ministers' Meeting Communiqué on Health* are available at: http://www.releases.gov.nl.ca/releases/2001/health/0926n07.htm.

2   Additional information on the *2003 First Ministers' Accord on Health Care Renewal* is available at: http://www.hc-sc.gc.ca/hcs-sss/delivery-prestation/fptcollab/2003accord/index-eng.php.

3   Additional information on the *2004 Health Accord* is available at: http://www.hc-sc.gc.ca/hcs-sss/delivery-prestation/fptcollab/2004-fmm-rpm/index-eng.php.

4   Information on the health agreements is available at the links in references #1-3 or at: http://www.hc-sc.gc.ca/hcs-sss/indicat/index-eng.php.

5   The list of 70 indicators has been previously published. See: http://www.hc-sc.gc.ca/hcs-sss/indicat/index-eng.php.

6   Additional information on this audit is available at: http://www.oag-bvg.gc.ca/internet/English/parl_oag_200812_08_e_31832.html.

7   Information on the CIHI/SC Health Indicator Framework is available at: http://www.cihi.ca/CIHI-ext-portal/pdf/internet/DEF_FRAMEWORK_JUNE09_EN.

8   Additional information on Statistics Canada's *Canadian Community Health Survey* is available in Annex 2 or at: http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3226&lang=en&db=imdb&adm=8&dis=2.

9   Statistical significance means that an observed difference would be unlikely to occur due to chance alone; thus, the observed difference can be attributed to a real difference in the population. The term "p<0.05" means there is less than a 5% probability that the difference is due to chance alone. Of note, the sample size in a study is an important determinant in how chance may affect the findings.

10 Statistics Canada. 2006 Census. *Aboriginal Peoples Highlight Tables*. Population by age groups, sex and Aboriginal identity groups, 2006 counts for Canada, provinces and territories—20% sample data (table). Ottawa: Statistics Canada; 2008. Catalogue No. 97-558-XWE2006002. Available from: http://www12.statcan.gc.ca/english/census06/data/highlights/Aboriginal/pages/Page.cfm?Lang=E&Geo=PR&Code=01&Table=2&Data=Count&Sex=1&Abor=1&StartRec=1&Sort=2&Display=Page&CSDFilter=250.

11 To learn more about the Canada Health Act, please visit the following weblink: http://www.hc-sc.gc.ca/hcs-sss/medi-assur/cha-lcs/index-eng.php.

12 Details about Health Canada's plans, priorities and strategic outcomes are available at: http://www.tbs-sct.gc.ca/rpp/2008-2009/inst/shc/shc-eng.pdf.

13 Information about health expenditures in Canada is available at: http://secure.cihi.ca/cihiweb/products/NHEX_Trends_Report_2010_final_ENG_web.pdf.

14 CIHI defines health expenditures as encompassing activities that are undertaken with the direct purpose of improving or maintaining health. Details can be found at the web link provided in reference #13, above.

15 Provincial and territorial health expenditures include provincial/territorial government funds, federal health transfers to the provinces/territories, and provincial government health transfers to municipal governments.

16 These are "autonomous social insurance schemes imposed and controlled by government," e.g., workers' compensation boards and the Quebec Drug Insurance Funds.

17 Details about the Canada Health Transfer are available at: http://www.fin.gc.ca/fedprov/cht-eng.asp.

18 Details about this are available at: http://www.fin.gc.ca/budget05/bp/bpc3-eng.asp.

19 Details are available at: http://pm.gc.ca/eng/media.asp?id=1611.

20 Details about Budget 2009 are available at: http://www.budget.gc.ca/2009/pdf/budget-planbugetaire-eng.pdf.

21 Gray, D.P., Evans, P., Sweeney, K., Lings, P., Seamark, D., Seamark, C., Dixon, M., Bradley, N. (2003). Towards a theory of continuity of care. *Journal of the Royal Society of Medicine*. 96(4): 160-166. Available from: http://jrsm.rsmjournals.com/cgi/reprint/96/4/160.

22 Rosser, W., Schultz, K. (2007). Promoting continuity of care should be integral to any health care system. *Canadian Medical Association Journal*. 177(11): 1385-1386. Available from: http://www.canadianmedicaljournal.ca/cgi/content/full/177/11/1385.

23 McIsaac, W.J., Fuller-Thomson, E., Talbot, Y. (2001). Does having regular care by a family physician improve preventive care? *Canadian Family Physician*. 47: 70-76. Available from: http://171.66.125.180/cgi/reprint/47/1/70.

24 Saultz, J.W., Lochner, J. (2005). Interpersonal continuity of care and care outcomes: a critical review. *Annals of Family Medicine*. 3: 159-166. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1466859/?tool=pubmed.

25 Lorig, K.R., Mazonson, P.D., Holman, H.R. (1993). Evidence suggesting that health education for self-management in patients with chronic arthritis has sustained health benefits while reducing health care costs. *Arthritis and Rheumatism*. 36(4): 439-446.

26 Vitacca, M., Bianchi, L., Guerra, A., Fracchia, C., Spanevello, A. (2009). Tele-assistance in chronic respiratory failure patients: a randomised clinical trial. *European Respiratory Journal*. 33: 411-418. Available from: http://erj.ersjournals.com/cgi/reprint/33/2/411

27 Dunlop, S., Coyote, P.C., McIsaac, W. (2000). Socio-economic status and the utilisation of physicians' services: results from the Canadian National Population Health Survey. *Social Science and Medicine*. 51: 123-133.

28 Zanchetta, M.S., Poureslami, I.M. (2006). Health literacy within the reality of immigrants' culture and language. *Canadian Journal of Public Health*. 97(2): S26-S30.

29 Kalichman, S.C., Benotsch, E.G., Weinhardt, L.S., Austin, J., Luke, W. (2002). Internet use among people living with HIV/AIDS: association of health information, health behaviors, and health status. *AIDS Education and Prevention*. 14(1): 51-61.

30 Eng, T.R., Maxfield, A., Patrick, K., Deering, M.J., Ratzan, S.C., Gustafson, D.H. (1998). Access to health information and support: a public highway or a private road. *Journal of the American Medical Association*. 280(15): 1371-1375. Available from: http://jama.ama-assn.org/cgi/content/full/280/15/1371.

31 Citation from *Supreme Court of Canada: Chaoulli v. Quebec (Attorney General)*, 2005. SCC 35 Date: 20050609 Docket: 29272. Page 7. Available from: http://scc.lexum.org/en/2005/2005scc35/2005scc35.html.

32 Bhandari, A., Wagner, T. (2006). Self-reported utilization of health care services: improving measurement and accuracy. *Medical Care Research and Review*. 63(2): 217-235.

33 Details on volume of medical imaging exams in Canada, available on the Canadian Institute for Health Information website at: http://www.cihi.ca/CIHI-ext-portal/internet/en/Document/types+of+care/specialized+services/medical+imaging/RELEASE_26MAY11.

34 Details on Patient Wait Times Guarantees are available at: http://pm.gc.ca/eng/media.asp?id=1611.

35 Connor-Spady, B., Sanmartin, C., Johnston, G., McGurran, J., Kehler, M., Noseworthy, T. (2008). Willingness of patients to change surgeons for a shorter waiting time for arthoplasty. *Canadian Medical Association Journal*. 179(4): 327-332. Available from: http://www.cmaj.ca/cgi/reprint/179/4/327.

36 Details on CIHI's *2011 Wait Times Tables – A Comparison by Province* are available at: https://secure.cihi.ca/estore/productFamily.htm?locale=en&pf=PFC1599.

37 Steinbrook, R. (2006). Private health care in Canada. *The New England Journal of Medicine*. 354: 1661-1664. Available from: http://www.nejm.org/doi/pdf/10.1056/NEJMp068064.

38 Law, M.R., Morris, J.K., Wald, N.J. (2009). Use of blood pressure lowering drugs in the prevention of cardiovascular disease: meta-analysis of 147 randomised trials in the context of expectations from prospective epidemiological studies. *British Medical Journal*. 338(191): b1665.

39 Chen, Y.F., Jobanputra, P., Barton, P., Jowett, S., Bryan, S., Clark, W., Fry-Smith, A., Burls, A. (2006). A systematic review of the effectiveness of adalimumab, etanercept and infliximab for the treatment of rheumatoid arthritis in adults and an economic evaluation of their cost-effectiveness. *Health Technology Assessment*. 10(42). 266 pages. Available from: http://eprints.bham.ac.uk/1/1/Chen_YF%2C_Jobanputra_P._TNF_inhibs_for_RA_HTA_2006.pdf.

40 American Diabetes Association. (2008). Standards of Medical Care in Diabetes—2008. *Diabetes Care*. 31(S1): S12-S54. Available from: http://care.diabetesjournals.org/content/31/Supplement_1/S12.full.pdf+html.

41   Marcellin, P., Chang, T.T., Lee Lim, S.G., Sievert, W., Tong, M., Arterburn, S., Borroto-Esoda, K., Frederick, D., Rousseau, F. (2008). Long-term efficacy and safety of Adefovir Dipivoxil for the treatment of hepatitis B e antigen-positive chronic hepatitis B. *Hepatology*. 48(3): 750-758. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/119163271/HTMLSTART.

42   Manavi, K. (2006). A review on infection with Chlamydia trachomatis. *Best Practice and Research Clinical Obstetrics and Gynaecology*. 20(6): 941-951.

43   Griffith, S. (1990). A review of the factors associated with patient compliance and the taking of prescribed medicines. *British Journal of General Practice*. 40: 114-116. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1371078/pdf/brjgenprac00082-0026.pdf.

44   Fenton, W.S., Blyler, C.R., Heinssen, R.K. (1997). Determinants of medication compliance in schizophrenia: empirical and clinical findings. *Schizophrenia Bulletin*. 23(4): 637-651. Available from: http://schizophreniabulletin.oxfordjournals.org/cgi/reprint/23/4/637.

45   Vermeire, E., Hearnshaw, H., Van Royen, P., Denekens, J. (2001). Patient adherence to treatment: three decades of research. A comprehensive review. *Journal of Clinical Pharmacy and Therapeutics*. 26: 331-342. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/119018661/PDFSTART.

46   Shah, N.S., Wright, A., Bai, G.H., Barrera, L., Boulahbal, F., Martín-Casabona, N., Drobniewski, F., Gilpin, C., Havelková, M., Lepe, R., Lumb, R., Metchock, B., Portaels, F., Rodrigues, M.F., Rüsch-Gerdes, S., Van Deun, A., Vincent, V., Laserson, K., Wells, C., Cegielski, J.P. (2007). Worldwide emergence of extensively drug-resistant tuberculosis. *Emerging Infectious Diseases.* 13(3): 380-387. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2725916/.

47   Simpson, S.H., Eurich, D.T., Majumdar, S.R., Padwal, R.S., Tsuyuki, R.T., Varney, J., Johnson, J.A. (2006). A meta-analysis of the association between adherence to drug therapy and mortality. *British Medical Journal*. 333(7557): 15.

48   Tamblyn, R., Laprise, R., Hanley, J.A., Abrahamowicz, M., Scott, S., Mayo, N., Hurley, J., Grad, R., Latimer, E., Perreault, R., McLeod, P., Huang, A., Larochelle, P., Mallet, L. (2001). Adverse events associated with prescription drug cost-sharing among poor and elderly persons. *Journal of the American Medical Association.* 285(4): 421-429. Available from: http://jama.ama-assn.org/cgi/reprint/285/4/421.

49   The Strategic Counsel. *Health Canada Performance Survey 2009*. Page 49.

50   Sitzia, J. (1999). How valid and reliable are patient satisfaction data? An analysis of 195 studies. *International Journal for Quality in Health Care*. 11(4): 319-328. Available from: http://intqhc.oxfordjournals.org/content/11/4/319.full.pdf+html.

51   Sitzia, J., Wood, N. (1997). Patient satisfaction: a review of issues and concepts. *Social Science and Medicine*. 45(12): 1829-1843.

52   Hall, J.A., Dornan, M.C. (1990). Patient sociodemographic characteristics as predictors of satisfaction with medical care: a meta-analysis. *Social Science and Medicine*. 30(7): 811-819.

53   Rahmqvist, M. (2001). Patient satisfaction in relation to age, health status and other background factors: a model for comparisons of care units. *International Journal for Quality in Health Care*. 13(5): 385-390. Available from: http://intqhc.oxfordjournals.org/content/13/5/385.full.pdf+html.

54   Bleich, S.N., Özaltin, E., Murray, C.J.L. (2009). How does satisfaction with the health-care system relate to patient experience? *Bulletin of the World Health Organization.* 87: 271-278. Available from: http://www.scielosp.org/pdf/bwho/v87n4/v87n4a12.pdf.

