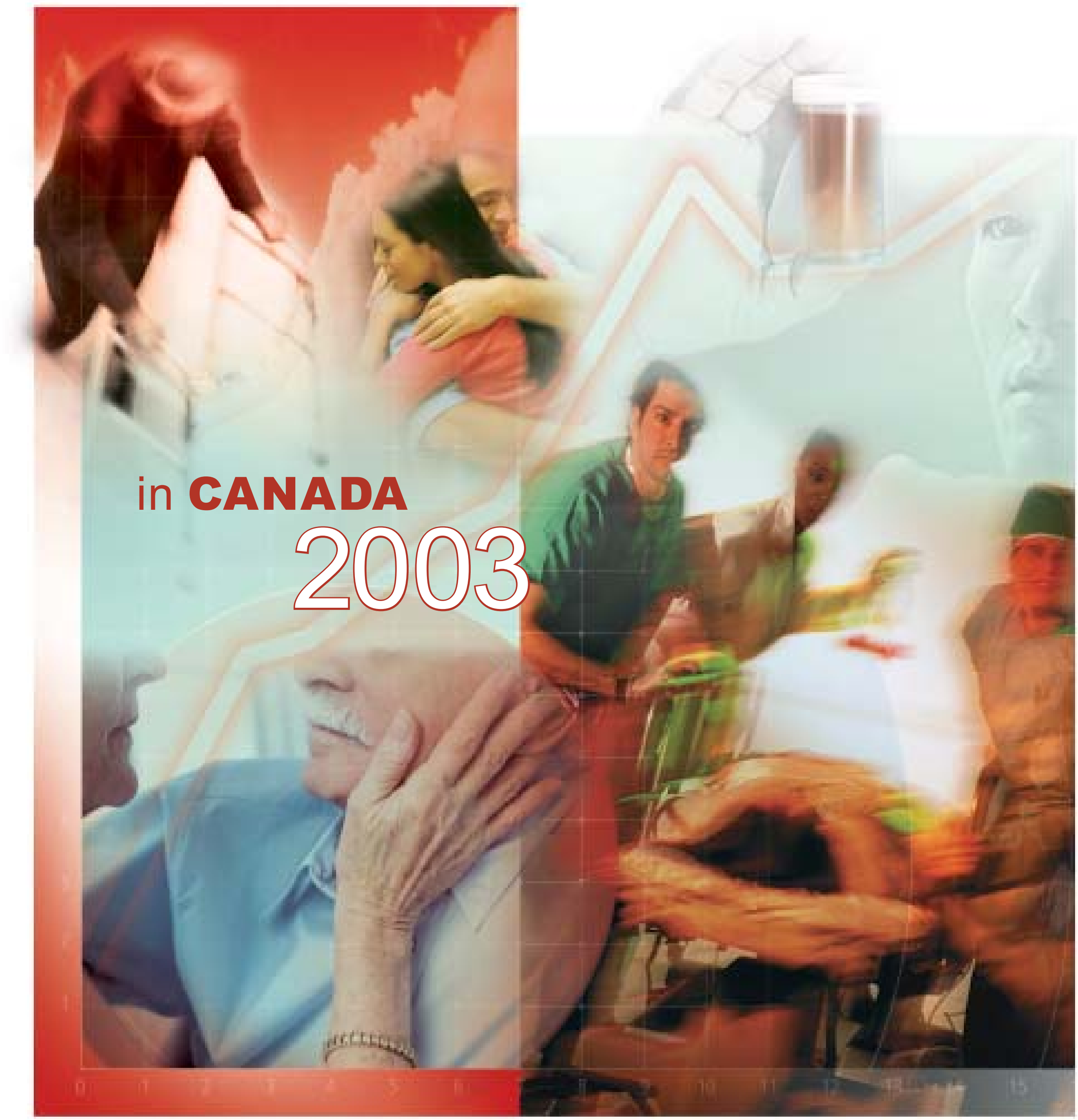
The GROWING BURDEN of HEART DISEASE and STROKE

HEART AND STROKE FOUNDATION OF CANADA
FONDATION DES MALADIES DU COEUR DU CANADA



in CANADA 2003

Health Canada / Santé Canada

Canadian Cardiovascular Society
Société canadienne de cardiologie

The content of this publication has been independently researched and written by the Heart and Stroke Foundation, in conjunction with its partners and is based on scientific evidence.

THE GROWING BURDEN OF HEART DISEASE AND STROKE IN CANADA 2003

Prepared in Collaboration with
Centre for Chronic Disease Prevention and Control, Health Canada
Canadian Cardiovascular Society
Heart and Stroke Foundation of Canada

Statistics Canada Statistique Canada

Data Sources & Analysis*
Statistics Canada
Canadian Institute for Health Information

CIHI ICIS
Canadian Institute for Health Information
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EXECUTIVE SUMMARY

The Growing Burden of Heart Disease and Stroke in Canada 2003 is the sixth edition of our biennial publication on the status of cardiovascular diseases in Canada. It serves as a natural sequel to the previous edition, *The Changing Face of Heart Disease and Stroke in Canada 2000*, which focused on the unfavourable profile of determinants of cardiovascular disease with an aging population and the adoption of unhealthy lifestyles by young Canadians, immigrants and native peoples. In this edition, we highlight the ongoing high cost that these diseases impose on our society, both in financial terms and in quality of life. With a predicted increase in the number of cases of cardiovascular diseases over the next 20 years, the resulting burden is expected to continue to increase.

Chapter 1 Risk Factors

Canadians run a high risk of developing cardiovascular diseases: 8 out of 10 individuals have at least one of the following risk factors — smoking, physical inactivity, being overweight, high blood pressure and diabetes — and 1 in 10 have three or more. As a result, unless community interventions with a sufficient preventive dose are implemented, the cardiovascular epidemic will continue. Addressing these risk factors will prevent not only cardiovascular diseases, but also many other chronic diseases that share the same risk factors.

For some risk factors, the trends are encouraging. Both physical inactivity in the adult population and smoking in general have decreased over the past 8 years, based on self-reported data. Unfortunately, the trends among other risk factors continue to give cause for concern. The percentage of the male population who are overweight has shown little change, and in fact, obesity is increasing among men (from 13.5% in 1994 to 16.1% in 2000). In addition, the prevalence of both self-reported high blood pressure and diabetes has increased. (High blood pressure rose from 11.6% to 14.4% and diabetes from 3.7% to 4.7% between 1994 and 2000).

Young people carry a high level of risk for cardiovascular diseases. Nearly two-fifths (38.7%) of teenaged girls are physically inactive. Over one-quarter of men and women in their twenties are overweight. Among young women in their later teens (18 and 19 years), 1 in 5 smokes cigarettes daily; among young men in the same age group, the statistic is nearly 1 in 4. Lifestyle habits that are formed in this early stage tend to be continued through life.

Risk factors differ between men and women. Women tend to be more physically inactive and to report having high blood pressure. More men than women smoke. Men are more likely to consume less than the recommended amount of fruits and vegetables and to be overweight.

The prevalence of all risk factors varies by region. In comparison to Canada as a whole, British Columbia tends to have a lower prevalence of all risk factors, while prevalence in Newfoundland tends to be higher. In spite of this, the previous east-west gradient in risk factors as seen in past reports has become muted, with some prairie provinces having higher risk factors and some eastern provinces having lower risk factors than other provinces or territories.

A major limitation of the existing data is its lack of physical and biochemical measures of cardiovascular risk. Most provinces have not repeated the Heart Health Surveys that were conducted between 1985 and 1990, leaving a critical void in information about the detection and control of high blood pressure and dyslipidemia in Canada. In addition, we must rely on self-reported weight and height to estimate the prevalence of being overweight in the population.

Chapter 2 Interventions and Services

Heart disease and stroke are chronic lifelong diseases that can be treated to relieve symptoms, improve the quality of life and reduce early death. Cardiovascular diseases are a major cause of hospitalization among both men and women, as either the primary or an associated health problem. Although national data are unavailable, it is reasonable to assume that cardiovascular diseases are also a major factor in emergency department and outpatient visits. Although hospitalization rates for cardiovascular diseases (except for congestive heart failure) are decreasing, the actual numbers of hospitalizations will increase in the future because of the aging of the population.

While hospitalization rates have been decreasing, the number of prescriptions for cardiovascular diseases has increased during the 1990s. Improved treatment, including the introduction of new drugs may have decreased the need for hospitalization. Unfortunately, national data do not exist on the health effect of this increased prescription use, the appropriateness of prescriptions, or patient compliance.

The number of several interventional procedures, including coronary artery bypass grafting, angioplasties, valve surgery, pacemaker implantation and heart transplantation, has been increasing. This may reflect the increase in the aging population in Canada. And the actual number of procedures is actually much higher, since many procedures are being performed on an outpatient basis and are, therefore, not included in hospitalization data. In fact, this increased use of outpatient facilities for procedures that were previously performed in hospital may, in part, account for the decrease in hospitalization rates for cardiovascular diseases. The increase in procedures has a major impact on health care costs. It also puts a strain on the limited availability of both human resources and equipment.

Sex differences exist in cardiovascular disease hospitalization rates and procedures. Men have higher hospitalization rates than women for all cardiovascular diseases. The difference is smallest for cerebrovascular disease and congestive heart failure. All procedures are performed more often on men than women. Whether these differences reflect gender attitudes of health professionals or biology, or both, requires further study.

Chapter 3
Cost of Cardiovascular Diseases

Cardiovascular diseases have a significant economic impact in Canada. In its report, *Economic Burden of Illness in Canada, 1998*, Health Canada estimated the total cost of cardiovascular diseases on the health sector of the Canadian economy to be $18,472.9 million (11.6% of the total cost of all illnesses), which includes a direct cost of $6,818.1 million (8.1% of the total direct cost of all illnesses) and an indirect cost of $11,654.8 million (15.4% of the total indirect cost of all illnesses).

> "Direct costs are defined as the value of goods and services for which payment was made and resources used in treatment, care and rehabilitation related to illness or injury. The five direct cost components in this report are organized and measured in terms of hospital care expenditures; drug expenditures; physician care expenditures; expenditures for care in other institutions; and additional direct health expenditures (including other professionals, capital, public health, prepayment administration, health research, etc). Other direct costs borne by patients or other payers (such as costs for transportation to health providers, special diets and clothing) are not included.
>
> Indirect costs are defined as the value of economic output lost because of illness, injury-related work disability, or premature death. The three indirect cost components in this report are measured in terms of the value of years of life lost due to premature death (mortality costs), and the value of activity days lost due to short-term and long-term disability (morbidity costs due to long- and short-term disability). Other indirect costs, including the value of time lost from work and leisure activities by family members or friends who care for the patient, are not included in this report." (EBIC)

In 1998, the total economic burden of illness was $159,434.5 million dollars — $83,954.9 million in direct costs and $75,479.6 million in indirect costs. $38,266.0 million of total costs could not be assigned to any particular disease category. These "unattributable" costs constituted a significant proportion (24.0%) of the total costs. Thus, the total costs related to cardiovascular diseases could be much higher.

The direct, indirect and total costs for 1998 were less than those incurred in 1993, when calculated using 1998 dollars. There is no clear explanation for this. Unattributable costs were much higher in 1998 compared to 1993, however, (38, 266.0 million compared to 29, 443.6 million, respectively) representing an increase from 17.6% to 24.0% of total costs. Their impact on cardiovascular disease costs is uncertain. Nonetheless, understanding how to control costs and maximize efficiency is an imperative.

In terms of the direct costs of cardiovascular diseases in Canada in 1998, the major cost components were: hospital care ($4,161.8 million; 61.0% of CVD direct costs), drugs ($1,772.8 million; 26.0%), physician care ($822.3 million; 12.1%), and additional direct health expenditures including research ($61.2 million; 0.9%).

The major components of the indirect cost of cardiovascular diseases in 1998 were: costs due to mortality (as cost of premature death) ($8,250.0 million; 70.8% of CVD indirect costs), morbidity due to long-term disability ($3,151.5 million; 27.0%), and morbidity due to short-term disability ($253.3 million; 2.2%).

Cardiovascular diseases are the most costly contributors to both direct and indirect health costs in Canada — they are also largely preventable. Approximately 80% of the population has at least one modifiable risk factor for cardiovascular diseases. Therefore, decreasing these risk factors in the population can have a great impact on reducing the costs of cardiovascular disease.