55   Xiao, H., Barber, J.P. (2008). The effect of perceived health status on patient satisfaction. *Value in Health*. 11(4): 719-725. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1524-4733.2007.00294.x/pdf.

56   Lee, D.S., Tu, J.V., Chong, A., Alter, D.A. (2008). Patient satisfaction and its relationship with quality and outcomes of care after acute myocardial infarction. *Circulation*. 118: 1938-1945. Available from: http://circ.ahajournals.org/cgi/reprint/118/19/1938.

57   Sulmasy, D.P., McIlvane, J.M. (2002). Patients' ratings of quality and satisfaction with care at the end of life. *Archives of Internal Medicine*. 162: 2098-2104. Available from: http://archinte.ama-assn.org/cgi/reprint/162/18/2098.

58   Rao, M., Clarke, A., Sanderson, C., Hammersley, R. (2006). Patients' own assessments of quality of primary care compared with objective records based measures of technical quality of care: cross sectional study. *British Medical Journal*. doi:10.1136/bmj.38874.499167.7C. Available from: http://www.bmj.com/content/333/7557/19.full.pdf.

59   Becker, G., Newsom, E. (2003). Socioeconomic status and dissatisfaction with health care among chronically ill African Americans. *American Journal of Public Health*. 93: 742-748. Available from: http://ajph.aphapublications.org/cgi/reprint/93/5/742.

60   Karolija, D., Wood-Dauphinee, S., Pointner, R. (2007). Patient-reported outcomes. How important are they? *Surgical Endoscopy*. 21: 503-507. Available from: http://www.springerlink.com/content/88r2041555603541/fulltext.pdf.

61   Coyte, P.C., Wright, J.G., Hawker, G.A., Bombardier, C., Dittus, R.S., Paul, J.E., Freund, D.A., Ho, E. (1994). Waiting times for knee-replacement surgery in the United States and Ontario. *The New England Journal of Medicine*. 331: 1068-1071.

62   Billings, J., Zeitel, L., Lukomnik, J., Carey, T.S., Blank, A.E., Newman, L. (1993). Impact of socioeconomic status on hospital use in New York City. *Health Affairs*. 12(1): 162-173. Available from: http://content.healthaffairs.org/cgi/reprint/12/1/162.

63   Roos, L.L., Walld, R., Uhanova, J., Bond, R. (2005). Physician visits, hospitalizations, and socioeconomic status: ambulatory care sensitive conditions in a Canadian setting. *Health Research and Educational Trust*. 40(4): 1167-1185. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1475-6773.2005.00407.x/pdf.

64   Agabiti, N., Pirani, M., Schifano, P., Cesaroni, G., Davoli, M., Bisanti, L., Caranci, N., Costa, G., Forastiere, F., Marinacci, M., Russo, A., Spadea, T., Perucci, C.A., and Italian Study Group on Inequalities in Health Care. (2009). Income level and chronic ambulatory care sensitive conditions in adults: a multicity population-based study in Italy. *BioMed Central Public Health*. 9: 457-464. Available from: http://www.biomedcentral.com/1471-2458/9/457.

65   Levinton, C., Lacroix, J., Choi, L., Tallentire, M., Paul, J. (2006). Ambulatory care sensitive conditions technical summary. Hospital Report 2006: Acute Care. *Canadian Institute for Health Information*. Available from: http://www.hospitalreport.ca/downloads/2006/AC/2006_AC_ambcare_techreport.pdf.

66   Pappas, G., Hadden, W.C., Kozak, L.J., Fisher, G.F. (1997). Potentially avoidable hospitalizations: inequalities in rates between US socioeconomic groups. *American Journal of Public Health*. 87: 811-816. Available from: http://ajph.aphapublications.org/cgi/reprint/87/5/811.

67   Trivedi, A.N., Zaslavsky, A.M., Schneider, E.C., Ayanian, J.Z. (2005). Trends in the quality of care and racial disparities in Medicare managed care. *The New England Journal of Medicine*. 353: 692-700.

68   Booth, G.L., Hux, J.E. (2003). Relationship between avoidable hospitalizations for diabetes mellitus and income level. *Archives of Internal Medicine*. 163: 101-106. Available from: http://archinte.ama-assn.org/cgi/reprint/163/1/101.

69   Shi, L., Samuels, M.E., Pease, M., Bailey, W.P., Corley, E.H. (1999). Patient characteristics associated with hospitalizations for ambulatory care sensitive conditions in South Carolina. *Southern Medical Journal*. 92: 989-998.

70   Culler, S.D., Parchman, M.L., Przybylski, M. (1998). Factors related to potentially preventable hospitalisations among elderly. *Medical Care*. 36: 804-817.

71   Zhang, W., Mueller, K.J., Chen, L.W. (2008). Uninsured hospitalizations: rural and urban differences. *The Journal of Rural Health*. 24(2): 194-202. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1748-0361.2008.00158.x/pdf.

72   Ansari, Z., Laditka, J.N., Laditka, S.B. (2006). Access to health care and hospitalization for ambulatory care sensitive conditions. *Medical Care Research and Reviews*. 63: 719-741.

73   Statistics Canada. (2004). *Primary Health Care – Hospitalization rate for ambulatory care sensitive conditions*. Available from: http://www.statcan.gc.ca/pub/82-401-x/2002000/considerations/pc/4064257-eng.htm.

74   Desai, M.M., Stauffer, B.D., Feringa, H.H., Schreiner, G.C. (2009). Statistical models and patients predictors of readmission for acute myocardial infarction. *Circulation: Cardiovascular Quality and Outcomes*. 2: 500-507. Available from: http://circoutcomes.ahajournals.org/cgi/content/full/2/5/500 - R2-832949.

75   Canadian Institute for Health Information. (2010). *Health Indicators 2010: Definitions. Data Sources and Rationale* (Ottawa, Ont.: CIHI, 2010). Available from: http://www.cihi.ca/CIHI-ext-portal/pdf/internet/DEFINITIONS_052010_EN.

76   Carroll, D.L., Rankin, S.H., Cooper, B.A. (2007). The effects of a collaborative peer advisor/advanced practice nurse intervention: cardiac rehabilitation participation and rehospitalization in older adults after a cardiac event. *Journal of Cardiovascular Nursing*. 22: 313-319.

77   Young, W., Rewa, G., Goodman, S.G., Jaglal, S.B., Cash, L., Lefkowitz, C., Coyte, P.C. (2003). Evaluation of a community-based inner-city disease management program for postmyocardial infarction patients: a randomized controlled trial. *Canadian Medical Association Journal*. 169: 905-910.

78   Ades, P.A., Huang, D., Weaver, S.O. (1992). Cardiac rehabilitation participation predicts lower rehospitalization costs. *American Heart Journal*. 123: 916-921.

79   Bondestam, E., Breikss, A., Hartford, M. (1995). Effects of early rehabilitation on consumption of medical care during the first year after acute myocardial infarction in patients ≥ 65 years of age. *American Journal of Cardiology*. 75: 767-771.

80   Ades, P.A., Pashkow, F.J., Nestor, J.R. (1997). Cost-effectiveness of cardiac rehabilitation after myocardial infarction. *Journal of Cardiopulmonary Rehabilitation*. 17(4): 222-231.

81   Canadian Institute for Health Information. (2010). *Regulated Nurses: Canadian Trends, 2004 to 2008*. Available from: http://secure.cihi.ca/cihiweb/products/regulated_nurses_2004_2008_en.pdf.

82   Dussault, G., Dubois, C.A. (2003). Human resources for health policies: a critical component in health policies. *Human Resources for Health.* 1: 1. Available from: http://www.human-resources-health.com/content/pdf/1478-4491-1-1.pdf.

83   Anand, S., Bärnighausen, T. (2004). Human resources and health outcomes: cross-country econometric study. *The Lancet.* 364: 1603-1609. Available from: http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(04)17313-3/fulltext.

84   Canadian Institute for Health Information. (2009). *Supply, Distribution and Migration of Canadian Physicians, 2008*. Available from: http://secure.cihi.ca/cihiweb/products/SMDB_2008_e.pdf.

85   Canadian Institute for Health Information. (2010). *Use of MRI and CT exams varies greatly among provinces*. Available from: http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types+of+care/specialized+services/medical+imaging/release_22jul2010#.

86   Wang, L., Nie, J.X., Tracy, S., Moineddin, R., Upshur, R.E.G. (2008). Utilization patterns of diagnostic imaging across the late life course: a population-based study in Ontario, Canada. *International Journal of Technology Assessment in Health Care*. 24(4): 384-390. Available from: http://journals.cambridge.org/action/displayFulltext?type=6&fid=2347084&jid=THC&volumeId=24&issueId=04&aid=2347080&fulltextType=RA&fileId=S0266462308080501.

87   Kidwell, C.S., Chalela, J.A., Saver, J.L., Starkman, S., Hill, M.D., Demchuk, A.M., Butman, J.A., Patronas, N., Alger, J.R., Latour, L.L., Luby, M.L., Baird, A.E., Leary, M.C., Tremwel, M., Ovbiagele, B., Fredieu, A., Suzuki, S., Villablanca, J.P., Davis, S., Dunn, B., Todd, J.W., Ezzeddine, M.A., Haymore, J., Lynch, J.K., Davis, L., Warach, S. (2004). Comparison of MRI and CT for detection of acute intracerebral hemorrhage. *Journal of the American Medical Association*. 292(15): 1823-1830. Available from: http://jama.ama-assn.org/cgi/reprint/292/15/1823.

88   Brydie, A. (2003). Early MRI in the management of clinical scaphoid fracture. *The British Journal of Radiology*. 76: 296-300. Available from: http://bjr.birjournals.org/cgi/reprint/76/905/296.

89   Sandrasegaran, K., Rajesh, A., Rushing, D.A., Rydberg, J., Akisik, F.M., Henley, J.D. (2005). Gastrointestinal stromal tumors: CT and MRI findings. *European Radiology.* 15: 1407-1414. Available from: http://www.springerlink.com/content/r2682761v6033017/fulltext.pdf.

90   Holmes, J.F., Akkinepalli, R. (2005). Computed tomography versus plain radiography to screen for cervical spine injury: a meta-analysis. *Journal of Trauma-Injury Infection and Critical Care*. 58(5): 902-905.

91   Mowatt, G., Cook, J.A., Hillis, G.S., Walker, S., Fraser, C., Jia, X., Waugh, N. (2008). 64-slice computed tomography angiography in the diagnosis and assessment of coronary artery disease: systematic review and meta-analysis. *Heart*. 94(11): 1386-1393.

92   Health Canada. (2003). Whole body screening using MRI or CT technology. *It's Your Health*. Available from: http://www.hc-sc.gc.ca/hl-vs/alt_formats/pacrb-dgapcr/pdf/iyh-vsv/med/mri-irm-eng.pdf.

93   Franiel, T., Schmidt, S., Klingebiel, R. (2006). First-degree burns on MRI due to nonferrous tattoos. *American Journal of Roentgenology*. 187: W556. Available from: http://www.ajronline.org/cgi/content/full/187/5/W556.

94   Murphy, K.J., Brunberg, J.A. (1997). Adult claustrophobia, anxiety and sedation in MRI. *Magnetic Resonance Imaging*. 15(1): 51-54.

95   Lin, S.P., Brown, J.J. (2007). MR contrast agents: physical and pharmacologic basics. *Journal of Magnetic Resonance Imaging.* 25: 884-899. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/114219236/PDFSTART.

96   Health Canada. (2007). *Association of gadolinium-containing contrast agents and Nephrogenic Systemic Fibrosis/Nephrogenic Fibrosing Dermopathy (NSF/NFD)—Notice to hospitals*. Available from: http://www.hc-sc.gc.ca/dhp-mps/medeff/advisories-avis/prof/_2007/gadolinium_nth-aah-eng.php.

97   Hill, B.C., Johnson, S.C., Owens, E.K., Gerber, J.L., Senagore, A.J. (2010). CT scan for suspected acute abdominal process: impact of combinations of IV, oral, and rectal contrast. *World Journal of Surgery*. 34: 699-703. Available from: http://www.springerlink.com/content/9645u30468832602/fulltext.pdf.

98   The Canadian Association of Radiologists. (2009). *Do you need that scan?* Ottawa: CAR. Available from: http://www.car.ca/uploads/patient%20info/car_cat_scan_eng.pdf.

99   Reed, M. (2010). Patient safety through medical imaging appropriateness. *Technology for Doctors, online.* November 11, 2010 issue. Available from: http://www.car.ca/uploads/news%20publications/safety_through_appropriateness_reprint259low.pdf.

100   Statistics Canada. (2006). *Mortality, Summary List of Causes - Data quality, concepts and methodology*. Available from: http://www.statcan.gc.ca/pub/84f0209x/2001000/4078972-eng.htm.

101   Pan, S.Y., Ugnat, A.-M., Semenciw, R., Desmeules, M., Mao, Y., MacLeod, M. (2006). Trends in childhood injury mortality in Canada, 1979-2002. *Injury Prevention*. 12(3): 155-160. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2563519/.

102   Government of Canada. (1990). *Teen Suicide*. Available from: http://dsp-psd.pwgsc.gc.ca/Collection-R/LoPBdP/BP/bp236-e.htm.

103   Public Health Agency of Canada. (2008). *Leading Causes of Death and Hospitalization in Canada*. Available from: http://www.phac-aspc.gc.ca/publicat/lcd-pcd97/index-eng.php.

104   Health Canada. (2007). *Healthy Living - Safety and Injuries*. Available from: http://www.hc-sc.gc.ca/hl-vs/securit/index-eng.php.

105   Public Health Agency of Canada. (2006). *Facts on Injury*. Available from: www.phac-aspc.gc.ca/injury-bles/facts-eng.php.

106   Health Canada. (2001). *Unintentional and Intentional Injury Profile for Aboriginal People in Canada*. Available from: http://www.hc-sc.gc.ca/fniah-spnia/pubs/promotion/_injury-bless/2001_trauma/index-eng.php.

107   Clayton, D., Barceló, A. (1999). The cost of suicide mortality in New Brunswick, 1996. *Chronic Diseases in Canada*. 20(2): 89-95.

108   Mann, J.J., Apter, A., Bertolote, J. (2005). Suicide prevention strategies: a systematic review. *Journal of the American Medical Association*. 294(16): 2064-2074. Available from: http://jama.ama-assn.org/cgi/reprint/294/16/2064.

109   Doessel, D.P., Williams, R.F.G., Whiteford, H. (2009). A reassessment of suicide measurement – some comparative PYLL-based trends in Queensland, Australia, 1920-2005. *Crisis*. 30(1): 6-12. Available from: http://www.psycontent.com/content/1u401x444844121t/.

110   Ballesteros, M.F., Gielen, A.C. (2010). Patient counseling for unintentional injury prevention. *American Journal of Lifestyle Medicine*. 4(1): 38-41. Available from: http://ajl.sagepub.com/content/4/1/38.full.pdf+html.

111   Details on cancer trends can be found in the *Canadian Cancer Statistics 2008* report, available at: http://www.cancer.ca/Canada-wide/About%20cancer/Cancer%20statistics/~/media/CCS/Canada%20wide/Files%20List/English%20files%20heading/pdf%20not%20in%20publications%20section/Canadian%20Cancer%20Society%20Statistics%20PDF%202008_614137951.ashx.

112   Rock, C.L., Demark-Wahnefried, W. (2002). Can lifestyle modification increase survival in women diagnosed with breast cancer? *Journal of Nutrition*. 132: 3504S-3509S. Available from: http://jn.nutrition.org/cgi/reprint/132/11/3504S.

113   Ornish, D., Weidner, G., Fair, W.R., Marlin, R., Pettengill, E.B., Raisin, C.J., Dunn-Emke, S., Crutchfield, L., Jacobs, F.N., Barnard, R.J., Aronson, W.J., McCormac, P., McKnight, D.J., Fein, J.D., Dnistrian, A.M., Weinstein, J., Ngo, T.H., Mendell, N.R., Carroll, P.R. (2005). Intensive lifestyle changes may affect the progression of prostate cancer. *Journal of Urology*. 174: 1065-1070. Available from: http://www.abundantwellbeing.com/Nischala/CancerStudyOrnish.pdf.

114 Jones, L.W., Demark-Wahnefried, W. (2006). Diet, exercise, and complementary therapies after primary treatment for cancer. *The Lancet Oncology*. 7(12): 1017-1026.

115 Key, T.J., Schatzkin, A., Willet, W.C., Allen, N.E., Spencer, E.A., Travis, R.C. (2004). Diet, nutrition and the prevention of cancer. *Public Health Nutrition.* 7(1A): 187-200.

116 Centers for Disease Control and Prevention. (2004). *The Health Consequence of Smoking*. Available from: http://www.cdc.gov/tobacco/data_statistics/sgr/2004/complete_report/index.htm.

117 Boffetta, P., Hashibe, M. (2006). Alcohol and cancer. *The Lancet Oncology*. 7: 149-156.

118 Collaborative group on hormonal factors in breast cancer. (2002). Alcohol, tobacco and breast cancer-collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without the disease. *British Journal of Cancer*. 87: 1234-1245.

119 World Cancer Research Fund / American Institute for Cancer Research. (2007). Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective. Washington, DC: AICR.

120 Giovannucci, E., Rimm, E.B., Liu, Y., Stampfer, M.J., Willett, W.C. (2002). A prospective study of tomato products, lycopene, and prostate cancer risk. *Journal of the National Cancer Institute*. 94: 391-398. Available from: http://jnci.oxfordjournals.org/content/94/5/391.full.pdf+html.

121 Feskanich, D., Ziegler, R.G., Michaud, D.S., Giovannucci, E.L., Speizer, F.E., Willett, W.C., Colditz, G.A. (2000). Prospective study of fruit and vegetable consumption and risk of lung cancer among men and women. *Journal of the National Cancer Institute*. 92: 1812-1823. Available from: http://jnci.oxfordjournals.org/content/92/22/1812.full.pdf+html.

122 Norat, T., Lukanova, A., Ferrari, P., Riboli, E. (2002). Meat consumption and colorectal cancer risk: a dose–response meta-analysis of epidemiological studies. *International Journal of Cancer*. 98: 241-256. Available from: http://onlinelibrary.wiley.com/doi/10.1002/ijc.10126/pdf.

123 Michaud, D.S., Augustsson, K., Rimm, E.B., Stampfer, M.J., Willett, W.C., Giovannucci, E. (2001). A prospective study on intake of animal products and risk of prostate cancer. *Cancer Causes and Control*. 12: 557-567.

124 Howe, G.R., Aronson, K.J., Benito, E., Castelleto, R., Cornée, J., Duffy, S., Gallagher, R.P., Iscovich, J.M., Deng-ao, J., Kaaks, R., Kune, G.A., Kune, S., Lee, H.P., Lee, M., Miller, A.B., Peters, R.K., Potter, J.D., Riboli, E., Slattery, M.L., Trichopoulos, D., Tuyns, A., Tzonou, A., Watson, L.F., Whittemore, A.S., Wu-Williams, A.H., Shu, Z. (1997). The relationship between dietary fat intake and risk of colorectal cancer: evidence from the combined analysis of 13 case-control studies. *Cancer Causes and Control*. 8: 215-228.

125 Potter, J.D., Steinmetz, K. (1996). Vegetables, fruit and phytoestrogens as preventive agents. In: Stewart, B.W., McGregor, D., eds. *Principles of Chemoprevention*. IARC Scientific Publication No. 139. Lyon: IARC, pages 61-90.

126 Jacobs, D.R.J., Marquart, L., Slavin, J., Kushi, L.H. (1998). Whole-grain intake and cancer: an expanded review and meta-analysis. *Nutrition and Cancer*. 30: 85-96.

127 Bueno De Mesquita, H.B., Ferrari, P., Riboli, E., on behalf of EPIC. (2002). Plant foods and the risk of colorectal cancer in Europe: preliminary findings. *IARC Scientific Publications Series*. 156: 89-95.

128 Fuchs, C.S., Giovannucci, E.L., Colditz, G.A., Hunter, D.J., Stampfer, M.J., Rosner, B., Speizer, F.E., Willett, W.C. (1999). Dietary fiber and the risk of colorectal cancer and adenoma in women. *The New England Journal of Medicine*. 340: 169-176. Available from: http://www.nejm.org/doi/pdf/10.1056/NEJM199901213400301.

129 Michels, K.B., Giovannucci, E., Joshipura, K.J., Rosner, B.A., Stampfer, M.J., Fuchs, C.S., Colditz, G.A., Speizer, F.E., Willett, W.C. (2000). Prospective study of fruit and vegetable consumption and incidence of colon and rectal cancers. *Journal of the National Cancer Institute*. 92: 1740-1752. Available from: http://jnci.oxfordjournals.org/content/92/21/1740.full.pdf+html.

130 Public Health Agency of Canada. (2009). *Obesity in Canada: Snapshot*. Available from: http://www.phac-aspc.gc.ca/publicat/2009/oc/pdf/oc-eng.pdf.

131 Kruk, J., Aboul-Enein, H.Y. (2006). Physical activity in the prevention of cancer. *Asian Pacific Journal of Cancer Prevention.* 7: 11-21.

132 Hardman, A.E. (2001). Physical activity and cancer risk. *Proceedings of the Nutrition Society.* 60: 107-113.

133 McTiernan, A. (2008). Mechanisms linking physical activity with cancer. *Nature Reviews Cancer.* 8: 205-211. Available from: http://www.nature.com/nrc/journal/v8/n3/pdf/nrc2325.pdf.

134 Tjepkema, M., Wilkins, R., Senécal, S., Guimond, E., Penney, C. (2009). Mortality of Métis and Registered Indian adults in Canada: An 11-year follow-up study. *Health Reports* (Statistics Canada, Catalogue 82-003-X) 20(4): 1-21. Available from: http://www.statcan.gc.ca/pub/82-003-x/2009004/article/11034-eng.htm.

135 Public Health Agency of Canada. (2010). *Cardiovascular Disease. Six Types of Cardiovascular Disease*. Available from: http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/cvd-mcv-eng.php.

136 Stampfer, M.J., Hu, F.B., Manson, J.E., Rimm, E.B., Willett, W.C. (2000). Primary prevention of coronary heart disease in women through diet and lifestyle. *The New England Journal of Medicine*. 343: 16-22. Available from: http://www.nejm.org/doi/pdf/10.1056/NEJM200007063430103.

137 He, F.J., Nowson, C.A., MacGregor, G.A. (2006). Fruit and vegetable consumption and stroke: meta-analysis of cohort studies. *The Lancet*. 367: 320-326.

138 Lee, C.D., Folsom, A.R., Blair, S.N. (2003). Physical activity and stroke risk: a meta-analysis. *Stroke*. 34: 2475-2481. Available from: http://stroke.ahajournals.org/cgi/reprint/34/10/2475.

139 Baigent, C., Keech, A., Kearney, P.M., Blackwell, L., Buck, G., Pollicino, C., Kirby, A., Sourjina, T., Peto, R., Collins, R., Simes, J. (2005). Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90 056 participants in 14 randomised trials of statins. *The Lancet*. 366: 1267-1278.

140 Staessen, J.A., Wang, J.-G., Thijs, L. (2001). Cardiovascular protection and blood pressure reduction: a meta-analysis. *The Lancet*. 358: 1305-1315.

141 Huxley, R., Barzi, F., Woodward, M. (2006). Excess risk of fatal coronary heart disease associated with diabetes in men and women: meta-analysis of 37 prospective cohort studies. *British Medical Journal*. 332: 73-78. Available from: http://www.bmj.com/content/332/7533/73.full.pdf+html.

142 Public Health Agency of Canada. (2009). *2009 Tracking heart disease and stroke in Canada*. Available from: http://www.phac-aspc.gc.ca/publicat/2009/cvd-avc/pdf/cvd-avs-2009-eng.pdf.

143 Lakier, J.B. (1992). Smoking and cardiovascular disease. *The American Journal of Medicine*. 93(Suppl. 1): 8S-12S.

144 Critchley, J.A., Capewell, S. (2003). Mortality risk reduction associated with smoking cessation in patients with coronary heart disease. *Journal of the American Medical Association*. 290(1): 86-97. Available from: http://jama.ama-assn.org/cgi/reprint/290/1/86.

145 Warren, T.Y., Barry, V., Hooker, S.P., Sui, X., Church, T.S., Blair, S.N. (2010). Sedentary behaviors increase risk of cardiovascular disease mortality in men. *Medicine and Science in Sports and Exercise*. 42(5): 879-885.

146 Warburton, D.E.R., Nichol, C.W., Bredin, S.D. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal*. 174(6): 801-809. Available from: http://www.cmaj.ca/cgi/reprint/174/6/801.

147 van't Veer, P., Jansen, M.C.J.F., Klerk, M., Kok, F.J. (2000). Fruits and vegetables in the prevention of cancer and cardiovascular disease. *Public Health Nutrition*. 3(1): 103-107. Available from: http://journals.cambridge.org/action/displayFulltext?type=1&fid=626024&jid=&volumeId=&issueId=01&aid=555840&bodyId=&membershipNumber=&societyETOCSession.