The commonly held perception is that cardiovascular diseases affect primarily older people. While many of the health care costs are associated with individuals 65 years of age and over, cardiovascular diseases among younger adults also have a major economic impact. Preventing cardiovascular diseases in this age group, then, has long-term economic implications.

Hospitalization for cardiovascular diseases costs over $4 billion annually. Since hospitalization rates increase with age (see Chapter 2) and the number of individuals over the age of 65 years in Canada is growing, hospital costs are likely to increase in the future.

The number of prescription drugs for cardiovascular diseases has been increasing. Thus, the cost of prescription drugs is also likely to increase in the future.

The Economic Burden of Illness in Canada, 1998 faced significant challenges in the use of existing data to describe the economic burden of illness in Canada from a health perspective. One major obstacle that EBIC faced is that health care costs associated with other aspects of health problem management, such as home care, residential care and therapy are difficult to capture and difficult to assign to particular disease categories and are, therefore, assigned as "unattributable" costs. The high proportion of "unattributable" costs makes analysis and interpretation of the data difficult, and calls for a refinement and improvement in data collection. In addition, greater detail in the data analysis would permit tracking of changes in one cost component in relation to others for specific diseases.

The most recent report on the economic burden of illness uses data from 1998. While this is useful from a research perspective, the time lag limits its application for surveillance. Policy-makers who are making decisions for the year 2003 need more current information.

Chapter 4 Health Outcomes

When considering health outcomes from cardiovascular disease (heart disease and stroke), mortality tends to receive the greatest attention due to the availability of the data. But since many live with cardiovascular disease, it is important to consider who develops it (incidence), who is currently living with it (prevalence), and the nature of their disabilities and the quality of their lives.

Cardiovascular diseases are the underlying cause of death for 1 in 3 Canadians. The number of deaths and, by proxy, the number of Canadians with cardiovascular disease, will likely increase as the population ages. Thus, the burden of cardiovascular diseases will continue for many more years.

The mortality figures provide only part of the picture, however. Overall, 5.7% of Canadian adults, and nearly 1 in 4 aged 70+ years, report having heart problems, and they, with their families, know personally the challenges of living with cardiovascular disease. They feel less healthy than the rest of the Canadian population, many must restrict their activities, and many need help with the normal activities of daily living. While the 70+ age group have the highest rates of cardiovascular disease, many Canadians develop the condition in their forties and fifties.

In comparison to other countries, Canada has one of the lowest mortality rates due to stroke. In contrast, Canada does not appear to fare as well when comparing its ischemic heart disease mortality rate to other countries. Canada may be able to learn successful approaches to reducing both the incidence and premature death rate due to ischemic heart disease from other countries.

Within Canada, variations in cardiovascular disease rates vary between the provinces/territories. Newfoundland has consistently higher mortality rates than the other provinces/territories for cardiovascular diseases overall, and for ischemic heart disease, acute myocardial infarction and cerebrovascular disease. Newfoundlanders also reported a higher prevalence of all modifiable risk factors than the Canadian population overall. Mortality rates from cardiovascular diseases were lower in the north than Canada as a whole, except for congestive heart failure.

Mortality rates for both men and women for ischemic heart disease, acute myocardial infarction and cerebrovascular disease continue to decrease. The rate for congestive heart failure is decreasing as well, but at a slower pace. This may be a result of both the rising incidence of the disease and a possible shift in diagnostic labelling from ischemic heart disease. Even though cardiovascular disease mortality rates have decreased, in the future the number of women who will die from cardiovascular diseases is expected to increase, due to the aging population. As a result, the burden of cardiovascular diseases in the population will increase.

Cardiovascular diseases affect men and women differently. More men than women die from ischemic heart disease and acute myocardial infarction, but more women than men die from congestive heart failure and cerebrovascular disease.

Chapter 5 Determinants of Cardiovascular Health

A wide variety of factors interact to influence health: income and social status, social support networks, education, employment and working conditions, social environments, physical environments, personal health practices and coping skills, healthy child development, biology and genetic endowment, health services, gender, and culture. Some of these, such as personal health practices, relate to the individual alone. Others, such as social environments, relate to the environment in which the individual lives.

Income and education can influence the adoption of healthy behaviours. Increased income permits a wider array of lifestyle choices that can influence health. Higher levels of education not only increase knowledge and skills specific to healthy behaviours, but also provide access to more lucrative employment.

Individuals who live in poverty must cope with the daily stress of meeting basic needs. Lifestyle choices, such as smoking, may be adopted to help cope with this stress. Lack of income may limit an individual's ability to purchase healthy food, which in turn may lead to health problems. Likewise, the individual may lack the income to purchase medication that would improve a health problem such as high blood pressure.

Ischemic heart disease mortality including premature death correlates with neighbourhood income, with the wealthiest quintile having the lowest rates and the poorest quintile the highest. Differentials in health care after acute myocardial infarction are not responsible for most of the differences in survival across socio-economic categories. Thus socio-economic differences in mortality rates for ischemic heart disease appear to be due primarily to differences in incidence rather than in treatment and survival.

The analysis of the Canadian Community Health Survey (CCHS) data provides one possible reason for the income disparity in mortality rates. Individuals in the lowest income quintile had a higher proportion of risk factors than those in the highest quintile. To be effective, then, preventive policies must address socio-economic disparities.

The increasingly higher mortality rates due to diabetes in the lowest income group may indicate higher rates of diabetes among low income groups. Since diabetes is a risk factor for ischemic heart disease, low income individuals with diabetes are also at increased risk for ischemic heart disease.

Public policies can mediate the effect of inequities in risk for cardiovascular disease by decreasing exposure to risk factors or facilitating the adoption of healthy behaviours. For example, regulating exposure to environmental tobacco smoke in the service industry, where wages tend to be lower compared to other occupations, would reduce the risk of cardiovascular disease by decreasing exposure to a risk factor and encouraging smoking cessation.

As a prerequisite to developing effective interventions, research is also required to provide a better understanding of the way in which socio-economic differences mediate their effects on outcomes.

Given the importance of the social determinants of health, the ability to report mortality and morbidity data linked to individual and family level socio-economic characteristics, such as education, occupation, race, ethnicity and period of immigration, is a desirable, essential component of a cardiovascular disease surveillance system.

Implications for Action

Increase Prevention

- Develop policies and implement community level and national programs with a sufficient preventive dose to decrease the high prevalence of cardiovascular disease risk factors.
- Implement policies and programs to encourage the adoption of healthy behaviours among children and youth.
- Conduct periodic surveys of nationally representative samples that include physical and biochemical measures to assess the prevalence of hypercholesterolemia, high blood pressure, diabetes and being overweight.

Effective Health Services

- Improve cardiovascular disease surveillance by developing data sources to provide comparative information on such indicators as: use of emergency and outpatient services; use of therapy and rehabilitation programs; access to surgical procedures and ambulatory care services; use of interventions according to clinical practice guidelines; and satisfaction with services.
- Review present cardiovascular health resources (human and technological) and future needs, based on the projected increase in a number of hospitalizations and procedures because of the aging population.
- Develop cost-effective programs and services to meet the projected increase in the need for cardiovascular disease services.
- Conduct more research on the differences between the sexes in hospitalization and procedures for cardiovascular diseases.

Reduce Economic Burden

- Invest in the prevention and reduction of risk factors for cardiovascular diseases to decrease the economic burden of cardiovascular diseases in Canada.
- Develop effective and less expensive alternatives to hospital care for cardiovascular disease problems to mitigate against the anticipated increase in hospital costs associated with acute care.
- Improve the timeliness and quality of existing administrative data and develop additional data sources to enhance the use of economic data for surveillance purposes.

Improve Outcome

- Increase home care, pharmacare and palliative care services to cope with the projected increase in the number of people who will be dying from cardiovascular diseases in the future.
- Explore reasons behind the higher ischemic disease mortality rates in Canada compared to other countries.
- Develop an ongoing system of data collection to monitor the incidence and prevalence of cardiovascular diseases, their impact and treatment outcomes.

Address Socio-economic Determinants of Health

- Implement policies to address the socio-economic determinants of cardiovascular health.
- Target interventions to individuals in low income groups, where the prevalence of risk factors is high.
- Conduct research to identify reasons for socio-economic differences in cardiovascular risk factors and health outcomes.
- Include socio-economic indicators of health in the cardiovascular surveillance system.

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INTRODUCTION

The Growing Burden of Heart Disease and Stroke in Canada 2003 is the sixth edition of our biennial publication on the status of cardiovascular diseases in Canada. It serves as a natural sequel to the previous edition, *The Changing Face of Heart Disease and Stroke in Canada 2000*, which focused on the unfavourable profile of determinants of cardiovascular disease with an aging population and the adoption of unhealthy lifestyles by young Canadians, immigrants and native peoples. In this edition, we highlight the ongoing high cost that these diseases impose on our society, both in financial terms and in quality of life. With a predicted increase in the numbers of cases of cardiovascular diseases over the next 20 years, the resulting burden is expected to continue to increase.

In large part, the growing burden will result from the "greying of Canada". Between 1991 and 2001, the population aged 80 years and over rose 41% to 932,000 and is expected to increase an additional 43% between 2001 and 2011. By then, it will have surpassed an estimated 1.3 million. The population between 45 and 64 years of age increased 36% between 1991 and 2001, witnessing the entry of the baby boomers into this group. According to the 2001 Census, seniors aged 65 and over constituted 13% of the Canadian population in 2001, up from nearly 12% in 1991. This proportion is projected to reach 15% by 2011 and just over 20% by 2025.

Deferred adverse outcomes will add to the growing burden. Cardiovascular diseases are rarely cured; medical and surgical treatments for the most part provide temporary relief. As the underlying disease progresses, events occur and the ensuing burden accumulates.

The growing burden of cardiovascular diseases remains a consequence of lifestyle choices that include smoking, overeating and physical inactivity. In particular, individuals who are socio-economically disadvantaged show higher prevalence rates of the major risk factors. Reaching these and other high-risk populations remains an unmet challenge, even as data show some narrowing of the risk factor gap between the high and low socio-economic strata.

In spite of some gains, much remains to be done in terms of prevention. Eighty percent of the Canadian population has at least 1 modifiable risk factor for cardiovascular disease; nearly one-third has 2 risk factors; and another 11% have 3 or more. The prevalence of some risk factors, such as overweight among men, diabetes and high blood pressure, is increasing. Witness the epidemic rise in obesity among adolescents, accompanied by the decline in physical activity. Even the decreased levels of activity among seniors should not be accepted as a normal consequence of aging. Billions of dollars are spent treating cardiovascular diseases. The proportion and amount of the cardiovascular health care dollar that is allocated to prevention needs to be increased. Realigning the focus on prevention presents an enormous challenge. Those involved in providing care, as well as those who need care, may feel threatened by the need to go after limited resources in order to meet this challenge. Their needs must be secure even as the preventive agenda is addressed.

Focusing on cardiovascular diseases in isolation misses an opportunity to recognize the consequences of cardiac related lifestyle factors on other major non-communicable diseases. The following table (Table I-1) indicates the contribution of modifiable risk factors for cardiovascular disease to 3 other leading non-communicable diseases, including diabetes, cancer and chronic obstructive pulmonary disease. Pooling resources and coordinating strategies locally, provincially, nationally and globally can provide a common preventive pathway for relieving the burden of a variety of non-communicable diseases. In addition, reliable and timely data can provide the basis for appropriate policy interventions in order to further aid both primary and secondary prevention.

While we emphasize prevention in this document, we also acknowledge the importance of medical and surgical treatment for cardiovascular diseases. The investment in research into new pharmacological agents and innovative surgical approaches is paying off with improved survivorship and a better quality of life for those with disease. Understanding the role played by specific genes can help us plan targeted interventions, bringing a new hope that we can treat and prevent cardiovascular diseases more effectively. Likewise, the testing of new strategies to motivate lifestyle changes, such as smoking cessation or the adoption of increased physical activity, should lead to more widespread primary and secondary prevention. Hope for the future does not dismiss the failures of yesterday, however, and their consequences today. Both in-hospital and out-of-hospital medical and surgical treatments, rehabilitation and home care are expensive and, as a result, will cause the economic burden of disease to increase.