148 Mente, A., de Koning, L., Shannon, H.S., Anand, S.S. (2009). A systematic review of the evidence supporting a causal link between dietary factors and coronary heart disease. *Archives of Internal Medicine*. 169(7): 659-669. Available from: http://archinte.ama-assn.org/cgi/reprint/169/7/659.

149 Lee, C.M.Y., Huxley, R.R., Wildman, R.P., Woodward, M. (2008). Indices of abdominal obesity are better discriminators of cardiovascular risk factors than BMI: a meta-analysis. *Journal of Clinical Epidemiology*. 61: 646-653.

150 Lewington, S., Clarke, R., Qizilbash, N., Peto, R., Collins, R. (2002). Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. *The Lancet*. 360: 1903-1913.

151 Liszka, H.A., Mainous, A.G., King, D.E., Everett, C.J., Egan, B.M. (2005). Prehypertension and cardiovascular morbidity. *Annals of Family Medicine*. 3(4): 294-299. Available from: http://annfammed.org/cgi/reprint/3/4/294.

152 Barter, P., Gotto, A.M., LaRosa, J.C., Maroni, J., Szarek, M., Grundy, S.M., Kastelein, J.J.P., Bittner, V., Fruchart, J.-C. (2007). HDL cholesterol, very low levels of LDL cholesterol, and cardiovascular events. *The New England Journal of Medicine*. 357: 1301-1310. Available from: http://content.nejm.org/cgi/reprint/357/13/1301.pdf.

153　Staus, S.E., Majumdar, S.R., McAlister, F.A. (2002). New evidence for stroke prevention: scientific review. *Journal of the American Medical Association*. 288(11): 1388-1395.

154　Halbert, R.J., Natoli, J.L., Gano, A., Badamgarav, E., Buist, A.S., Mannino, D.M. (2006). Global burden of COPD: systematic review and meta-analysis. *European Respiratory Journal*. 28(3): 523-532. Available from: http://www.ersj.org.uk/cgi/reprint/28/3/523.

155　Mannino, D.M., Buist, A.S. (2007). Global burden of COPD: risk factors, prevalence, and future trends. *The Lancet*. 370: 765-773.

156　Mannino, D.M., Homa, D.M., Akinbami, L.J., Ford, E.S., Redd, S.C. (2002). Chronic obstructive pulmonary disease surveillance-United States, 1971-2000. *Respiratory Care*. 47: 1184-1199.

157　Prescott, E., Bjerg, A.M., Andersen, P.K., Lange, P., Vestbo, J. (1997). Gender difference in smoking effects on lung function and risk of hospitalization for COPD: results from a Danish longitudinal population study. *European Respiratory Journal*. 10: 822-827. Available from: http://erj.ersjournals.com/cgi/reprint/10/4/822.

158　Kennedy, S.M., Chambers, R., Du, W., Dimich-Ward, H. (2007). Environmental and occupational exposures: do they affect chronic obstructive pulmonary disease differently in women and men? *Proceedings of the American Thoracic Society*. 4: 692-694. Available from: http://pats.atsjournals.org/cgi/reprint/4/8/692.

159　Baker, D., Marks, G., Poulos, L., Williamson, M. (2004). Review of proposed National Health Priority Area asthma indicators and data sources. Available from: http://www.asthmamonitoring.org/PDF/review_asthma_ind_final.pdf.

160　Phelan, P.D., Robertson, C.F., Olinsky, A. (2002). The Melbourne Asthma Study: 1964-1999. *Journal of Allergy and Clinical Immunology*. 109(2): 189-194. Available from: http://www.sciencedirect.com/science/article/B6WH4-45V7WNK-2/2/ebb8e36702ff3b26e5c08abf88a0b9e4.

161　Public Health Agency of Canada. (2008). *Asthma*. Available from: http://www.phac-aspc.gc.ca/cd-mc/crd-mrc/asthma-asthme-eng.php.

162　Centers for Disease Control and Prevention. (2002). Surveillance for Asthma — United States, 1980—1999. *Surveillance Summaries*. 51(SS01): 1-13. Available from: http://www.cdc.gov/MMWR/preview/mmwrhtml/ss5101a1.htm.

163　Catterall, J.R., Rhind, G.B., Stewart, I.C., Whyte, K.F., Shapiro, C.M., Douglas, N.J. (1986). Effect of sleep deprivation on overnight bronchoconstriction in nocturnal asthma. *Thorax*. 41(9): 676-680. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC460429/.

164　Zielinski, T.A., Brown, E.S., Nejtek, V.A., Khan, D.A., Moore, J.J., Rush, A.J. (2000). Depression in asthma: prevalence and clinical implications. *The Primary Care Companion to the Journal of Clinical Psychiatry*. 2(5): 153-158.

165　Woznicki, K. (2010). Childhood asthma linked to risk of COPD. *Medscape*.

166　National Academy of Sciences Institute of Medicine (NAS). (2000). *Clearing the Air: Asthma and Indoor Air Exposures*. National Academic Press, Washington, DC.

167　von Mutius, E., Illi, S., Hirsch, T., Leupold, W., Keil, U., Weiland, S.K. (1999). Frequency of infections and risk of asthma, atopy and airway hyperresponsiveness in children. *European Respiratory Journal*. 14: 4-11.

168　Calvani, M. Jr., Alessandri, C., Bonci, E. (2002). Fever episodes in early life and the development of atopy in children with asthma. *European Respiratory Journal*. 20: 391-396. Available from: http://erj.ersjournals.com/cgi/content/abstract/20/2/391.

169　Potera, C. (2003). Low birth weight linked to asthma. *Environmental Health Perspectives*. 111(3): 146-149.

170　Beuther, D.A., Weiss, S.T., Sutherland, E.R. (2006). Obesity and asthma. *American Journal of Respiratory and Critical Care Medicine*. 174: 112-119. Available from: http://ajrccm.atsjournals.org/cgi/reprint/174/2/112.

171　Camargo, C.A. Jr., Weiss, S.T., Zhang, S., Willett, W.C., Speizer, F.E. (1999). Prospective study of body mass index, weight change, and risk of adult-onset asthma in women. *Archives of Internal Medicine*. 159: 2582–2588. Available from: http://archinte.ama-assn.org/cgi/reprint/159/21/2582.

172　Smith, G.C.S., Wood, A.M., White, I.R., Pell, J.P., Cameron, A.D., Dobbie, R. (2004). Neonatal respiratory morbidity at term and the risk of childhood asthma. *Archive of Disease in Childhood*. 89: 956-960. Available from: http://adc.bmj.com/content/89/10/956.abstract.

173 Gilmour, I., Jaakkola, M.S., London, S.J., Nel, A.E., Rogers, C.A. (2006). How exposure to environmental tobacco smoke, outdoor air pollutants, and increased pollen burdens influences the incidence of asthma. *Environmental Health Perspectives*. 114(4): 627-633.

174 Lau, S., Illi, S., Sommerfield, C., Niggermann, B., Bergman, R., von Mutius, E., Wahn, U., & the Multicentre Allergy Study Group. (2000). Early exposure to house-dust mite and cat allergens and development of childhood asthma: a cohort study. *The Lancet*. 356: 1392-1397.

175 Reijonen, T.M., Kotaniemi-Syrjanen, A., Korhonen, K., Korppi, M. (2000). Predictors of asthma three years after hospital admission for wheezing in infancy. *Pediatrics*. 106: 1406-1412. Available from: http://pediatrics.aappublications.org/cgi/content/abstract/106/6/1406.

176 Celedon, J.C., Lintonjua, A.A., Ryan, L., Weiss, S.T., Gold, D.R. (2002). Day care attendance, respiratory tract illnesses, wheezing, asthma, and total serum IgE level in early childhood. *Archives of Pediatrics & Adolescent Medicine*. 156(3): 241-245. Available from: http://archpedi.ama-assn.org/cgi/reprint/156/3/241.pdf.

177 Weiss, S.T. (2002). Eat Dirt – The Hygiene Hypothesis and allergic diseases. *The New England Journal of Medicine*. 347(12): 930-931. Available from: http://content.nejm.org/cgi/content/full/347/12/930.

178 Vartiainen, E., Seppälä, T., Lillsunde, P., Puska, P. (2002).Validation of self-reported smoking by serum cotinine measurement in a community-based study. *Journal of Epidemiology and Community Health*. 56: 167-170. Available from: http://jech.bmj.com/content/56/3/167.full.pdf.

179 West, R., Zatonski, W., Przewozniak, K., Jarvis, M.J. (2007). Can we trust national smoking prevalence figures? Discrepancies between biochemically assessed and self-reported smoking rates in three countries. *Cancer Epidemiology, Biomarkers & Prevention*. 16: 820-822. Available from: http://cebp.aacrjournals.org/content/16/4/820.full.pdf+html.

180 Patrick, D.L., Cheadle, A.,Thompson, D.C., Diehr, P., Koepsell,T., Kinne, S. (1994).The validity of self-reported smoking: a review and meta-analysis. *American Journal of Public Health*. 84(7): 1086-1093. Available from: http://ajph.aphapublications.org/cgi/reprint/84/7/1086.

181 Peto, R., Lopez, A.D., Boreham, J.,Thun, M., Heath, C. Jr., Doll, R. (1996). Mortality from smoking worldwide. *British Medical Journal*. 52(1): 12-21. Available from: http://bmb.oxfordjournals.org/cgi/reprint/52/1/12.

182 Ezzati, M., Lopez, A.D. (2003). Estimates of global mortality attributable to smoking in 2000. *The Lancet*. 362: 847-852.

183 Rehm, J., Baliunas, D., Brochu, S., Fischer, B., Gnam, W., Patra, J., Popova, S., Sarnocinska-Hart, A.,Taylor, B. (2006). *The costs of substance abuse in Canada 2002*. Available from: http://www.risqtoxico.ca/documents/2006_Brochu_ReportCost.pdf.

184 U.S. Department of Health and Human Services. (2004). *The Health Consequences of Smoking: A Report of the Surgeon General*. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2004. Available from: http://www.cdc.gov/tobacco/data_statistics/sgr/2004/complete_report/index.htm.

185 Public Health Agency of Canada. (2010). *Life with arthritis in Canada: a personal and public health challenge*. Available from: http://www.phac-aspc.gc.ca/cd-mc/arthritis-arthrite/lwaic-vaaac-10/5-eng.php.

186 Gaudin, P., Leguen-Guegan, S., Allenet, B., Baillet, A., Grange, L., Juvin, R. (2008). Is dynamic exercise beneficial in patients with rheumatoid arthritis? *Joint Bone Spine*. 75: 11-17.

187 Dunlop, D.D., Semanik, P., Song, J., Manheim, L.M., Shih,V., Chang, R.W. (2005). Risk factors for functional decline in older adults with arthritis. *Arthritis and Rheumatism*. 52(4): 1274-1282. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/110438370/PDFSTART.

188 Häkkinen, A., Sokka,T., Kotaniemi, A., Hannonen, P. (2001). A randomized two-year study of the effects of dynamic strength training on muscle strength, disease activity, functional capacity, and bone mineral density in early rheumatoid arthritis. *Arthritis and Rheumatism*. 44(3): 515-522. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/78003200/PDFSTART?CRETRY=1&SRETRY=0

189 Messier, S.P., Loeser, R.F., Miller, G.D., Morgan, T.M., Rejeski, W.J., Sevick, M.A., Ettinger, W.H. Jr., Pahor, M., Williamson, J.D. (2004). Exercise and dietary weight loss in overweight and obese older adults with knee osteoarthritis: the arthritis, diet, and activity promotion trial. *Arthritis and Rheumatism*. 50(5): 1501-1510. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/108563876/PDFSTART.

190 Tukker, A., Visscher, T.L.S., Picavet, H.S.J. (2008). Overweight and health problems of the lower extremities: osteoarthritis, pain and disability. *Public Health Nutrition*. 12(3): 359-368. Available from: http://journals.cambridge.org/action/displayFulltext?type=1&fid=3824672&jid=&volumeId=&issueId=03&aid=3824664&bodyId=&membershipNumber=&societyETOCSession.

191 Marks, R., Allegrante, J.P. (2007). Prevalence and impact of arthritis: opportunity for prevention. *Health Education Journal*. 66: 3-21. Available from: http://hej.sagepub.com/content/66/1/3.full.pdf+html.

192 Kanis, J.A., Johnell, O., Oden, A., Sernbo, I., Redlund-Johnell, I., Dawson, A., de Laet, C., Jonsson, B. (2000). Long-term risk of osteoporosic fracture in Malmö. *Osteoporosis International*. 11: 669-674. Available from: http://www.springerlink.com/content/uru1d0dw9c3dv278/fulltext.pdf.

193 Lin, J.T., Lane, J.M. (2004). Osteoporosis: a review. *Clinical Orthopaedics and Related Research*. 425: 126-134.

194 Ralston, S.H., de Crombrugghe, B. (2010). Genetic regulation of bone mass and susceptibility to osteoporosis. *Genes and Development*. 20: 2492-2506. Available from: http://genesdev.cshlp.org/content/20/18/2492.full.pdf+html.

195 Rizzoli, R., Boonen, S., Brandi, M.L., Burlet, N., Delmas, P., Reginster, J.Y. (2008). The role of calcium and vitamin D in the management of osteoporosis. *Bone*. 42: 246-249.

196 Wolff, I., van Croonenborg, J.J., Kemper, H.C.G., Kostense, P.J., Twisk, J.W.R. (1999). The effect of exercise training programs on bone mass: a meta-analysis of published controlled trials in pre- and postmenopausal women. *Osteoporosis International*. 9: 1-12. Available from: http://www.springerlink.com/content/ywv4w3m54tfx5kt0/fulltext.pdf.

197 Hallström, T., Wolk, A., Glynn, A., Michaelsson, K. (2006). Coffee, tea and caffeine consumption in relation to osteoporotic fracture risk in a cohort of Swedish women. *Osteoporosis International*. 17: 1055–1064. Available from: http://www.springerlink.com/content/k51814917p6lr7k8/fulltext.pdf.

198 Wetmore, C.M., Ichikawa, L., LaCroix, A.Z., Ott, S.M., Scholes, D. (2008). Association between caffeine intake and bone mass among young women: potential effect modification by depot medroxyprogesterone acetate use. *Osteoporosis International*. 19: 519–527. Available from: http://www.springerlink.com/content/92n2232980k41251/fulltext.pdf.

199 Kanis, J.A., Johansson, H., Johnell, O., Oden, A., de Laet, C., Eisman, J.A., Pols, H., Tetenhouse, A. (2005). Alcohol intake as a risk factor for fracture. *Osteoporosis International*. 16: 737-742. Available from: http://www.springerlink.com/content/r6bmh7jrxrx9w2g2/fulltext.pdf.

200 Fang, L., Oliver, A., Jayaraman, G.C., Wong, T. (2010). Trends in age disparities between younger and middle-aged adults among reported rates of Chlamydia, Gonorrhea and infectious Syphilis infections in Canada: Findings from 1997 to 2007. *Sexually Transmitted Diseases*. 37(1): 18-25.

201 Public Health Agency of Canada. (2010). *Canadian Guideline on Sexually Transmitted Infections – Chlamydial Infections, 2010*. Available from: http://www.phac-aspc.gc.ca/std-mts/sti-its/pdf/502chlamydia-eng.pdf.

202 To learn more about the rates of Chlamydia in Canada for different age groups, visit: http://www.phac-aspc.gc.ca/std-mts/sti-its_tab/chlamydia1991-08-eng.php.

203 Anderson, J.E. (2003). Condom use and HIV risk among US adults. *American Journal of Public Health*. 93: 912-914. Available from: http://ajph.aphapublications.org/cgi/reprint/93/6/912.

204 Mercer, C.H., Copas, A.J., Sonnenberg, P., Johnson, A.M., McManus, S., Erens, B., Cassel, J.A. (2008). Who has sex with whom? Characteristics of heterosexual partnerships reported in a national probability survey and implications for STI risk. *International Journal of Epidemiology*. 38: 206-214. Available from: http://ije.oxfordjournals.org/cgi/reprint/38/1/206.

205 Grant, K., Ragsdale, K. (2008). Sex and the 'recently single': perceptions of sexuality and HIV risk among mature women and primary care physicians. *Culture, Health and Sexuality*. 10(5): 495-511.

206 Low, N., Broutet, N., Adu-Sarkodie, Y., Barton, P., Hossain, M., Hawkes, S. (2006). Global control of sexually transmitted infections. *The Lancet*. 368: 2001-2016.

207 Cohen, M.S., Hoffman, I.F., Royce, R.A., Kazembe, P., Dyer, J.R., Costello Daly, C., Zimba, D., Vernazza, P.L., Maida, M., Fiscus, S.A., Eron, J.J. Jr., and the AIDSCAP Malawi Research Group. (1997). Reduction of concentration of HIV-1 in semen after treatment of urethritis: implications for prevention of sexual transmission of HIV-1. *The Lancet*. 349(9069): 1868-1873.

208 Public Health Agency of Canada. (2008). *What is HIV/AIDS?* Available from: http://www.phac-aspc.gc.ca/aids-sida/info/index-eng.php.

209 Joint United Nations Programme on HIV/AIDS, *2008 Report on the Global AIDS Epidemic.* Available from: http://www.unaids.org/en/KnowledgeCentre/HIVData/GlobalReport/2008/2008_Global_report.asp.

210 Mullen, P.D., Ramírez, G., Strouse, D., Hedges, L.V., Sogolow, E. (2002). Meta-analysis of the effects of behavioural HIV prevention interventions on the sexual risk behaviour of sexually experienced adolescents in controlled studies in the United States. *Journal of Acquired Immune Deficiency Syndromes*. 30: S94-S105.

211 Semaan, S., Des Jarlais, D.C., Sogolow, E., Johnson, W.D., Hedges, L.V., Ramirez, G., Flores, S.A., Norman, L., Sweat, M.D., Needle, R. (2002). A meta-analysis of the effect of HIV prevention interventions on the sex behaviors of drug users in the United States. *Journal of Acquired Immune Deficiency Syndromes.* 30: S73-S93. Available from: http://journals.lww.com/jaids/Abstract/2002/07011/A_Meta_analysis_of_the_Effect_of_HIV_Prevention.8.aspx.

212 Strathdee, S.A., Hallett, T.B., Bobrova, N., Rhodes, T., Booth, R., Abdool, R., Hankins, C.A. (2010). HIV and risk environment for injecting drug users: the past, present, and future. *The Lancet.* 376: 268-284.

213 Jaffe, H.W., Valdiserri, R.O., De Cock, K.M. (2007). The reemerging HIV/AIDS epidemic in men who have sex with men. *Journal of the American Medical Association.* 298(20): 2412-2414. Available from: http://jama.ama-assn.org/cgi/reprint/298/20/2412.

214 Jewkes, R. (2010). Gender inequities must be addressed in HIV prevention. *Science.* 329: 145-147. Available from: http://www.sciencemag.org/cgi/reprint/329/5988/145.pdf.

215 Larkin, J., Flicker, S., Koleszar-Green, R., Mintz, S., Dagnino, M., Mitchell, C. (2007). HIV risk, systemic inequities, and Aboriginal youth. *Canadian Journal of Public Health.* 98(3): 179-182. Available from: http://journal.cpha.ca/index.php/cjph/article/viewFile/811/811.

216 Marks, G., Crepaz, N., Senterfitt, J.W., Janssen, R.S. (2005). Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States—Implication for HIV Prevention Programs. *Epidemiology and Social Science.* 39(4): 446-453. Available from: http://journals.lww.com/jaids/Fulltext/2005/08010/Meta_Analysis_of_High_Risk_Sexual_Behavior_in.13.aspx.

217 Crepaz, N., Lyles, C.M., Wolitski, R.J., Passin, W.F., Rama, S.M., Herbst, J.H., Purcell, D.W., Malow, R.M., Stall, R., for the HIV/AIDS Prevention Research Synthesis (PRS) Team. (2006). Do prevention interventions reduce HIV risk behaviours among people living with HIV? A meta-analytical review of controlled trials. *AIDS.* 20: 143-157.

218 Murphy, E.L., Collier, A.C., Kalish, L.A., Assman, S.F., Para, M.F., Flanigan, T.P., Kumar, P.N., Mintz, L., Wallach, F.R., Nemo, G.J. (2001). Highly active antiretroviral therapy decreases mortality and morbidity in patients with advanced HIV disease. *Annals of Internal Medicine*. 135(1): 17-26. Available from: http://www.annals.org/content/135/1/17.full.pdf+html.

219 Vlahov, D., Galai, N., Safaeian, M., Galea, S., Kirk, G.D., Lucas, G.M., Sterling, T.R. (2005). Effectiveness of highly active antiretroviral therapy among injection drug users with late-stage human immunodeficiency virus infection. *American Journal of Epidemiology.* 161(11): 999-1012. Available from: http://aje.oxfordjournals.org/cgi/reprint/161/11/999.

220 Little, S.J., Holte, S., Routy, J.P., Daar, E.S., Markowitz, M., Collier, A.C., Koup, R.A., Mellors, J.W., Connick, E., Conway, B., Kilby, M., Wang, L., Whitcomb, J.M., Hellman, N.S., Richman, D.D. (2002). Antiretroviral-drug resistance among patients recently infected with HIV. *The New England Journal of Medicine*. 347(6): 385-394.

221 Canadian Food Inspection Agency. (2005). *E. coli 0157:H7 Food safety facts: Preventing foodborne illness*. Available from: http://www.inspection.gc.ca/english/fssa/concen/cause/ecolie.shtml.

222 Clark, W.F., Kortas, C., Suri, R.S., Moist, L.M., Salvadori, M., Weir, M.A., Garg, A.X. (2008). Excessive fluid intake as a novel cause of proteinuria. *Canadian Medical Association Journal*. 178(2): 173-175. Available from: http://ecmaj.ca/content/178/2/173.full.pdf+html.

223 Richards, A. (2005). The Walkerton Health Study. *The Canadian Nurse*. 101(5): 16-21.

224 Garg, A.X., Salvadori, M., Moist, L.M., Suri, R.S., Clark, W.F. (2009). Renal prognosis of toxigenic Escherichia coli infection. *Kidney International*. 75: S38-S41.

225 Aiello, A.E., Coulborn, R.M., Perez, V., Larson, E.L. (2008). Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. *American Journal of Public Health*. 98(8): 1372-1381. Available from: http://ajph.aphapublications.org/cgi/reprint/98/8/1372.

226 Public Health Agency of Canada. (2010). *Verotoxic E. coli*. Available from: http://dsol-smed.phac-aspc.gc.ca/dsol-smed/ndis/diseases/ecol_e.html.

227 Cosgrove, S.E. (2006). The relationship between antimicrobial resistance and patient outcomes: mortality, length of hospital stay, and health care costs. *Clinical Infectious Diseases*. 42: S82-S89.

228 Holmberg, S.D., Solomon, S.L., Blake, P.A. (1987). Health and economic impacts of antimicrobial resistance. *Reviews of Infectious Diseases*. 9: 1065–1078. Available from: http://www.jstor.org/pss/4454251.

229 Health Canada. (2006). *Antibiotic Resistance*. Available from: http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/med/antibio-eng.php.

230 Weinstein, R.A. (2001). Controlling antimicrobial resistance in hospitals: infection control and use of antibiotics. *Emerging Infectious Diseases*. 7: 188-192. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2631704/pdf/11294703.pdf.

231 Conly, J. (2002). Antimicrobial resistance in Canada. *Canadian Medical Association Journal*. 167(8): 885-891. Available from: http://www.cmaj.ca/cgi/reprint/167/8/885.

232 Guerra, C.M., Pereira, C.A.P., Neves Neto, A.R., Cardo, D.M., Correa, L. (2007). Physicians' perceptions, beliefs, attitudes, and knowledge concerning antimicrobial resistance in a Brazilian teaching hospital. *Infection Control and Hospital Epidemiology*. 28: 1411-1414.

233 de Goma, E.M., Leeper, N.J., Heidenreich, P.A. (2008). Clinical significance of high-density lipoprotein cholesterol in patients with low low-density lipoprotein cholesterol. *Journal of the American College of Cardiology*. 51: 49-55. Available from: http://content.onlinejacc.org/cgi/reprint/51/1/49.pdf.

234 Briel, M., Ferreira-Gonzalez, I., You, J.J., Karanicolas, P.J., Akl, E.A., Wu, P., Blechacz, B., Bassler, D., Wei, X., Sharman, A., Whitt, I., Alves da Silva, S., Khalid, Z., Nordmann, A.J., Zhou, Q., Walter, S.D., Vale, N., Bhatnagar, N., O'Regan, C., Mills, E.J., Bucher, H.C., Montori, V.M., Guyatt, G.H. (2009). Association between change in high density lipoprotein cholesterol and cardiovascular disease morbidity and mortality: systematic review and meta-regression analysis. *British Medical Journal*. 338: 1-8.

235 Hu, F.B., Manson, J.E., Willett, W.C. (2001). Types of dietary fat and risk of coronary heart disease: a critical review. *Journal of the American College of Nutrition*. 20(1): 5-19. Available from: http://www.jacn.org/cgi/reprint/20/1/5.

236 Dietschy, J.M. (1998). Dietary fatty acids and the regulation of plasma low density lipoprotein cholesterol concentrations. *Journal of Nutrition*. 128: 444S-448S. Available from: http://jn.nutrition.org/cgi/reprint/128/2/444S.