Once again, *The Growing Burden of Heart Disease and Stroke in Canada 2003* is the collaborative effort of the Heart and Stroke Foundation of Canada, the Centre for Chronic Disease Prevention and Control (Health Canada), and the Canadian Cardiovascular Society. We gratefully acknowledge the key partnership role played by Statistics Canada and the Canadian Institute for Health Information in the provision of the data and data analysis for this publication. Please note that the "Implications for Action" sections appearing at the end of each of the chapters in this publication do not represent the opinion of Statistics Canada or of the Canadian Institute for Health Information. We also welcome the participation of the Institute for Clinical Evaluative Sciences. All the information contained in this publication, including all tables and graphs, are accessible in English and in French on the internet at http://www.heartandstroke.ca/growingburden.

We welcome feedback on this, our latest report on the status of cardiovascular diseases in Canada. We have attempted to respond to the suggestions offered in the survey request after the previous edition. As in the past, this publication aims to not only present the best data available but also suggest key policy implications. As Canadians put their health care system under intense review amidst the throes of determining its very future, the demand for health-related information increases. Indeed, this process serves to underscore the importance of surveillance. The public, health professionals and policy-makers all see the need for timely, accurate and relevant data. By exploring the data contained in this edition we show the gaps in our knowledge and raise new questions. Forecasting and tracking changes as well as monitoring progress are integral parts of achieving heart health for all. We challenge ourselves and major stakeholders to invest in a coordinated surveillance system that will address the information needs related not only to cardiovascular diseases, but to all non-communicable diseases as well.

Andreas Wielgosz, Scientific Editor

Table I-1 The 8 Major Modifiable Risk Factors for Cardiovascular Diseases and Other Leading Non-communicable Diseases

CONDITION	Cardiovascular Diseases*	Diabetes	Cancer	Chronic-obstructive Pulmonary Disease
RISK FACTOR				
Smoking	✓	✓	✓	✓
Alcohol	✓		✓	
Physical Inactivity	✓	✓	✓	
Nutrition	✓	✓	✓	
Obesity	✓	✓	✓	✓
Raised Blood pressure	✓	✓		
Dietary fat/ Blood lipids	✓	✓	✓	
Blood glucose	✓	✓	✓	

*Includes heart disease, stroke and hypertension.

Source: World Health Organization

RISK FACTORS

As the Victoria Declaration on Heart Health aptly stated:

> *Cardiovascular disease is largely preventable. We have the scientific knowledge to create a world in which most heart disease and stroke could be eliminated.*
>
> **(Advisory Board of the International Heart Health Conference 1992)**

Even though the scientific knowledge exists, preventing heart disease and stroke is a complex undertaking. Their prevention requires action at multiple levels. Primary prevention aims to reduce the incidence of disease by controlling risk factors. Secondary prevention attempts to reduce the prevalence of disease by early diagnosis and treatment. The goal of tertiary prevention is to limit the progress or complications of established disease.

Mortality from ischemic heart disease in North America has declined steadily since the 1960s. It is estimated that 25% of the decline in the United States between 1980 and 1990 was due to efforts in primary prevention, 29% to secondary prevention, and 43% to improvements in treatment.

A growing body of evidence suggests that the determinants of health go beyond individual genetic endowment, lifestyle behaviour and the health care system to include more pervasive forces in the physical, social and economic environment. Thus, a fourth and even earlier stage, primordial prevention, has been proposed. Primordial prevention aims at avoiding the emergence of the social, economic and cultural patterns of living that are known to contribute to an elevated risk of disease. Health policy-makers and analysts have emphasized the need to address these underlying determinants in order to prevent heart disease and stroke. They urge us to direct attention toward modifying not only risk factors and risk behaviours, but also such "risk conditions" as poverty, powerlessness and lack of social support. Chapter 5 will discuss these determinants in more detail.

Risk Conditions

Age

Increased age is the dominant risk condition for heart disease and stroke. Rates of all major forms of heart disease increase with advancing age. As the Canadian population ages, the number of individuals with heart disease and stroke is expected to increase.

Sex

At younger ages, men are at much higher risk than women of developing coronary artery disease (CAD). Men tend to have a ten year lead on women in the development of CAD. They are also at higher risk of stroke. (See Chapter 4 "Health Outcomes" for differences among men and women in mortality rates for heart disease and stroke).

Family History

A family history of early coronary disease is an important risk factor for CAD. It is also an independent risk factor for stroke. The factors that contribute to this association may include familial factors, lifestyle and molecular defects in vascular physiology, which render the vessel wall more susceptible to atherosclerosis. Promising research findings will likely result in genetic typing and gene-specific treatment to prevent heart disease. The extent to which the findings will be of benefit to the general population is as yet unclear.

Modifiable Risk Factors

Modifiable risk factors are those over which an individual has some control, and that he or she can modify in order to reduce their risk of developing heart disease or stroke. Table 1-1 lists the major modifiable risk factors for heart disease and stroke.

While this report discusses each risk factor individually, in reality many people have more than one risk factor. In 2000, the Canadian Community Health Survey (CCHS) found that 80.2% of the population between the ages of 20 and 59 years had at least one of the following risk factors: daily smoking, physical inactivity, being overweight, high blood pressure or diabetes (Table 1-2). The survey also included a question about consumption of fresh fruits and vegetables. Although this is not a major independent risk factor, adding the prevalence of consumption of fresh fruits and vegetables below the recommended daily amounts would increase the prevalence of one or more combined risk factors in the Canadian population to 90%.

The risk of heart disease and stroke increases with an increased number of risk factors.

A recent study by the World Health Organization (WHO) has identified tobacco use, high blood pressure, alcohol consumption, high cholesterol, high body mass index (BMI), low consumption of fruits and vegetables, and physical inactivity as the top seven contributors to the burden of disease in developed countries. Blood glucose was not included in this study.

Table 1-1 Modifiable Risk Factors (self-reported) among Adults Aged 20-59, Canada, 2000

Risk Factor	Proportion of the Population Aged 20-59 Years (%)
Tobacco Smoking (Daily)	25.7
Physical Inactivity	55.5
Overweight (BMI ≥ 25.0)	47.5
Less than Recommended Consumption of Fruits and Vegetables	64.7
High Blood Pressure	8.3
Diabetes*	2.7

* For the purposes of this report diabetes is listed as a major risk factor.

Source: Statistics Canada, Canadian Community Health Survey

Table 1-2 Combined Risk Factors for Cardiovascular Disease (self-reported) among Adults Aged 20-59 Years, Canada, 2000

Number of Risk Factors	Risk Factors (% of population)
No Risk Factors	19.8
At Least 1 Risk Factor:	80.2
1 Risk Factor	39.1
2 Risk Factors	30.0
3 or More Risk Factors	11.1

Source: Statistics Canada, Canadian Community Health Survey

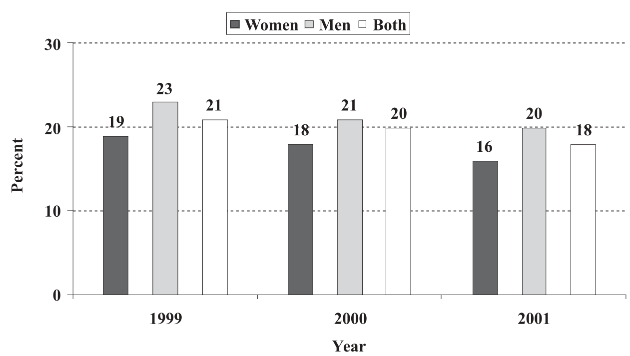
Tobacco Smoking

Tobacco use is the major cause of preventable death in Canada. Smoking is responsible for approximately the equivalent number of deaths due to cardiovascular diseases and cancer. Smoking increases the risk of developing all major forms of cardiovascular diseases. In addition, women who smoke and use oral contraceptives have an increased risk of subarachnoid hemorrhage.

The data in this section include individuals aged 15+ years, the entire sample in the Canadian Tobacco Use Monitoring Survey (CTUMS).

According to CTUMS, 21.7% of the population aged 15+ years were current smokers. Of these, 18.1% were daily smokers and 3.7% were occasional smokers. The percentage of daily smokers decreased from 21% in 1999 and this was evident among both men and women (Figure 1-1).

Figure 1-1 Percentage of the general population aged 15+ years who were daily smokers, Canada, 1999-2001



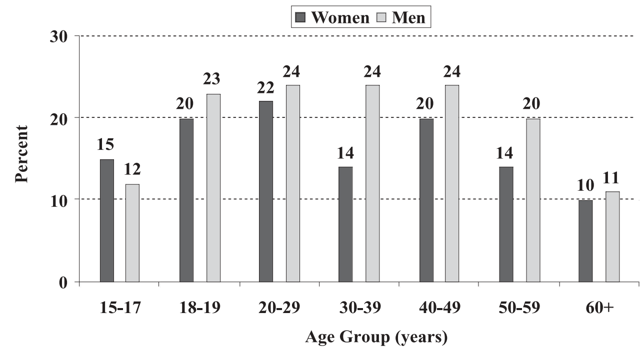
Source: Health Canada, Canadian Tobacco Use Monitoring Survey (CTUMS)

Sixteen percent of teenage men (15-19 years) smoked daily in 2001, a decrease from 19% in 1999. Among teenage women the prevalence was 17%, down from 21% in 1999.

In 2001, the percentage of men who were daily smokers increased during the teenage years, and then remained the same until reaching the 50-59 year old age group, at which point the percentage of daily smokers decreased with age (Figure 1-2). The pattern among women differed, however, in that the percentage of daily smokers continued to increase in their 20s, then showed a large decrease in their 30s. The reasons for this, though unclear, may reflect a decrease in smoking while childbearing. The percentage then increased to a level similar to that of women in the late teens. After the age of 50 years, the percentage decreased in the same manner as among men.

The percentage of adults who smoked daily in 2001 was lower in B.C. and Ontario than in all other provinces (Figure 1-3).

Figure 1-2 Percentage of the general population aged 15+ years who were daily smokers by age group and sex, Canada, 2001

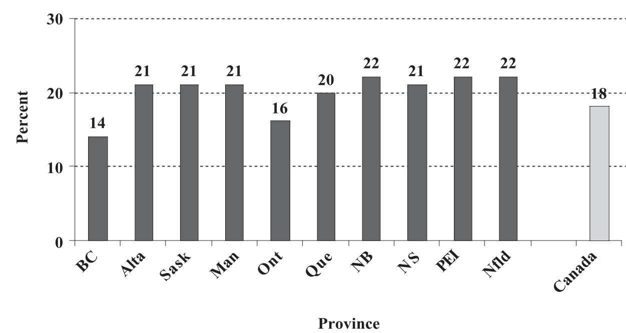


Source: Canadian Tobacco Use Monitoring Survey (CTUMS), Health Canada

Among women, the highest percentage of daily smokers in 2001 was in the lowest income category (Figure 1-4). Among men, the highest percentage was in the low and medium low income categories.

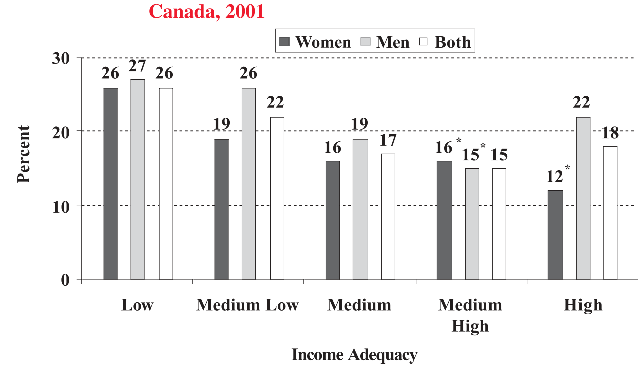
Note: For definition of Income Adequacy, see Glossary.