237 Kris-Etherton, P.M., Pearson, T.A., Wan, Y., Hargrove, R.L., Moriarty, K., Fishell, V., Etherton, T.D. (1999). High–monounsaturated fatty acid diets lower both plasma cholesterol and triacylglycerol concentrations. *American Journal of Clinical Nutrition*. 70: 1009-1015. Available from: http://www.ajcn.org/cgi/reprint/70/6/1009.

238 Katan, M.B., Zock, P.L., Mensink, R.P. (1995). Dietary oils, serum lipoproteins, and coronary heart disease. *American Journal of Clinical Nutrition*. 61(supplement): 1368S-1373S.

239 Brown, L., Rosner, B., Willett, W.W., Sacks, F.M. (1999). Cholesterol-lowering effects of dietary fiber: a meta-analysis. *American Journal of Clinical Nutrition*. 69: 30-42. Available from: http://www.ajcn.org/cgi/reprint/69/1/30.

240 Anderson, J.W., Baird, P., Davis, R.H. Jr., Ferreri, S., Knudtson, M., Koraym, A., Waters, V., Williams, C.L. (2009). Health benefits of dietary fiber. *Nutrition Reviews*. 67(4): 188-205. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1753-4887.2009.00189.x/pdf.

241 Halverstadt, A., Phares, D.A., Wilund, K.R., Goldberg, A.P., Hagberg, J.M. (2007). Endurance exercise training raises high-density lipoprotein cholesterol and lowers small low-density lipoprotein and very low-density lipoprotein independent of body fat phenotypes in older men and women. *Metabolism Clinical and Experimental*. 56: 444-450.

242 Leon, A.S., Sanchez, O.A. (2001). Response of blood lipids to exercise training alone or combined with dietary intervention. *Medicine and Science in Sports and Exercise*. 33: S502-S515.

243 Leon, A.S., Sanchez, O.A. (2001). Meta-analysis of the effects of aerobic exercise training on blood lipids. *Circulation*. 104 (Suppl II): 414-415.

244 Treasure, C.B., Klein, J.L., Weintraub, W.S., Talley, J.D., Stillabower, M.E., Kosinski, A.S., Zhang, J., Boccuzzi, S.J., Cedarholm, J.C., Alexander, R.W. (1995). Beneficial effects of cholesterol-lowering therapy on the coronary endothelium in patients with coronary artery disease. *The New England Journal of Medicine*. 332(8): 481-487.

245 Wilkins, K., Campbell, N.R.C., Joffres, M.R., McAlister, F.A., Nichol, M., Quach, S., Johansen, H.L., Tremblay, M.S. (2010). Blood pressure in Canadian adults. *Health Reports*. 21(1): 1-11. Available from: http://www.statcan.gc.ca/pub/82-003-x/2010001/article/11118-eng.pdf.

246 Goldstein, I.B., Shapiro, D., Guthrie, D. (2006). Ambulatory blood pressure and family history of hypertension in healthy men and women. *American Journal of Hypertension*. 19(5): 486-491.

247 Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo, J.L. Jr., Jones, D.W., Materson, B.J., Oparil, S., Wright, J.T. Jr., Roccella, E.J. (2003). Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension*. 42: 1206-1252. Available from: http://hyper.ahajournals.org/cgi/reprint/42/6/1206.

248 Dickinson, H.O., Mason, J.M., Nicolson, D.J., Campbell, F., Beyer, F.R., Cook, J.V., Williams, B., Ford, G.A. (2006). Lifestyle interventions to reduce raised blood pressure: a systematic review of randomized controlled trials. *Journal of Hypertension*. 24(2): 215-233.

249 Neter, J.E., Stam, B.E., Kok, F.J., Grobbee, D.E., Geleijnse, J.M. (2003). Influence of weight reduction on blood pressure: a meta-analysis of randomized controlled trials. *Hypertension*. 42: 878-884. Available from: http://hyper.ahajournals.org/cgi/reprint/42/5/878.

250 Whelton, S.P., Chin, A., Xin, X., He, J. (2002). Effect of aerobic exercise on blood pressure: a meta-analysis of randomized, controlled trials. *Annals of Internal Medicine*. 136: 493-503. Available from: http://www.annals.org/content/136/7/493.full.pdf+html.

251 Allen, K., Blascovich, J., Mendes, W.B. (2002). Cardiovascular reactivity and the presence of pets, friends, and spouses: the truth about cats and dogs. *Psychosomatic Medicine*. 64: 727-739. Available from: http://www.psychosomaticmedicine.org/cgi/content/abstract/64/5/727.

252 Stamler, R. (1991). Implications of the INTERSALT study. *Hypertension*. 17(1): I16-I20.

253 Lawes, C.M.M., Bennett, D.A., Feigin, V.L., Rodgers, A. (2004). Blood pressure and stroke: an overview of published reviews. *Stroke*. 35: 776-785. Available from: http://stroke.ahajournals.org/cgi/reprint/01.STR.0000116869.64771.5Av1.

254 Almeida, D.M. (2005). Resilience and vulnerability to daily stressors assessed via diary methods. *Current Directions in Psychological Science*. 14: 64-68.

255 McIntyre, K.P., Korn, J.H., Matsuo, H. (2008). Sweating the small stuff: how different types of hassles result in the experience of stress. *Stress and Health*. 24: 383-392. Available from: http://onlinelibrary.wiley.com/doi/10.1002/smi.1190/pdf.

256 Hammen, C. (2005). Stress and depression. *Annual Review of Clinical Psychology*. 1: 293-319. Available from: http://arjournals.annualreviews.org/doi/pdf/10.1146/annurev.clinpsy.1.102803.143938.

257 Cohen, S., Janicki-Deverts, D., Miller, G.E. (2007). Psychological stress and disease. *Journal of the American Medical Association*. 298(14): 1685-1687. Available from: http://jama.ama-assn.org/cgi/reprint/298/14/1685.

258 Kalimo, R., Tenkanen, L., Härmä, M., Poppius, E., Heinsalmi, P. (2000). Job stress and sleep disorders: findings from the Helsinki Heart Study. *Stress Medicine*. 16: 65–75. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/71004348/PDFSTART.

259 Kouvonen, A., Kivimäki, M., Elovainio, M., Virtanen, M., Linna, A., Vahtera, J. (2005). Job strain and leisure-time physical activity in female and male public sector employees. *Preventive Medicine*. 41: 532–539.

260 Kouvonen, A., Kivimäki, M., Virtanen, M., Pentti, J., Vahtera, J. (2005). Work stress, smoking status, and smoking intensity: an observational study of 46,190 employees. *Journal of Epidemiology & Community Health.* 59: 63–69.

261 McEwen, B.S. (1998). Protective and damaging effects of stress mediators. *The New England Journal of Medicine*. 338: 171-179.

262 Brady, S.S., Matthews, K.A. (2006). Chronic stress influences ambulatory blood pressure in adolescents. *Annals of Behavioral Medicine*. 31(1): 80-88. Available from: http://www.springerlink.com/content/x651880406747811/fulltext.pdf.

263 Kivimäki, M., Virtanen, M., Elovainio, M., Kouvonen, A., Väänänen, A., Vahtera, J. (2006). Work stress in the etiology of coronary heart disease: a meta-analysis. *Scandinavian Journal of Work, Environment and Health*. 32(6): 431-442.

264 Belkic, K.L., Landsbergis, P.A., Schnall, P.L., Baker, D. (2004). Is job strain a major source of cardiovascular disease risk? *Scandinavian Journal of Work, Environment and Health*. 30(2): 85-128.

265 Hintsanen, M., Kivimäki, M., Elovainio, M., Pulkki-Råback, L., Keskivaara, P., Juonala, M., Raitakari, O.T., Keltikangas-Järvinen, L. (2005). Job strain and early atherosclerosis: the cardiovascular risk in young Finns study. *Psychosomatic Medicine*. 67: 740-747. Available from: http://www.psychosomaticmedicine.org/cgi/reprint/67/5/740.

266 Campagne, D.M. (2006). Should fertilization treatment start with reducing stress? *Human Reproduction*. 21(7): 1651–1658. Available from: http://humrep.oxfordjournals.org/cgi/reprint/21/7/1651.

267 Epel, E.S., Blackburn, E.H., Lin, J., Dhabbar, F.S., Adler, N.E., Morrow, J.D., Cawthon, R.M. (2004). Accelerated telomere shortening in response to life stress. *Proceedings of the National Academy of Sciences of the United States of America*. 101: 17312-17315. Available from: http://www.pnas.org/content/101/49/17312.full.pdf+html.

268 Dunn, A.L., Trivedi, M.H., O'Neal, H.A. (2001). Physical activity dose-response effects on outcomes of depression and anxiety. *Medicine and Science in Sports and Exercise*. 33: S587-S597.

269 Hassmén, P., Koivula, N., Uutela, A. (2000). Physical exercise and psychological well-being: a population study in Finland. *Preventive Medicine*. 30: 17–25.

270 Michalsen, A., Grossman, P., Acil, A., Langhorst, J., Lüdtke, R., Esch, T., Stefano, G.B., Dobos, G.J. (2005). Rapid stress reduction and anxiolysis among distressed women as a consequence of a three-month intensive yoga program. *Medical Science Monitor*. 11(12): CR555-561. Available from: http://www.yoga-vidya.de/fileadmin/yv/Yogatherapie/Artikel/StressreduktionYoga.pdf.

271 Smith, C., Hancock, H., Blake-Mortimer, J., Eckert, K. (2007). A randomised comparative trial of yoga and relaxation to reduce stress and anxiety. *Complementary Therapies in Medicine*. 15: 77-83.

272 Labbé, E., Schmidt, N., Babin, J., Pharr, M. (2007). Coping with stress: the effectiveness of different types of music. *Applied Psychophysiology and Feedback*. 32: 163-168. Available from: http://www.springerlink.com/content/j521ur30881238g7/fulltext.pdf.

273 Bennett, M.P., Zeller, J.M., Rosenberg, L., McCann, J. (2003). The effect of mirthful laughter on stress and natural killer cell activity. *Alternative Therapies in Health and Medicine*. 9(2): 38-45. Available from: http://digitalcommons.wku.edu/cgi/viewcontent.cgi?article=1008&context=nurs_fac_pub.

274 Kimura, H., Nagao, F., Tanaka, Y., Sakai, S., Ohnishi, T., Okumara, K. (2005). Beneficial effects of the Nishino Breathing Method on immune activity and stress level. *The Journal of Alternative and Complementary Medicine*. 11(2): 285-291. Available from: http://www.liebertonline.com/doi/pdf/10.1089/acm.2005.11.285.

275 Koszycki, D., Benger, M., Shlik, J., Bradwejn, J. (2007). Randomized trial of a meditation-based stress reduction program and cognitive behaviour therapy in generalized social anxiety disorder. *Behaviour Research and Therapy*. 45: 2518-2526.

276 Public Health Agency of Canada. (2009). *What is Diabetes*. Available from: http://www.phac-aspc.gc.ca/cd-mc/diabetes-diabete/index-eng.php.

277 Public Health Agency of Canada. (2009). *Report from the National Diabetes Surveillance System: Diabetes in Canada, 2009*. Available from: http://www.phac-aspc.gc.ca/publicat/2009/ndssdic-snsddac-09/pdf/report-2009-eng.pdf.

278 Tortora, G.J., Grabowski, S.R. (1996). *Principles of Anatomy and Physiology*. New York, NY: HarperCollins.

279 Hussain, A., Claussen, B., Ramachandran, A., Williams, R. (2006). Prevention of type 2 diabetes: a review. *Diabetes Research and Clinical Practice*. 76: 317-326.

280 Colagiuri, R. (2004). Integrating psycho-social issues into national diabetes programmes. *Diabetes Voice*. 49: 31-33.

281 Grey, M. (2000). Coping and Diabetes. *Diabetes Spectrum.* 13(3): 167. Available from: http://journal.diabetes.org/diabetesspectrum/00v13n3/pg167.htm.

282 Eriksson, J., Lindström, J. Tuomiletho, J. (2001). Potential for the prevention of type 2 diabetes. *British Medical Bulletin*. 60: 183-199. Available from: http://bmb.oxfordjournals.org/cgi/content/full/60/1/183.

283 Laaksonen, M.A., Knekt, P., Rissanen, H., Härkänen, T., Virtala, E., Maniemi, J., Aromaa, A., Heliövaara, M., Reunamen, A. (2010). The relative importance of modifiable potential risk factors of type 2 diabetes: a meta-analysis of two cohorts. *European Journal of Epidemiology*. 25: 115-124. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20012885.