Figure 1-3 Percentage of adults aged 15+ years in the general population who were daily smokers by province, Canada, 2001



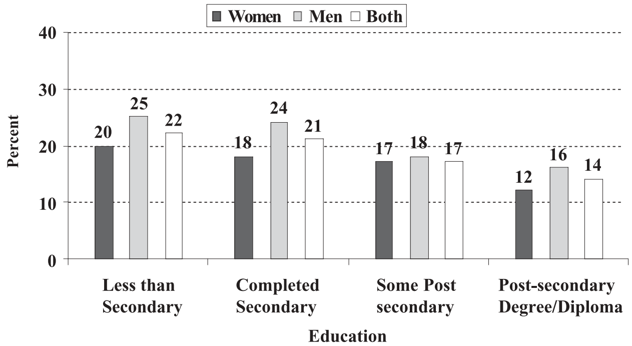
Source: Canadian Tobacco Use Monitoring Survey (CTUMS), Health Canada

Figure 1-4 Percentage of the general population aged 15+ years who were daily smokers by income adequacy and sex, Canada, 2001



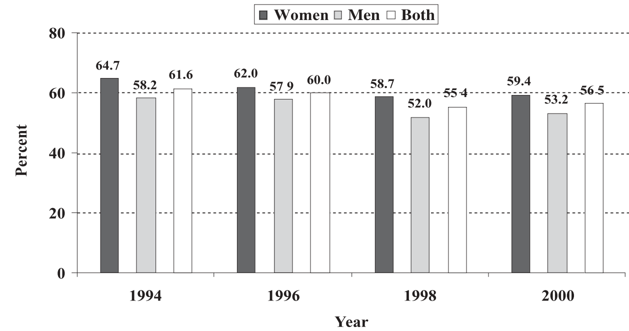
*Interpret with caution: based on small sample size
Source: Canadian Tobacco Use Monitoring Survey (CTUMS) Health Canada

Figure 1-5 Percentage of the general population aged 15+ years who were daily smokers by education and sex, Canada, 2001



Source: Canadian Tobacco Use Monitoring Survey (CTUMS), Health Canada

Figure 1-6 Percentage of the general population aged 20+ years who were physically inactive[1], Canada, 1994-2000



[1] Energy expenditure at or below the leisure time activity level (1.5 kilcalories/kilogram/day)
Source: Statistics Canada, National Population Health Survey and Canadian Community Health Survey

According to CTUMS, a lower percentage of men who had some post-secondary education or who had completed post-secondary education smoked daily in 2001 (Figure 1-5). Among women, the lowest percentage of daily smokers was among those with a post-secondary degree or diploma.

Physical Inactivity

Physical inactivity is a risk factor for cardiovascular diseases (See Glossary for definition of Physical Inactivity). Regular physical activity can reduce body weight, improve serum lipids and cholesterol, blood pressure and diabetes, and thereby reduce overall cardiovascular risk. National guidelines recommend the development of an active lifestyle that includes 60 minutes of light physical activity or 30 minutes of moderate physical activity each day.

Only data from the CCHS include individuals aged 12+ years.

In 2000, over one-half (56.5%) of adults were physically inactive in their leisure time (Figure 1-6). More women than men were physically inactive. From 1994 to 2000, levels of physical inactivity among adults dropped from 61.6% to 56.5%. This improvement occurred among both men and women.

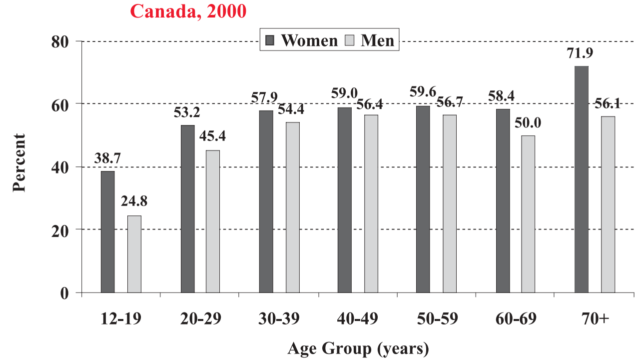
In general, physical inactivity increased with age in 2000 (Figure 1-7). The exception appeared among men aged between 60 and 69 years who showed less inactivity compared to the 50-59 year age group. More women then men were physically inactive in all age groups. Young women between 12 and 19 years of age were 1.5 times more likely than their male counterparts to be physically inactive. The percentage of men who were physically inactive increased dramatically between the 12-19 and 20-29 year age groups.

In 2000, the percentage of the general population that was physically inactive varied by province/territory (Figure 1-8). The lowest percentages of inactivity were in the Yukon, B.C. and Alberta. The percentages of people who were physically inactive were higher in Newfoundland, P.E.I., New Brunswick, Quebec and Manitoba than in the Canadian population as a whole.

In 2000, men and women in the lowest income category were 1.3 times more likely to be physically inactive than those in the highest income category (Figure 1-9). There was no significant difference in physical inactivity between the two lower income levels.

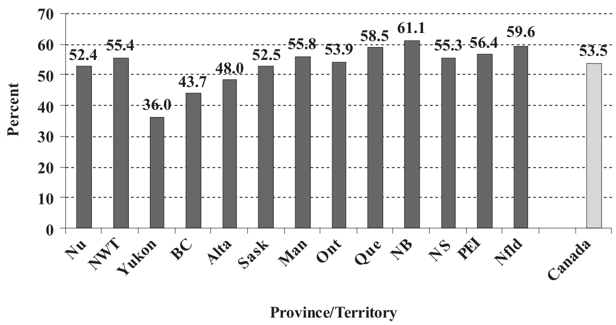
The percentage of men who were physically inactive was lowest among those with some post-secondary education (Figure 1-10). Among women, those with some post-secondary education or a post-secondary degree were less likely to be physically inactive than those with secondary education or less.

Figure 1-7 Percentage of the general population aged 12+ years who were physically inactive[1] by age group and sex, Canada, 2000



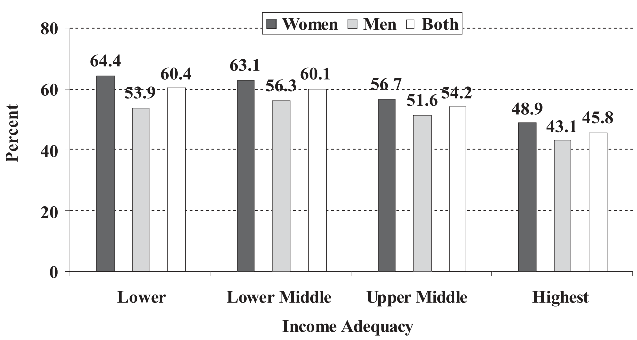
[1] Energy expenditure at or below the leisure time activity level (1.5 kilocalories/kilogram/day)
Source: Statistics Canada, Canadian Community Health Survey

Figure 1-8 Percentage of the general population aged 12+ years who were physically inactive[1] by province/territory, Canada, 2000



[1] Energy expenditure at or below the leisure time activity level (1.5 kilocalories/kilogram/day)
Source: Statistics Canada, Canadian Community Health Survey

Figure 1-9 Percentage of the general population aged 12+ years who were physically inactive[1] by income adequacy and sex, Canada, 2000



[1] Energy expenditure at or below the leisure time activity level (1.5 kilocalories/kilogram/day)
Source: Statistics Canada, Canadian Community Health Survey

Overweight

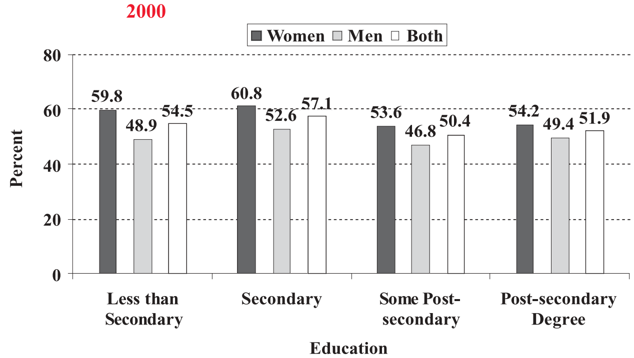
Being overweight — either excess weight (defined by WHO as a body mass index (BMI) of 25.0-29.9) or obesity (BMI ≥ 30.0) among individuals aged between 18 and 64 years — is one of the most common factors influencing the development of high blood pressure and diabetes. These conditions are, in turn, two important risk factors for cardiovascular diseases. The greater the BMI, the greater the risk of heart disease and stroke. In general, healthy nutrition and regular physical activity can reduce excess weight and obesity.

In 1998/99, the National Longitudinal Survey of Children and Youth reported that, based on international definitions, 37% of children aged 2 to 11 years were overweight and 18% were classified as obese. This was an increase from 34% overweight and 16% who were obese in 1994/95.

The CCHS reported that 47.5% of adults were overweight (BMI ≥ 25.0) in 2000 (Figure 1-11). The percentage of overweight men and women has varied between 1994 and 2000, showing no consistent trend. In 2000, the percentage of men who were overweight was 1.4 times higher than women.

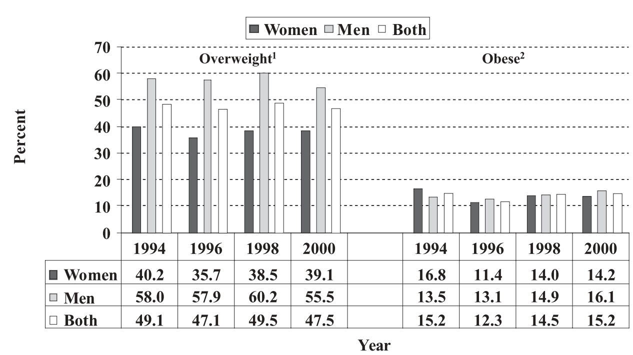
The 2000 CCHS also found that 15.2% of adults were obese (BMI ≥ 30.0) — the same as in 1994. In the intervening years the percentage varied. The percentage of men who were obese increased from 13.5% to 16.1% while the percentage of women decreased from 16.8% to 14.2%.

Figure 1-10 Percentage of the general population aged 12+ years who were physically inactive[1] by education and sex, Canada, 2000



[1] Energy expenditure at or below the leisure time activity level (1.5 kilocalories/kilogram/day)
Source: Statistics Canada, Canadian Community Health Survey

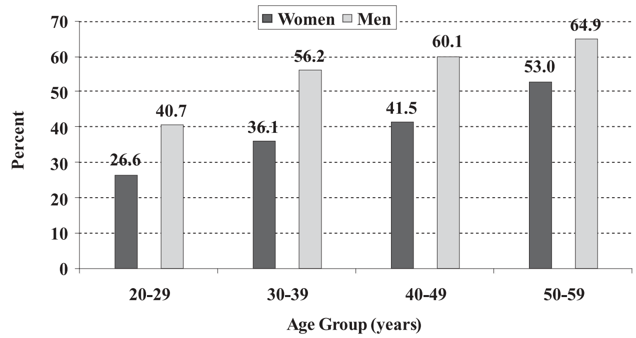
Figure 1-11 Percentage of adults aged 20-59 years in the general population who were overweight[1] and, of those, who were obese[2], Canada, 1994-2000



	1994	1996	1998	2000		1994	1996	1998	2000
Women	40.2	35.7	38.5	39.1		16.8	11.4	14.0	14.2
Men	58.0	57.9	60.2	55.5		13.5	13.1	14.9	16.1
Both	49.1	47.1	49.5	47.5		15.2	12.3	14.5	15.2

[1]Overweight: Self-reported BMI ≥ 25.0 (includes obese) [2]Obese: Self-reported BMI ≥ 30.0
Source: Statistics Canada, National Population Health Survey and Canadian Community Health Survey

Figure 1-12 Percentage of adults aged 20-59 years in the general population who were overweight[1] by age group and sex, Canada, 2000



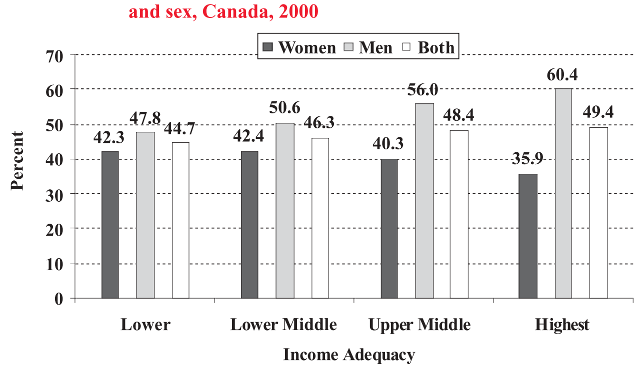
[1]Overweight: Self-reported BMI ≥ 25.0
Source: Statistics Canada, Canadian Community Health Survey

According to the 2000 CCHS, the percentage of people who were overweight increased with age (Figure 1-12). The percentage of women who were overweight doubled between the 20-29 and 50-59 year age groups. Among men, the percentage in the older age group was 1.6 times higher than among the younger men.

The percentage of adults aged 20-59 years who were overweight was higher in the eastern provinces and Manitoba, Saskatchewan, Northwest Territories and Nunavut than in the overall Canadian population (Figure 1-13). Quebec and B.C. had the lowest percentages who were overweight.

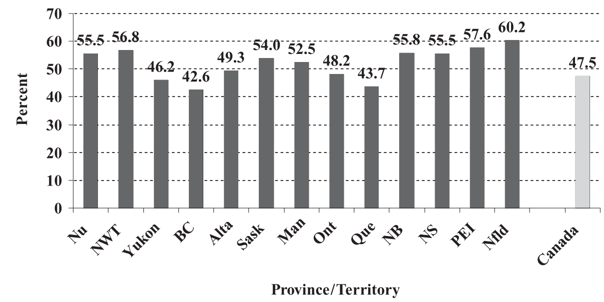
Highest income women were less likely to be overweight than women in other income categories (Figure 1-14). Among men, the pattern was reversed, with the highest percentage overweight in the highest income category.

Figure 1-14 Percentage of adults aged 20-59 years in the general population who were overweight[1] by income adequacy and sex, Canada, 2000



[1]Overweight: Self-reported BMI ≥ 25.0
Source: Statistics Canada, Canadian Community Health Survey

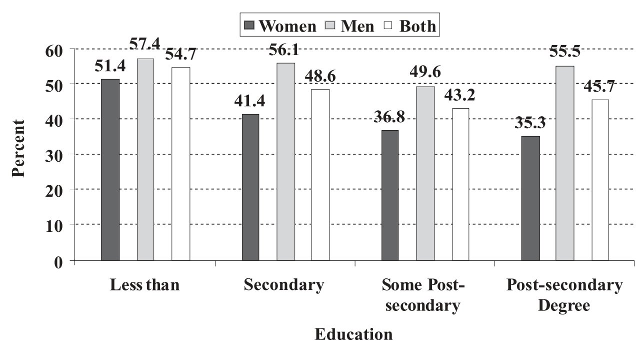
Figure 1-13 Percentage of adults aged 20-59 years in the general population who were overweight[1] by province/territory, Canada, 2000



[1]Overweight: Self-reported BMI ≥ 25.0
Source: Statistics Canada, Canadian Community Health Survey

In 2000, women with less than secondary education were 1.5 times more likely to be overweight than women with a post-secondary degree (Figure 1-15). Among men, those with some post-secondary education had the lowest percentage that was overweight.

Figure 1-15 Percentage of adults aged 20-59 years in the general population who were overweight[1] by education and sex, Canada, 2000



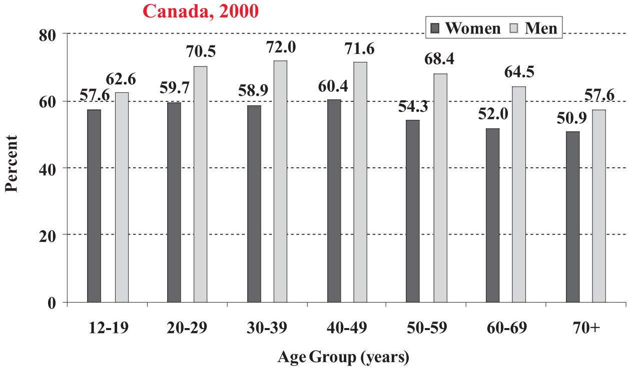
[1]Overweight: Self-reported BMI ≥ 25.0
Source: Statistics Canada, Canadian Community Health Survey

Inadequate Consumption of Fruits and Vegetables

A daily consumption of 5 to 10 servings of fresh fruits and vegetables is associated with a reduced risk of cardiovascular diseases. This benefit is related to the intake of natural vitamins, anti-oxidants and fibre. The potassium that such a diet provides has also been shown to be protective, particularly against strokes.

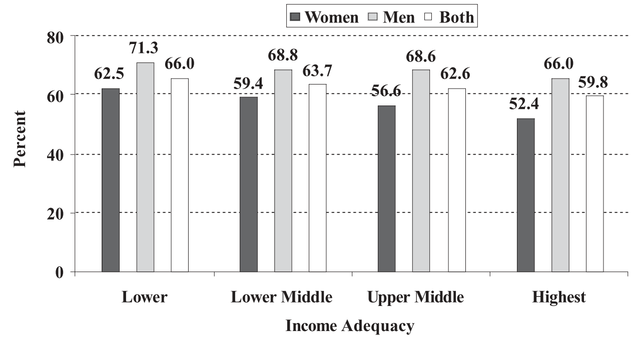
Although consumption of fresh fruits and vegetables tends to be seasonal with a higher intake during the summer months, it should be maintained at the recommended 5 or more daily servings year-round.

Figure 1-16 Percentage of the general population aged 12+ years who consumed less than the recommended daily amount of fruits and vegetables by age group and sex, Canada, 2000



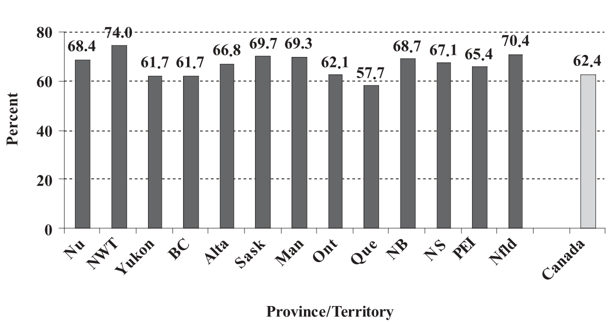
Source: Statistics Canada, Canadian Community Health Survey

Figure 1-18 Percentage of the general population aged 12+ years who consumed less than the recommended daily amount of fruits and vegetables by income adequacy and sex, Canada, 2000



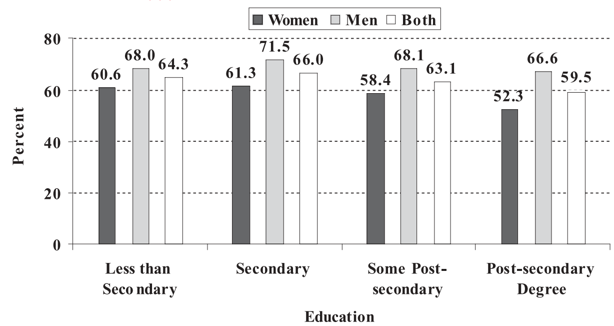
Source: Statistics Canada, Canadian Community Health Survey

Figure 1-17 Percentage of the general population aged 12+ years who consumed less than the recommended daily amount of fruits and vegetables by province/territory, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

Figure 1-19 Percentage of the general population aged 12+ years who consumed less than the recommended daily amount of fruits and vegetables by education and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

The data in this section include individuals aged 12+ years, the entire sample in the CCHS.

In 2000, 62.4% of Canadians 12 years of age and over (57.0% of women and 68.1% of men) consumed less than the recommended daily amount of fruits and vegetables, according to the CCHS. Among men, eating habits vary with age (Figure 1-16). The percentage who consumed less than the recommended daily amount rose in the 20-29 year age group and did not improve until after the age of 50. Among women, inadequate fruit and vegetable consumption was highest and similar in the age groups under the age of 50 years. Consumption improved among women after the age of 50.

Individuals in the Yukon, B.C. Ontario and Quebec reported better consumption of fruits and vegetables than individuals in all other provinces/territories (Figure 1-17).

Men and women with low incomes were more likely to consume less than the recommended daily amount of fruits and vegetables (Figure 1-18).

In 2000, there was very little difference in the consumption of the recommended daily amount of fruits and vegetables among men with various education levels (Figure 1-19). However, post-secondary education was associated with a lower percentage of women who consumed less than the recommended amount of fruits and vegetables.

High Blood Pressure

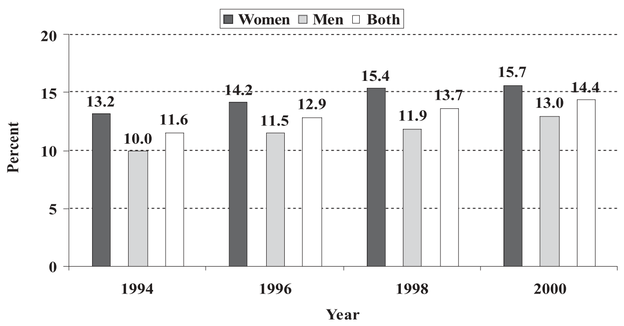
High blood pressure (defined as a systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg) is a major risk factor for both stroke and coronary artery disease, peripheral vascular disease and congestive heart failure. It increases overall cardiovascular risk by two to three times. Research evidence strongly supports the benefits of treating high blood pressure to reduce the incidence of stroke, myocardial infarction, ischemic heart disease, vascular disease, renal diseases, heart failure and overall death rate.

Individuals who have excess weight, are physically inactive, use alcohol heavily, or have excessive salt intake are more likely to develop high blood pressure. High blood pressure is commonly associated with other metabolic cardiovascular risk factors such as insulin resistance, obesity, hyperuricemia, and dyslipidemia.

The data in this section begin with individuals aged 20+ years, a sub-sample of the CCHS, because screening is recommended to start at the age of 20 years.

Between 1994 and 2000, the prevalence of self-reported high blood pressure increased among both men and women (Figure 1-20). A higher percentage of women than men consistently reported high blood pressure throughout this period.

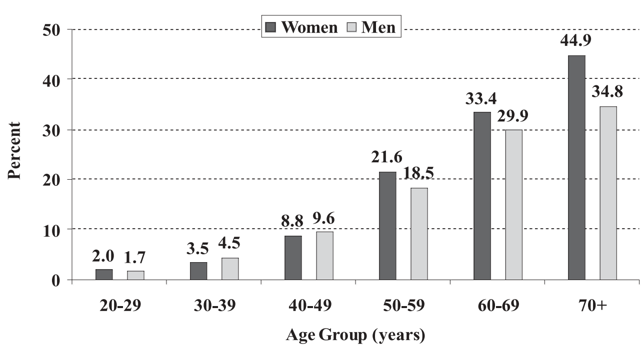
Figure 1-20 Percentage of the general population aged 20+ years who reported having high blood pressure, Canada, 1994-2000



Source: Statistics Canada, National Population Health Survey and Canadian Community Health Survey.

In 2000, the percentage of men and women who reported having high blood pressure increased with age (Figure 1-21). After the age of 50 years, the percentage of women was higher than men.

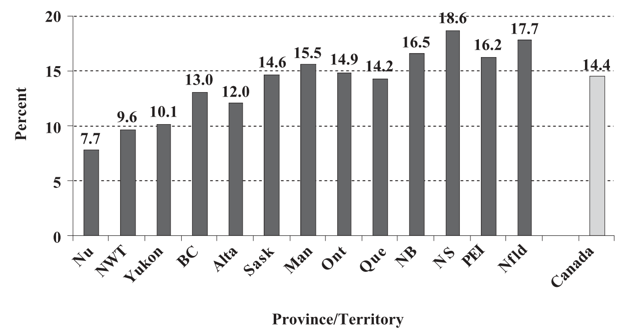
Figure 1-21 Percentage of the general population aged 20+ years who reported having high blood pressure by age group and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

In 2000, a higher percentage of adults in the eastern provinces reported having high blood pressure compared to all other provinces and territories combined (Figure 1-22). The percentage in northern territories, B.C. and Alberta was lower than in Canada as a whole.

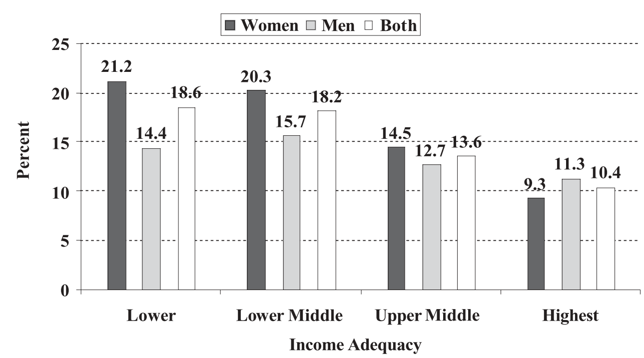
Figure 1-22 Percentage of adults aged 20+ years in the general population who reported having high blood pressure by province/territory, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

A higher percentage of men in the lower and lower middle income categories than in the upper income categories reported having high blood pressure (Figure 1-23). Among women, the percentage decreased with increased income. The percentage of women reporting high blood pressure was significantly higher than men in all income categories except the highest.