284 Narayan, K.M.V., Imperatore, G., Benjamin, S.M., Engelgau, M.M. (2002). Targeting people with pre-diabetes. *British Medical Journal*. 325: 403-404. Available from: http://www.bmj.com/cgi/content/full/325/7361/403.

285 Chau, D., Edeman, S.V. (2001). Clinical management of diabetes in the elderly. *Clinical Diabetes.* 19(4): 172-175.

286 Hamilton, M.T., Hamilton, D.G., Zderic, T.W. (2007). Role of low energy expenditure and sitting in obesity, metabolic syndrome, type 2 diabetes, and cardiovascular disease. *Diabetes*. 56: 2655-2667.

287 LaMonte, M.J., Blair, S.N., Church, T.S. (2005). Physical activity and diabetes prevention. *Journal of Applied Physiology*. 99: 1205-1213. Available from: http://jap.physiology.org/cgi/reprint/99/3/1205.

288 Oldroyd, J., Banerjee, M., Heald, A., Cruickshank, K. (2005). Diabetes and ethnic minorities. *Postgraduate Medical Journal*. 81: 486-490. Available from: http://pmj.bmj.com/content/81/958/486.full.

289 Gale, E.A.M., Gillepsie, K.M. (2001). Diabetes and gender. *Diabetologia*. 44: 3-15. Available from: http://www.springerlink.com/content/bv0k0pev28qq9ea3/.

290 Tjepkema, M. (2005). *Nutrition: Findings from the Canadian Community Health Survey—Adult obesity in Canada: Measured height and weight*. Ottawa: Statistics Canada. Catalogue No. 82-620-MWE2005001. Available from: http://www.statcan.ca/english/research/82-620-MIE/2005001/pdf/aobesity.pdf.

291 The standard BMI is not considered to be an appropriate indicator for individuals under 18 years of age as they have different growth rates and may not have reached full growth. However, in individuals who are very lean, muscular or physically fit or who have not reached full growth, BMI can overestimate potential health risks. In addition, BMI does not consider bone density, and it may not provide an accurate assessment of health risks among adults over 65 years as well as members of certain ethnic and racial groups. BMI measures body weight at a given time and may not accurately represent the risk for people who have experienced sudden weight change which may suggest the presence of additional health problems.

292 The data cited here include the household population 18 years and older who reported their weight and height. Data exclude pregnant women and persons measuring less than 91.4 centimetres (three feet) or greater than 210.8 centimetres (six feet, 11 inches) in height. Results should be treated with caution because a proportion of the difference may be explained by the mode used to collect the data from the respondent (i.e., by phone or in person). Figures for obese classes I, II and III may not sum up to the totals in the graph *Self-reported body mass index (obese category)* due to rounding. "Not stated" rate not shown. Age-standardized to the 1991 Canadian population.

293 These data include the household population 18 years and older who reported their weight and height. Data exclude pregnant women and persons measuring less than 91.4 centimetres (three feet) or greater than 210.8 centimetres (six feet, 11 inches) in height. Results should be treated with caution because a proportion of the difference may be explained by the mode used to collect the data from the respondent (i.e., by phone or in person). "Not stated" rate has changed significantly over time. Age-standardized to the 1991 Canadian population.

294 Includes household population 18 years and older who reported their weight and height. Data exclude pregnant women and persons measuring less than 91.4 centimetres (three feet) or greater than 210.8 centimetres (six feet, 11 inches) in height. Results should be treated with caution because a proportion of the difference may be explained by the mode used to collect the data from the respondent (i.e., by phone or in person). Totals for the obese category may not equal the sum of obese classes I, II and III in the graph *Self-reported body mass index (all categories)* due to rounding. "Not stated" rate has changed significantly over time. Age-standardized to the 1991 Canadian population.

295 Spencer, E.A., Appleby, P.N., Davey, G.K., Key, T.J. (2002). Validity of self-reported height and weight in 4808 EPIC–Oxford participants. *Public Health Nutrition*. 5: 561-565. Available from: http://journals.cambridge.org/action/displayFulltext?type=1&fid=627568&jid=PHN&volumeId=5&issueId=04&aid=566220.

296 Must, A., Spadano, J., Coakley, E.H., Field, A.E., Colditz, G., Dietz., W.H. (1999). The disease burden associated with overweight and obesity. *Journal of the American Medical Association.* 282(16): 1523-1529. Available from: http://jama.ama-assn.org/cgi/reprint/282/16/1523.

297 Datillo, A.M., Kris-Etherton, P.M. (1992). Effects of weight reduction on blood lipids and lipoproteins: a meta-analysis. *American Journal of Clinical Nutrition*. 56: 320-328. Available from: http://www.ajcn.org/cgi/reprint/56/2/320.

298   Harrington, M., Gibson, S., Cottrell, R.C. (2009). A review and meta-analysis of the effect of weight loss on all-cause mortality risk. *Nutrition Research Reviews*. 22: 93-108.

299   The "physically active" category included those people reporting either active or moderately active levels of physical activity. Energy expenditure (EE) is calculated using the frequency and duration per session of the physical activity, as well as the metabolic equivalent (MET) value of the activity. MET is a value of metabolic energy cost expressed as a multiple of the resting metabolic rate. Persons whose total EE (based on reported frequency and durations of the various physical activity indicators) was between 1.5 and 2.9 kcal/kg/day were considered "moderately active," while those with total EE that was 3.0 kcal/kg/day or over were considered "active." Persons whose total EE was less than 1.5 kcal/kg/day were considered "inactive." A full explanation of the derivation of the Physical Activity Index is available at: http://www.statcan.ca/english/sdds/document/3226_D2_T9_V3_E.pdf.

300   Prince, S.A., Adamo, K.B., Hamel, M.E., Hardt, J., Connor Gorber, S., Tremblay, M. (2008). A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity*. 5: 56. Available from: http://www.ijbnpa.org/content/pdf/1479-5868-5-56.pdf.

301   Katzmarzyk, P.T., Janssen, I. (2004). The economic costs associated with physical inactivity and obesity in Canada: an update. *Canadian Journal of Applied Physiology*. 29(1): 90-115. Available from: http://article.pubs.nrc-cnrc.gc.ca/RPAS/rpv?hm=HInit&journal=apnm&volume=29&calyLang=eng&afpf=h04-008.pdf.

302   Fletcher, G.F., Balady, G., Blair, S.N., Blumenthal, J., Caspersen, C., Chaitman, B., Epstein, S., Sivarajan Froelicher, E.S., Froelicher, V.F., Pina, I.L., Pollock, M.L. (1996). Statement on exercise: benefits and recommendations for physical activity programs for all Americans. *Circulation*. 94: 857-862.

303   Paffenbarger, R. (2000). Physical exercise to reduce cardiovascular disease risk. *Proceedings of the Nutrition Society*. 59: 421-422. Available from: http://journals.cambridge.org/action/displayFulltext?type=1&fid=797300&jid=&volumeId=&issueId=03&aid=797288&bodyId=&membershipNumber=&societyETOCSession.

304   Kampert, J.B., Blair, S.N., Barlow, C.E., Kohl, H.W. (1996). Physical activity, physical fitness, and all-cause and cancer mortality: a prospective study of men and women. *Annals of Epidemiology*. 6: 452-457.

305   Lee, I.-M. (1994). Physical activity, fitness, and cancer. In: Bouchard, C., Shephard, R.J., Stephens, T., eds. *Physical Activity, Fitness, and Health*. Champaign, IL: Human Kinetics; pgs. 814-831.

306   Lee, Y. (2000). The predictive value of self-assessed general, physical, and mental health on functional decline and mortality in older adults. *Journal of Epidemiology and Community Health*. 54: 123-129. Available from: http://jech.bmj.com/content/54/2/123.full.pdf.

307   Grant, M.D., Piotrowski, Z.H., Chappell, R. (1995). Self-reported health and survival in the Longitudinal Study of Aging, 1984-1986. *Journal of Clinical Epidemiology*. 48: 375-387.

308   Kaplan, G.A., Goldberg, D.E., Everson, S.A., Cohen, R.D., Salonen, R., Tuomilehto, J., Salonen, J. (1996). Perceived health status and morbidity and mortality: evidence from the Kuopio Ischaemic Heart Disease Risk Factor Study. *International Journal of Epidemiology*. 25(2): 259-265. Available from: http://ije.oxfordjournals.org/cgi/reprint/25/2/259.

309   Burström, B., Fredlund, P. (2001). Self-rated health: is it as good a predictor of subsequent mortality among adults in lower as well as higher social classes? *Journal of Epidemiology and Community Health*. 55: 836-840. Available from: http://jech.bmj.com/content/55/11/836.full.pdf.

310   Singh-Manoux, A., Martikainen, P., Ferrie, J., Zins, M., Marmot, M., Goldberg, M. (2006). What does self rated health measure? Results from the British Whitehall II and French Gazel cohort studies. *Journal of Epidemiology and Community Health*. 60: 364–372. Available from: http://jech.bmj.com/content/60/4/364.full.pdf.

311   Choi, N.G. (2003). Determinants of self-perceived changes in health status among pre- and early-retirement populations. *International Journal of Aging and Human Development*. 56(3): 197-222.

312   Mishra, G.D., Brown, W.J., Dobson, A.J. (2003). Physical and mental health: changes during menopause transition. *Quality of Life Research*. 12: 405-412. Available from: http://www.springerlink.com/content/g20p2148w2023655/fulltext.pdf.

313 Mulsant, B.H., Ganguli, M., Seaberg, E.C. (1997). The relationship between self-rated health and depressive symptoms in an epidemiological sample of community-dwelling older adults. *Journal of the American Geriatrics Society*. 45: 954-958.

314 Buckley, N.J., Denton, F.T., Robb, A.L., Spencer, B.G. (2004). The transition from good to poor health: an econometric study of the older population. *Journal of Health Economics*. 23: 1013-1034.

315 Tremblay, S., Ross, N.A., Berthelot, J.-M. (2002). Regional socio-economic context and health. *Supplement to Health Reports*. 13: 1-12. Ottawa: Statistics Canada, Catalogue 82-002. Available from: http://www.statcan.gc.ca/pub/82-003-s/2002001/pdf/82-003-s2002003-eng.pdf.

316 Marmot, M.G., Bosma, H., Hemingway, H., Brunner, E., Stansfeld, S. (1997). Contribution of job control and other risk factors to social variations in coronary heart disease incidence. *The Lancet*. 350: 235-239.

317 Marcus, D.K., Gurley, J.R., Marchi, M.M., Bauer, C. (2007). Cognitive and perceptual variables in hypochondriasis and health anxiety: a systematic review. *Clinical Psychology Review*. 27: 127-139.

318 Barsky, A.J., Orav, E.J., Bates, D.W. (2005). Somatization increases medical utilization and costs independent of psychiatric and medical comorbidity. *Archives of General Psychiatry*. 62: 903-910. Available from: http://archpsyc.ama-assn.org/cgi/reprint/62/8/903.

319 Details on the determinants of health are available at: http://www.phac-aspc.gc.ca/ph-sp/determinants/index-eng.php.

320 Ferrucci, L., Izmirlian, G., Leveille, S., Phillips, C.L., Corti, M.-C., Brock, D.B., Guralnik, J.M. (1999). Smoking, physical activity, and active life expectancy. *American Journal of Epidemiology*. 149: 645-653. Available from: http://aje.oxfordjournals.org/cgi/reprint/149/7/645.

321 Leveille, S.G., Guralnik, J.M., Ferrucci, L., Langlois, J.A. (1999). Aging successfully until death in old age: opportunity for increasing active life expectancy. *American Journal of Epidemiology*. 149: 654-664. Available from: http://aje.oxfordjournals.org/cgi/reprint/149/7/654.

322 Danaei, G., Rimm, E.B., Oza, S., Kulkarni, S.C., Murray, C.J.L., Ezzati, M. (2010). The promise of prevention: the effects of four preventable risk factors on national life expectancy and life expectancy disparities by race and county in the United States. *Public Library of Science Medicine*. 7(3): e1000248. Available from: http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1000248.

323 Al Snih, S., Ottenbacher, K.J., Markides, K.S., Kuo, Y.-F., Eschbach, K., Goodwin, J.S. (2007). The effect of obesity on disability vs mortality on older Americans. *Archives of Internal Medicine*. 167: 774-780. Available from: http://archinte.ama-assn.org/cgi/reprint/167/8/774.

324 Trichopoulou, A., Vasilipoulou, E. (2000). Mediterranean diet and longevity. *British Journal of Nutrition*. 84: S205-S209. Available from: http://journals.cambridge.org/action/displayFulltext?type=1&fid=885740&jid=&volumeId=&issueId=S2&aid=885732&bodyId=&membershipNumber=&societyETOCSession.