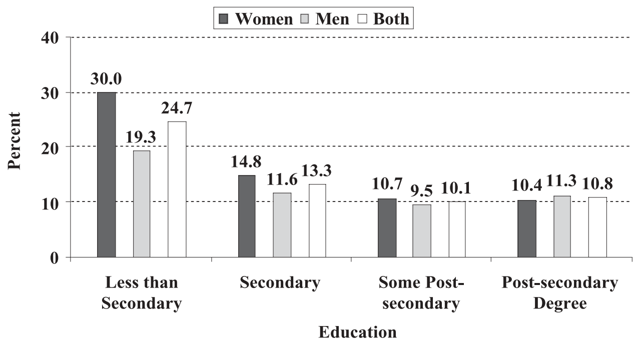
Figure 1-23 Percentage of the general population aged 20+ years who reported having high blood pressure by income adequacy and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

In 2000, the percentage of women and men who reported having high blood pressure was highest among those with less than secondary school education — 2.9 and 1.7 higher than women and men, respectively, with a post-secondary degree (Figure 1-24).

Figure 1-24 Percentage of the general population aged 20+ years who reported having high blood pressure by education and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

Early Detection of High Blood Pressure

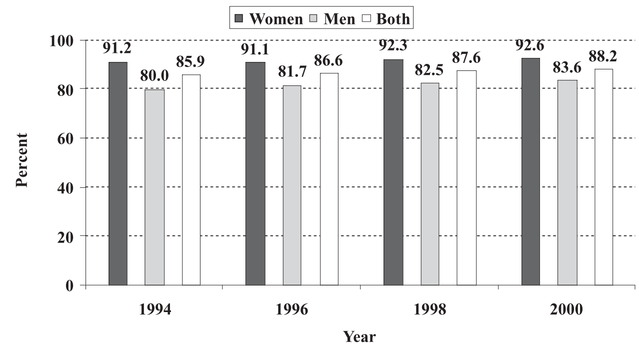
High blood pressure is often silent and usually detected only through screening. As a result, the Canadian Task Force on Preventive Practices recommends that all adults aged 20+ years have their blood pressure assessed every two years, and more frequently if additional risk factors are present.

According to the National Population Health Survey (NPHS) and CCHS, a high percentage of adults (≥ 80%) reported having their blood pressure measured between the years 1994 and 2000 (Figure 1-25). The percentage among men had slightly increased since 1994.

The percentage of men and women who had their blood pressure checked increased with age in 2000 (Figure 1-26). Men between 20 and 39 years of age were much less likely than women to have their blood pressure assessed. (Women in this age group visit their physicians for contraception and prenatal care. As a result, their blood pressure is checked more often than men). The gap narrowed with increasing age until the 70+ year age group, where the percentages were virtually equal.

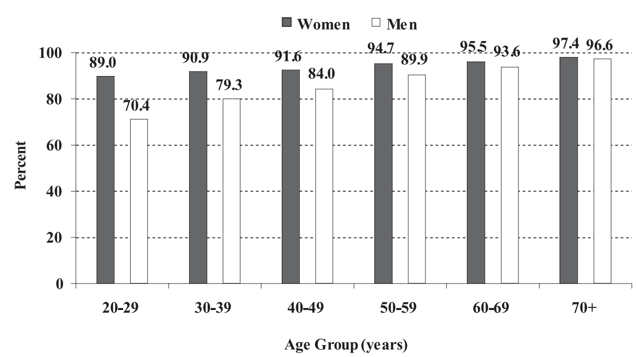
According to the 2000 CCHS, a very high percentage of Canadian adults in all provinces reported having their blood pressure checked in the previous 2 years (Figure 1-27). The percentage was lowest in Nunavut and the Northwest Territories.

Figure 1-25 Percentage of the general population aged 20+ who reported having had blood pressure measured in the previous two years, Canada, 1994-2000



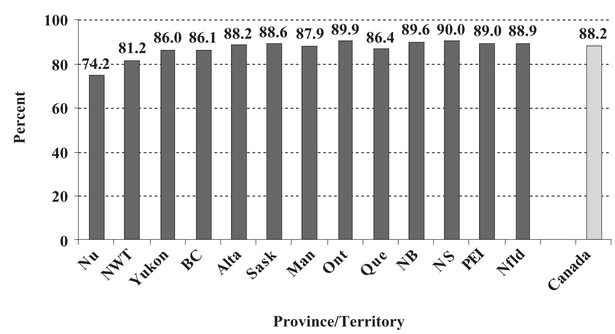
Source: Statistics Canada, National Population Health Survey and Canadian Community Health Survey

Figure 1-26 Percentage of the general population aged 20+ who reported having blood pressure measured in the previous two years by age group and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

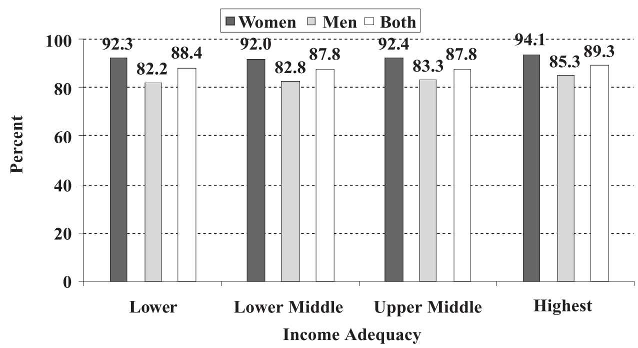
Figure 1-27 Percentage of the general population aged 20+ years who reported having blood pressure measured in the previous two years, by province, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

In 2000, a slightly higher percentage of adults in the highest income category compared to those in other income categories reported having their blood pressure checked in the previous 2 years (Figure 1-28).

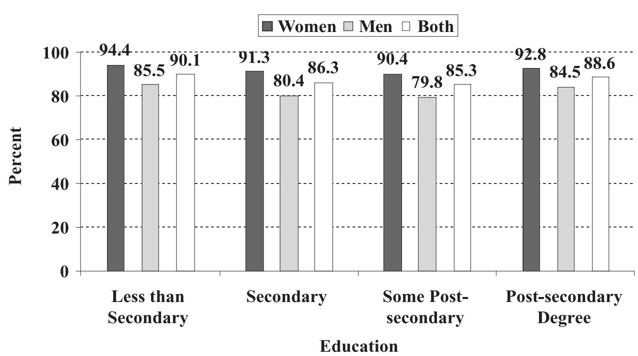
Figure 1-28 Percentage of the general population aged 20+ years who reported having blood pressure measured in the previous two years by income adequacy and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

The percentage of men and women who reported having their blood pressure measured in the previous 2 years varied little by education level (Figure 1-29). A slightly lower percentage of those with less than a secondary school education than those who had completed secondary school had their blood pressure checked. The pattern reversed between those with some post-secondary education and those who had completed post-secondary education.

Figure 1-29 Percentage of the general population aged 20+ years who reported having blood pressure measured in the previous two years by education and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

Diabetes

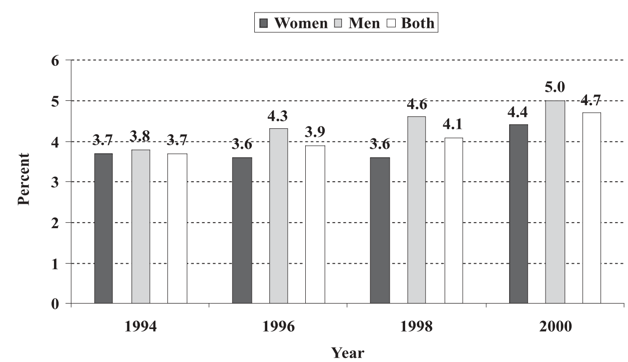
Adult onset diabetes is a significant risk factor for the development of high blood pressure, stroke, and heart and vascular disease, particularly in women. Diabetes not only increases the incidence of cardiovascular diseases but adversely influences outcomes as well. Individuals with diabetes have a higher mortality rate from heart disease.

Maintaining a healthy weight through healthy nutrition and regular physical activity can prevent diabetes. Effective management of diabetes can decrease the risk of cardiovascular disease and other diabetes-associated complications, such as peripheral vascular disease, eye problems and kidney disease.

This section includes individuals aged 20+ years with adult onset (Type 2) diabetes. The CCHS does not include children less than 12 years of age to determine Type 1 or child onset diabetes.

The prevalence of self-reported diabetes among Canadian adults increased between 1994 and 2000: by 32% among men and 19% among women (Figure 1-30).

Figure 1-30 Percentage of the general population aged 20+ years who reported having diabetes, Canada, 1994-2000

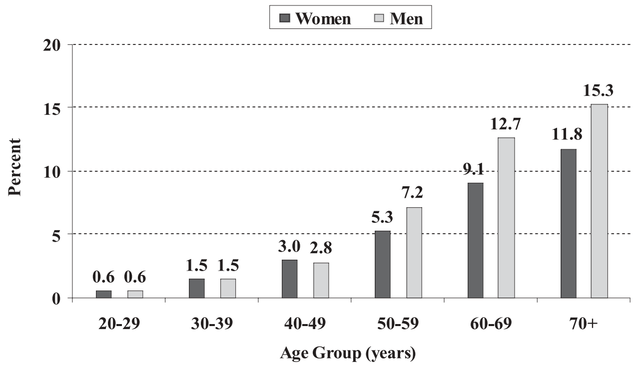


Source: Statistics Canada, National Population Health Survey and Canadian Community Health Survey

The percentage of men in the general population who reported having diabetes increased with age in 2000 (Figure 1-31). After the age of 50 years, the percentage of men with diabetes was higher than the percentage of women.

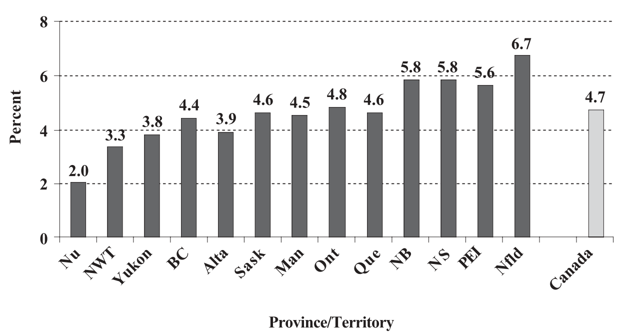
In 2000, the percentage of adults who reported having diabetes in Newfoundland, Nova Scotia and New Brunswick was higher than the percentage for all of Canada (Figure 1-32). The percentage in Alberta, Northwest Territories and Nunavut was lower. (The smaller sample sizes in some provinces/territories made it difficult to detect statistically significant differences between their jurisdictions and the overall Canadian population).

Figure 1-31 Percentage of the general population aged 20+ years who reported having diabetes by age group and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

Figure 1-32 Percentage of the general population aged 20+ years who reported having diabetes by province/territory, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

Men and women in the upper middle and highest income categories had a much lower prevalence of self-reported diabetes than their counterparts in the lower middle and lower categories (Figure 1-33).

In 2000, the percentage of both men and women with less than secondary education who reported having diabetes was 2.3 times higher than the other education categories (Figure 1-34).

Ethnicity

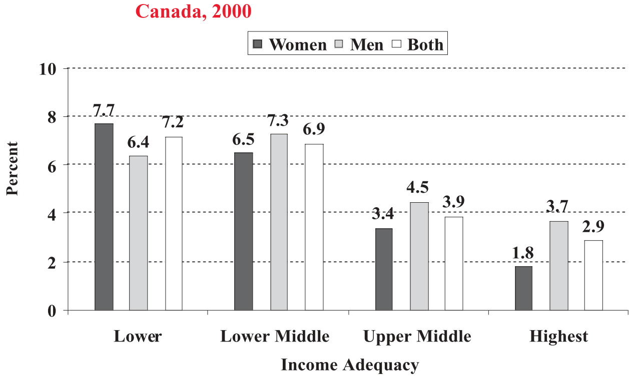
Research among South Asian-born and Chinese-born Canadians has identified different mortality rates from cardiovascular diseases compared to individuals born in Canada.

New immigrants may be a healthy group to begin with, but as they adopt unhealthy lifestyles they develop increased rates of cardiovascular diseases. Some ethnic groups, such as South Asians and Eastern Europeans, are particularly vulnerable to heart disease while Chinese are particularly vulnerable to stroke (less so to heart attacks). Preventive programs should be targeted at ethnic groups with culturally adapted messages, using language and media that are likely to reach them. Research is needed to identify any special genetic predispositions to heart disease and stroke among various ethnic groups and to develop effective interventions.

The CCHS provides information on risk factors by ethnicity (Table 1-3).

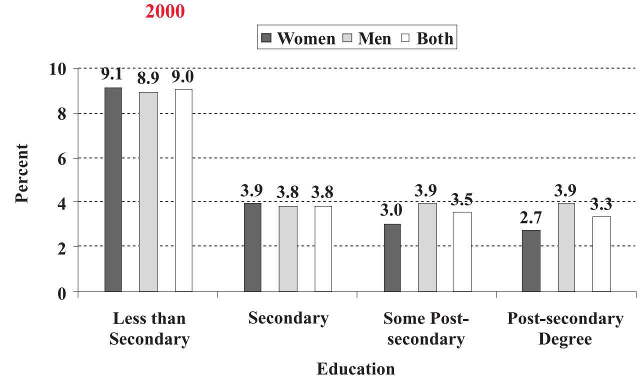
In 2000, individuals with Eastern European ethnicity were less likely to be physically inactive than the Canadian population as a whole. Those with South and Southeast Asian backgrounds were more likely to be physically inactive.

Figure 1-33 Percentage of the general population aged 20+ years who reported having diabetes by income adequacy and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

Figure 1-34 Percentage of the general population aged 20+ years who reported having diabetes by education and sex, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

Table 1-3 Risk Factors for Heart Disease and Stroke among Adults Aged 20+ Years of Various Ethnic Backgrounds, Canada, 2000					
Risk Factor	**Percent of Population with Risk Factor**				
	Chinese	**South Asian**	**Southeast Asian**	**Eastern European**	**Canadian**
Tobacco Smoking (Daily)	9.9	6.4	5.3*	22.8	22.7
Physical Inactivity	63.3	67.0	73.5	51.9	56.5
Overweight (BMI ≥ 25.0)	18.7	40.0	22.7	50.7	47.5
Consumed Less than Recommended Fruits & Vegs	70.5	61.6	67.2	62.0	62.8
High Blood Pressure	11.2	11.4	10.3*	15.2	14.4
Diabetes	3.4	5.6	2.8*	4.2	4.7

* Interpret with caution: based on small sample size   Source: Statistics Canada, Canadian Community Health Survey

In 2000, Canadians of Chinese or Southeast Asian ethnicity were more likely than the overall Canadian population to eat less than the recommended daily amount of fruits and vegetables.

Canadians of Chinese, Southeast Asian and South Asian backgrounds were much less likely to be overweight (BMI ≥ 25.0) than the Canadian population as a whole.

Aboriginal Peoples

In 2000, Aboriginal adults in Canada aged 20+ years were more likely than the Canadian population as a whole to be overweight (54.8% versus 47.5%) and to smoke (41.6% compared to 22.7%). They also were more likely to consume less than the recommended daily intake of fruits and vegetables (66.7% versus 62.8%).

On the other hand, Aboriginal Peoples were less likely than the overall Canadian population to be physically inactive (52.6% versus 56.5%) and less likely to report having high blood pressure (11.5% compared to 14.4%). The proportions that reported having diabetes were similar: (4.9% among Aboriginals compared to 4.7% for all of Canada). The results of the CCHS may reflect that its survey excluded individuals living on reserves. Other studies have found the prevalence of diabetes to be much higher among the Aboriginal Peoples.

In addition, the Aboriginal Peoples are younger than the Canadian population as a whole. As a result, since prevalence of diabetes increases with age, the Canadian population included in the survey will have a higher percentage of people with diabetes than the Aboriginal People included in the survey. The comparison between the two groups may, therefore, be skewed.

Dyslipidemia

Abnormally elevated cholesterol, low density lipoproteins (LDL) and triglycerides, and low levels of high density lipoproteins (HDL) are important risk factors for the development of vascular disease, particularly for coronary artery disease. Elevated levels of total serum cholesterol and low density cholesterol (LDC) are important risk factors for all types of stroke including stroke due to carotid artery disease. Pharmacological treatment of high blood cholesterol levels has proven to be very valuable in the management of coronary artery disease, reducing acute myocardial infarction by approximately 25% over 4 years in most studies. Pharmacological therapy has been shown to reduce the rate of stroke as well as coronary heart disease mortality.

According to the 1985-1990 Heart Health Surveys:

- 45% of men and 43% of women had a total plasma cholesterol level above the desirable level of 5.2 mmol/L;
- 30% of men and 27% of women were in the moderate risk group (5.2-6.1 mmol/L) and 18% and 17% respectively were in the highest risk group (≥ 6.2 mmol/L); and
- the proportion of men and women with a high cholesterol level (≥5.2 mmol/L) increased with age, almost doubling from the 25-34 year age group to 35-44 year age-group among men and from the 35-44 year age group to age 45-54 year age group among women.

More current data are needed in order to assess whether progress has been made in decreasing the proportion of the population with high cholesterol levels.

Discussion

Canadians run a high risk of developing cardiovascular diseases: 8 out of 10 individuals have at least one of the following risk factors — smoking, physical inactivity, being overweight, high blood pressure and diabetes — and 1 in 10 have three or more. As a result, unless community interventions with a sufficient preventive impact are implemented, the cardiovascular epidemic will continue. Addressing these risk factors will prevent not only cardiovascular diseases, but also many other chronic diseases that share the same risk factors.

For some risk factors, the trends are encouraging. Both physical inactivity in the adult population and smoking in general have decreased over the past 8 years, based on self-reported data. Unfortunately, the trends among other risk factors continue to give cause for concern. The percentage of the population who are overweight has shown little change, and in fact, obesity is increasing among men. In addition, the prevalence of both self-reported high blood pressure and diabetes has increased.

Young people carry a high level of risk for cardiovascular diseases. Nearly two-fifths of teenaged girls are physically inactive. Over one-quarter of men and women in their twenties are overweight. Among young women in their later teens (18 and 19 years), 1 in 5 smokes cigarettes daily; among young men in the same age group, the statistic is nearly 1 in 4. Lifestyle habits that are formed in this early stage tend to be continued through life.

Risk factors differ between men and women. Women tend to be more physically inactive and to report having high blood pressure. More men than women smoke. They are more likely to consume less than the recommended amount of fruits and vegetables and to be overweight.

The prevalence of all risk factors varies by region. In comparison to Canada as a whole, British Columbia tends to have a lower prevalence of all risk factors, while prevalence in Newfoundland tends to be higher. In spite of this, the previous east-west gradient in risk factors as seen in past reports has become muted, with some prairie provinces having higher rates of risk factors and some eastern provinces having lower rates of risk factors than other provinces or territories. (Provincial rates of cardiovascular disease have been adjusted for age).

A major limitation of the existing data is its lack of physical and biochemical measures of cardiovascular risk. Most provinces have not repeated the Heart Health Surveys that were conducted between 1985 to 1990, leaving a critical void in information about the detection and control of high blood pressure and dyslipidemia in Canada. In addition, we must rely on self-reported weight and height to estimate the prevalence of being overweight in the population.

Determining the prevalence of diabetes in the population presents a challenge. The approach used in this report relies on self-reports of diabetes having been diagnosed by a physician. This method has two limitations. First, people may not know that they have diabetes; and second, the criteria in making the diagnosis vary among physicians. A second approach uses administrative data to estimate the percentage of the population with diabetes. The National Diabetes Surveillance System (NDSS) uses this approach. Its report is available at http://www.hc-sc.gc.ca/ pphb-dgspsp/ccdpc-cpcmc/ diabetes-diabete/english/index.html.

Implications for Action

- Develop policies and implement community level and national programs with a sufficient preventive dose to decrease the high prevalence of cardiovascular disease risk factors.
- Implement policies and programs to encourage the adoption of healthy behaviours among children and youth.
- Conduct periodic surveys of nationally representative samples that include physical and biochemical measures to assess the prevalence of hypercholesterolemia, high blood pressure, diabetes and being overweight.

INTERVENTIONS AND SERVICES

Heart disease and stroke are chronic lifelong diseases that can be treated to relieve symptoms, improve the quality of life and reduce early death. A myriad of interventions, such as drugs, surgical procedures and education about lifestyle adjustments, is used in ambulatory and hospital settings. Clinical practice guidelines and care maps have been developed to improve consistency of treatment based on research evidence.

Helping individuals, both in the immediate or acute phase and in the community with rehabilitation and support, requires a range of health services. Community interventions are particularly important for individuals with a chronic illness such as heart disease or stroke, because they spend much of their time living in the community rather than in a hospital.

Monitoring the use of interventions and health services can provide information for planning and evaluating health services to meet the changing needs of the population. To date, no national database of individuals with heart disease and stroke has been established to provide person-specific data on the use of interventions and health services. Several provincial- and hospital-based databases do exist that can provide some of the information needed, but a national initiative to co-ordinate these databases would help to meet some of the need for information.

Hospitalization

Heart disease and stroke often result in health problems serious enough to require hospitalization. The following data from the Hospital Morbidity Database of the Canadian Institute for Health Information (CIHI) provide information on the use of hospital services (acute and chronic hospitals). The hospitalization data include individuals discharged from both acute and chronic care facilities. However, not all chronic care facilities are included; the proportion of chronic care facilities included varies from year to year and from province to province. Of particular note is that, as of fiscal year 1997/98, the Hospital Morbidity Database no longer included Ontario chronic care facilities. Since the number of hospitalizations for cardiovascular diseases in the Ontario chronic care hospitals prior to this time was small, this change had minimal impact on the overall rate of cardiovascular disease hospitalization.

The data presented in this report record each separation from a hospital (including transfers) as one episode of care. As a result, an individual will be counted more than once if he or she has more than one hospital separation.

Unfortunately, the database does not include information on visits to hospital by outpatients.

The data for most of the charts have been analyzed using the diagnosis most responsible for the length of stay. The health care team determines this at the time of hospitalization.

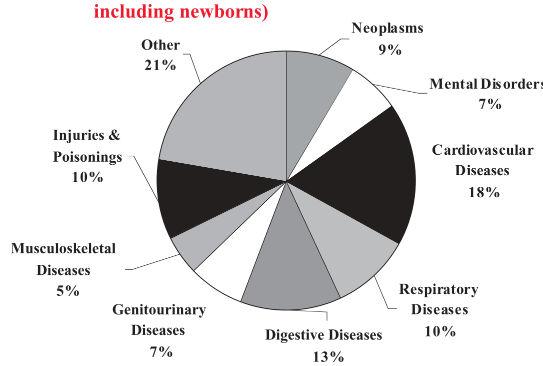
The health problems studied in this chapter include cardiovascular diseases as a whole (ICD-9 390-459), and selected cardiovascular diseases: ischemic heart disease (ICD-9 410-414), acute myocardial infarction (ICD-9 410), congestive heart failure (ICD-9 428) and cerebrovascular disease (ICD-9 430-438).

Projected numbers of hospitalizations for cardiovascular diseases as a whole and for each of the four diseases listed above have been estimated assuming that annual changes in the hospitalization rates in the future will be the same as the average annual changes in age-sex rates over the last ten years. These new annual rates were applied to Statistics Canada's population projections to take into account the aging of the population. Hospitalization rates have been somewhat inconsistent over the past 10 years: therefore, these projections present but one picture of a possible future.

Contribution to Hospitalizations

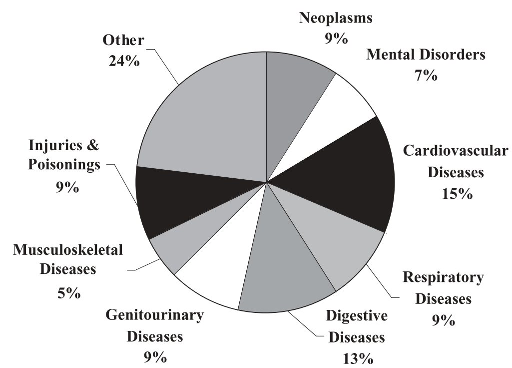
Cardiovascular diseases accounted for 18% of all hospitalizations among men and women in Canada in 2000/01, higher than any other health problem (Figure 2-1).