325 Gundgaard, J., Noelsen, J.N., Olsen, J., Sørensen, J. (2003). Increased intake of fruit and vegetables: estimation of impact in terms of life expectancy and healthcare costs. *Public Health Nutrition*. 6(1): 25-30. Available from: http://journals.cambridge.org/action/displayFulltext?type=1&fid=1382060&jid=&volumeId=&issueId=01&aid=1382052&bodyId=&membershipNumber=&societyETOCSession.

326 Alley, D.E., Chang, V.W. (2007). The changing relationship of obesity and disability, 1988-2004. *Journal of the American Medical Association*. 298(17): 2020-2027. Available from: http://jama.ama-assn.org/cgi/reprint/298/17/2020.

327 Reynolds, S.L., Saito, Y., Crimmins, E.M. (2005). The impact of obesity on active life expectancy in older American men and women. *Gerontologist*. 45(4): 438-444.

328 Strawbridge, W.J., Cohen, R.D., Shema, S.J., Kaplan, G.A. (1996). Successful aging: predictors and associated activities. *American Journal of Epidemiology*. 144(2): 135-141. Available from: http://aje.oxfordjournals.org/cgi/reprint/144/2/135.

329 Public Health Agency of Canada. (2008). *Canadian Perinatal Health Report, 2008 Edition*. Available at: http://www.publichealth.gc.ca/cphr.

330 Euro-Peristat project, with SCPE, Eurocat and Euroneostat. (2008). *European Perinatal Health Report*. Available from: www.europeristat.com.

331 Metzler, M., Kanarek, N., Highsmith, K., Bialek, R., Straw, R., Auston, I., Stanley, J., Klein, R. (2008). Community health status indicators project: the development of a national approach to community health. *Preventing Chronic Disease.* 5(3): 1-8. Available from: http://www.cdc.gov/pcd/issues/2008/jul/pdf/07_0225.pdf.

332 Singh, G.K.,Yu, S.M. (1995). Infant mortality in the United States: trends, differentials, and projections, 1950 through 2010. *American Journal of Public Health*. 85(7): 957-964.

333 Public Health Agency of Canada. (2008). *Canadian Perinatal Health Report, 2008 Edition*. Available at: http://www.publichealth.gc.ca/cphr. See page 281 for details on causes of infant death.

334 McDonald, S.D., Han, Z., Mulla, S., Beyene, J. (2010). Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: systematic review and meta-analyses. *British Medical Journal.* 341: c3428. Available from: http://www.bmj.com/cgi/content/full/341/jul20_1/c3428.

335 Lu, M.C., Chen, B. (2004). Racial and ethnic disparities in preterm birth: the role of stressful life events. *American Journal of Obstetrics and Gynecology*. 191(3): 691-699. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15467527.

336 Alexander, G.R., Slay, M. (2002). Prematurity at birth: trends, racial disparities, and epidemiology. *Mental Retardation and Developmental Disabilities Research Reviews*. 8(4): 215-220. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/101520060/PDFSTART.

337 Varner, M.W., Esplin, M.S. (2005). Current understanding of genetic factors in preterm birth. *BJOG: An International Journal of Obstetrics and Gynecology*. 112(Supplement 1): 28-31. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/118670842/PDFSTART.

338 Gribbin, C., James, D. (2004). Assessing fetal health. *Best Practice and Research Clinical Obstetrics and Gynaecology.* 18(3): 441-424.

339 Godfrey, K.M. (1998). Maternal regulation of fetal development and health in adult life. *European Journal of Obstetrics and Gynecology*. 78: 141-150.

340 Feldman, P.J., Dunkel-Schetter, C., Sandman, C.A., Wadhwa, P.D. (2000). Maternal social support predicts birth weight and fetal growth in human pregnancy. *Psychosomatic Medicine.* 62: 715-725. Available from: http://www.psychosomaticmedicine.org/cgi/reprint/62/5/715.

341 Canning, P.M., Frizzell, L.M., Courage, M.L. (2009). Birth outcomes associated with prenatal participation in a government support programme for mothers with low incomes. *Child: Care, Health and Development.* 36(2): 225-231. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2214.2009.01045.x/pdf.

342 Khanani, I., Elam, J., Hearn, R., Jones, C., Maseru, N. (2010). The impact of prenatal WIC participation on infant mortality and racial disparities. *American Journal of Public Health.* 100(S1): S204-S209. Available from: http://ajph.aphapublications.org/cgi/content/abstract/100/S1/S204.

343 Ickovics, J.R., Kershaw, T.S., Westdahl, C., Magriples, U., Massey, Z., Reynolds, H., Schindler-Rising, S. (2007). Group prenatal care and perinatal outcomes. *Obstetrics and Gynecology.* 110: 330-339. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2276878/pdf/nihms-42174.pdf.

344 Kierans, W.J., Joseph, K.S., Luo, Z.-C., Platt, R., Wilkins, R., Kramer, M.S. (2008). Does one size fit all? The case for ethnic-specific standards of fetal growth. *BMC Pregnancy and Childbirth*. 8: 1-9. Available from: http://www.biomedcentral.com/content/pdf/1471-2393-8-1.pdf.

345 Jaddoe,V.W.V., Troe, E.J.W.M., Hofman, A., Mackenbach, J.P., Moll, H.A., Steegers, E.A.P., Witteman, J.C.M. (2008). Active and passive maternal smoking during pregnancy and the risks of low birthweight and preterm birth: the Generation R Study. *Paediatric and Perinatal Epidemiology*. 22: 162-171. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1365-3016.2007.00916.x/pdf.

346 Haggarty, P., Campbell, D.M., Duthie, S., Andrews, K., Hoad, G., Piyathilake, C., McNeill, G. (2009). Diet and deprivation in pregnancy. *British Journal of Nutrition*. 102: 1487-1497. Available from: http://journals.cambridge.org/action/displayFulltext?type=1&fid=6657348&jid=&volumeId=&issueId=10&aid=6657340&bodyId=&membershipNumber=&societyETOCSession.

347 Wen, S.W., Goldenberg, R.L., Cutter, G.R., Hoffman, H.J., Cliver, S.P. (1990). Intrauterine growth retardation and preterm delivery: prenatal risk factors in an indigent population. *American Journal of Obstetrics and Gynecology*. 162: 213-218.

348   Hendler, I., Goldenberg, R.L., Mercer, B.M., Iams, J.D., Meis, P.J., Moawad, A.H., MacPherson, C.A., Caritis, S.N., Miodovnik, M., Menard, K.M., Thurnau, G.R., Sorokin, Y. (2005). The Preterm Prediction Study: association between maternal body mass index (BMI) and spontaneous preterm birth. *American Journal of Obstetrics and Gynecology*. 192: 882-886.

349   Lee, Y.M., Cleary-Goldman, J., D'Alton, M.E. (2006). The impact of multiple gestations in late preterm (near-term) births. *Clinics in Perinatology*. 33(4): 777-792.

350   Tough, S.C., Newburn-Cook, C., Johnston, D.W., Svenson, L.W., Rose, S., Belik, J. (2005). Delayed childbearing and its impact on population rate changes in lower birth weight, multiple birth, and preterm delivery. *Pediatrics*. 109: 399-403. Available from: http://pediatrics.aappublications.org/cgi/reprint/109/3/399.

351   Zhu, B.P., Rolfs, R.T., Nangle, B.E., Horan, J.M. (1999). Effect of the interval between pregnancies on perinatal outcomes. *The New England Journal of Medicine*. 340(8): 589-594.

352   Fuentes-Afflick, E., Hessol, N.A. (2000). Interpregnancy interval and the risk of premature infants. *Obstetrics and Gynecology*. 95(3): 383-390.

353   Mercer, B.M., Goldenberg, R.L., Moawad, A.H., Meis, P.J., Iams, J.D., Das, A.F., Caritis, S.N., Miodovnik, M., Menard, M.K., Thurnau, G.R., Dombrowski, M.P., Roberts, J.M., McNellis, D., and the National Institute of Child Health Human Development Maternal-Fetal Medicine Units Network. (1999). The preterm prediction study: effect of gestational age and cause of preterm birth on subsequent obstetric outcome. *American Journal of Obstetrics and Gynecology*. 181: 1216-1221.

354   Smith, L.K., Draper, E.S., Manktelow, B.N., Dorling, J.S., Field, D.J. (2007). Socioeconomic inequalities in very preterm birth rates. *Archives of Disease in Childhood: Fetal and Neonatal*. 92(1): F11-F14.

355   Harder, T., Rodekamp, E., Schellong, K., Dudenhausen, J.W., Plagemann, A. (2007). Birth weight and subsequent risk of type 2 diabetes: a meta-analysis. *American Journal of Epidemiology*. 165(8): 849-857. Available from: http://aje.oxfordjournals.org/cgi/reprint/165/8/849.

356   Hack, M., Flannery, D.J., Schluchter, M., Cartar, L., Borawski, E., Klein, N. (2002). Outcomes in young adulthood for very-low-birth-weight infants. *The New England Journal of Medicine*. 346(3): 149-157.

357   McMillen, C., Robinson, J.S. (2005). Developmental origins of the metabolic syndrome: prediction, plasticity, and programming. *Physiological Reviews*. 85: 571-633. Available from: http://physrev.physiology.org/cgi/reprint/85/2/571.

358   Huxley, R., Owen, C.G., Whincup, P.H., Cook, D.G., Rich-Edwards, J., Smith, G.D., Collins, R. (2007). Is birth weight a risk factor for ischemic heart disease in later life? *American Journal of Clinical Nutrition*. 85: 1244-1250. Available from: http://www.ajcn.org/cgi/reprint/85/5/1244.

359   Curhan, G.C., Chertow, G.M., Willett, W.C., Spiegelman, D., Colditz, G.A., Manson, J.E., Speizer, F.E., Stampfer, M.J. (1996). Birth weight and adult hypertension and obesity in women. *Circulation*. 94: 1310-1315. Available from: http://circ.ahajournals.org/cgi/content/full/94/6/1310.

360   Health Canada. (2009). *It's Your Health – Influenza (the 'flu')*. Available from: http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/diseases-maladies/flu-grippe-eng.php.

361   Mullahy, J. (1999). It'll only hurt a second? Microeconomic determinants of who gets flu shots. *Health Economics*. 8(1): 9-24. Available from: http://onlinelibrary.wiley.com/doi/10.1002/%28SICI%291099-1050%28199902%298:1%3C9::AID-HEC396%3E3.0.CO;2-X/abstract.

362   Centers for Disease Control and Prevention. (2010). *Seasonal Influenza (Flu) - Seasonal Flu Shot*. Available from: http://www.cdc.gov/flu/about/qa/flushot.htm.

363   Fiore, A.E., Shay, D.K., Broder, K., Iskander, J.K., Uyeki, T.M., Mootrey, G., Bresee, J.S., Cox, N.J. (2009). Prevention and control of seasonal influenza with vaccines. *Morbidity and Mortality Weekly Report (MMWR)*. 58: 1-52. Available from: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr58e0724a1.htm.

364   Public Health Agency of Canada. (2010). *Information on Seniors and the Flu Virus (Seasonal Flu and H1N1 Flu)*. Available from: http://www.phac-aspc.gc.ca/alert-alerte/h1n1/fs-fi-seniors-aines-eng.php.

365   Public Health Agency of Canada. (2010). *Take the flu seriously - get the shot! - Influenza Immunization*. Available from: http://www.phac-aspc.gc.ca/im/iif-vcg/gs-pg-eng.php.

366 Simonsen, L., Taylor, R.J., Viboud, C., Miller, M.A., Jackson, L.A. (2007). Mortality benefits of influenza vaccination in elderly people: an ongoing controversy. *The Lancet Infectious Diseases*. 7(10): 658-666. Available from: http://download.thelancet.com/flatcontentassets/H1N1-flu/vaccination/vaccination-12.pdf.

367 Jefferson, T., Rivetti, D., Rivetti, A., Rudin, M., Pietrantonj, C.D., Demicheli, V. (2005). Efficacy and effectiveness of influenza vaccines in elderly people: a systematic review. *The Lancet*. 366(9492): 1165-1174. Available from: http://download.thelancet.com/pdfs/journals/lancet/PIIS0140673605673394.pdf?id=e16241398b8eb460:-69863000:12b165ce4e9:76c41284581218107.

368 Ministère de la Santé et des Services sociaux, Québec. (1999). *Injectable Influenza (seasonal flu) Vaccine*. Available from: http://www.msss.gouv.qc.ca/sujets/santepub/vaccination/index.php?aid=137.

369 Health Canada. (2009). *Misconceptions about Vaccine Safety*. Available from: http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/med/misconception-eng.php.

370 Centers for Disease Control and Prevention. (1999). *Seasonal Flu Shot*. Available from: http://www.cdc.gov/flu/about/qa/flushot.htm.