Figure 2-1 Hospitalizations for men and women by diagnosis*, Canada, 2000/01 (excluding pregnancy and childbirth, including newborns)



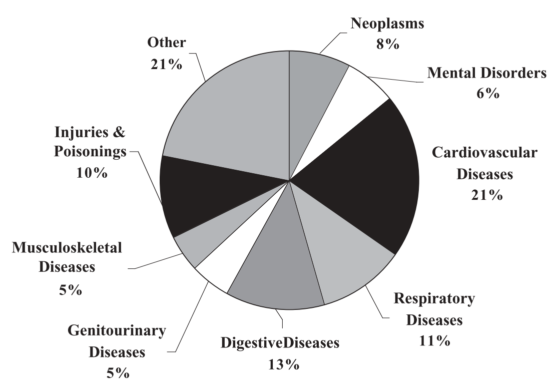
*Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Figure 2-2 Hospitalizations for women by diagnosis*, Canada, 2000/01 (excluding pregnancy and childbirth, including newborns)



*Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Figure 2-3 Hospitalizations for men by diagnosis*, Canada, 2000/01



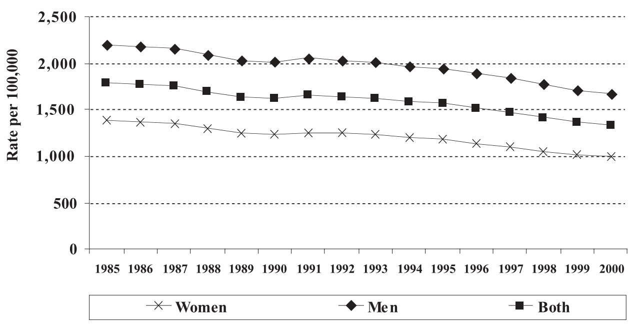
*Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

In 2000/01, cardiovascular diseases were the leading cause of hospitalizations for men (21% of all hospitalizations) and women (15% of all hospitalizations excluding childbirth and pregnancy) (Figures 2-2 & 2-3).

Trends over Time

Hospitalization rates for cardiovascular diseases have decreased steadily since 1985 (Figure 2-4). The trends over time were similar for both women and men. Hospitalizations for men for cardiovascular disease as a whole were 1.7 times higher than for women.

Figure 2-4 Hospitalization rates for all cardiovascular diseases* by sex, Canada, 1985-2000

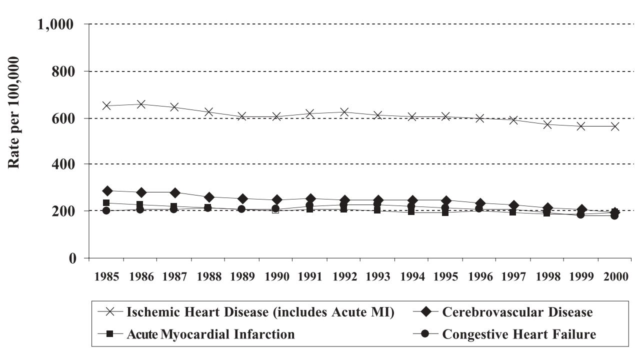


Age-standardized, Canada, 1991 *Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Between 1985/86 and 2000/01, hospitalization rates for ischemic heart disease decreased steadily (Figure 2-5). The same pattern was observed for cerebrovascular disease (mostly stroke). Rates for congestive heart failure increased to the mid-1990s then decreased.

Rates for acute myocardial infarction decreased to the mid-1990s, then remained steady. This suggests that the decline in hospitalization rates has halted.

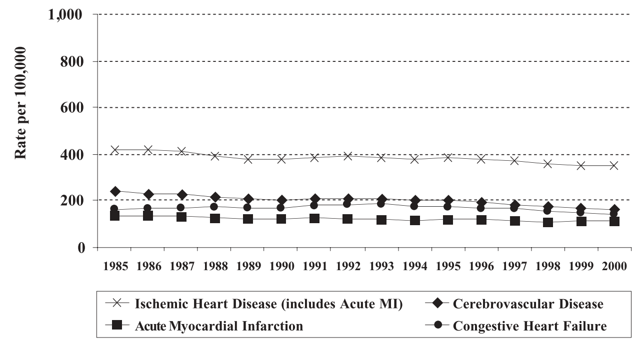
Figure 2-5 Hospitalization rates for men and women, by selected cardiovascular diseases*, Canada, 1985-2000



Age-standardized, Canada, 1991 *Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

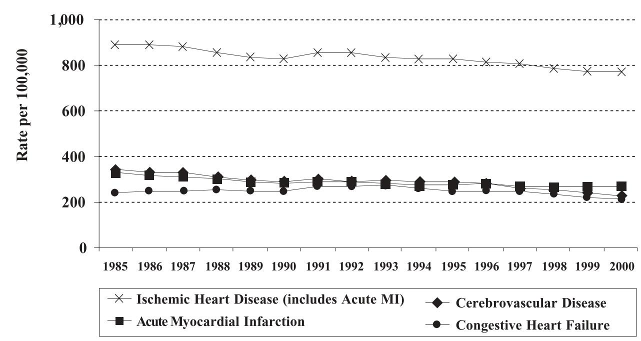
The same pattern was observed for both men and women, with the exception that the plateau in the rate of hospitalization for acute MI occurred earlier among women than men (1994 versus 1998) (Figures 2-6 and 2-7).

Figure 2-6 Hospitalization rates for women by selected cardiovascular diseases*, Canada, 1985-2000



Age-standardized, Canada 1991 *Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Figure 2-7 Hospitalization rates for men by selected cardiovascular diseases*, Canada, 1985-2000



Age-standardized, Canada 1991 *Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

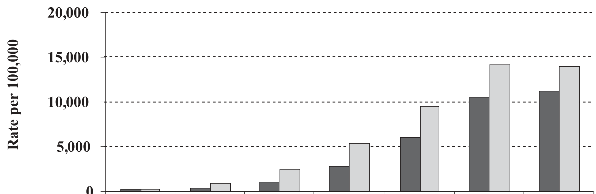
Cardiovascular Diseases

Hospitalization rates increased with age for all cardiovascular diseases in 2000/01, and were higher among men than women in all age groups (Figure 2-8).

From 1979 to the mid-1990s, the number of hospitalizations for cardiovascular diseases increased (Figure 2-9). They then stabilized in the latter 1990s. Based on the overall experience from 1985 onward, the number is predicted to increase among both men and women, but to a greater degree among men.

Where a cardiovascular disease was listed as a reason for hospital admission in 2000, it was the primary contributor to the length of stay in hospital for approximately 50% of admissions in all age groups (Figure 2-10).

Figure 2-8 Hospitalization rates for all cardiovascular diseases* by age group and sex, Canada, 2000/01

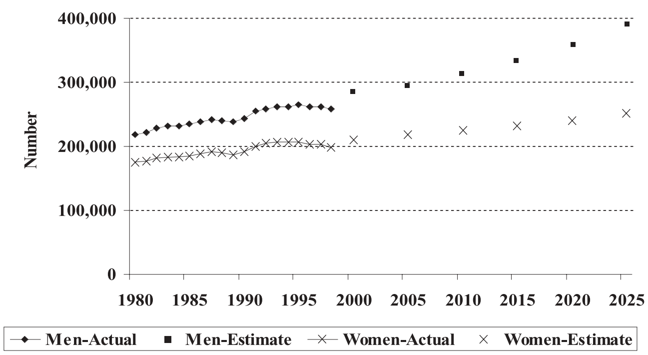


	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	158	407	1,105	2,814	6,096	10,538	11,168
Men	224	860	2,497	5,353	9,510	14,162	13,991

Age Group (years)

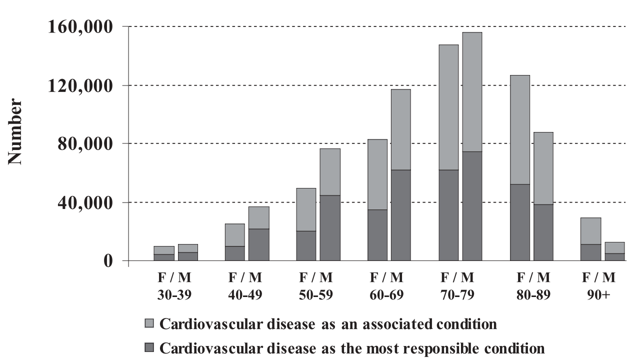
*Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Figure 2-9 Number of hospitalizations for cardiovascular diseases*, actual and projected, by sex, Canada, 1980-2025



*Using most responsible diagnosis only
Source: Statistics Canada, using data from the Hospital Morbidity Database, Canadian Institute for Health Information

Figure 2-10 Number of hospitalizations for cardiovascular diseases by age group and sex, Canada, 2000/01 (excluding pregnancy and childbirth)



Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

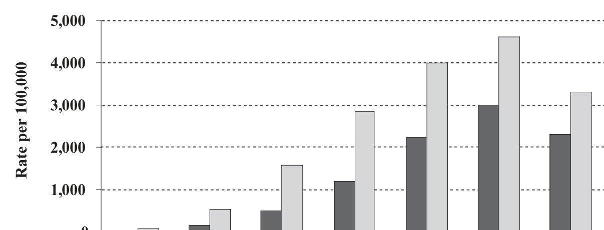
Ischemic Heart Disease

In 2000/01, hospitalization rates for ischemic heart disease (IHD) were much higher among men than women in all age groups. They increased steadily with age until the 90+ year age group. Among men, the increase began in the 40-49 year age group, while among women the increase did not appear for another 10 years (Figure 2-11).

While the actual number of hospitalizations for ischemic heart disease is projected to increase for both men and women in the next twenty years, the increase is projected to be at a much higher rate for men (Figure 2-12).

Until the age of 50 years, if an individual was hospitalized for ischemic heart disease in 2000, it was usually the primary contributor to length of stay in hospital (Figure 2-13). This pattern decreased over time until the 70-79 year age group, when ischemic heart disease was more likely to be an associated factor.

Figure 2-11 Hospitalization rates for ischemic heart disease* by age group and sex, Canada, 2000/01

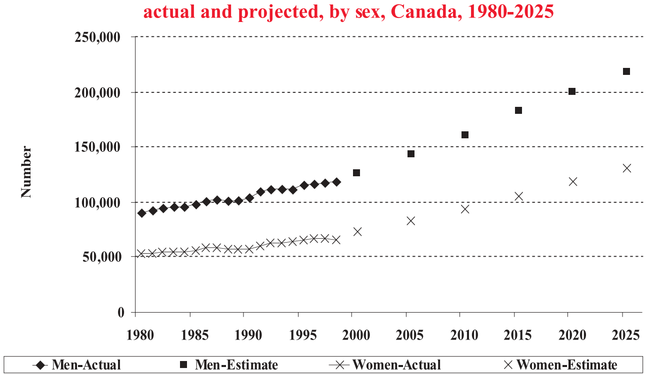


	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	23	142	497	1,201	2,223	3,005	2,296
Men	82	523	1,562	2,824	4,004	4,616	3,303

Age Group (years)

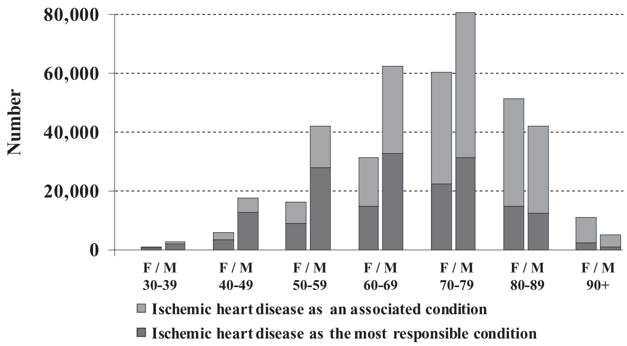
*Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Figure 2-12 Number of hospitalizations for ischemic heart disease*, actual and projected, by sex, Canada, 1980-2025



*Using most responsible diagnosis only
Source: Statistics Canada, using data from the Hospital Morbidity Database, Canadian Institute for Health Information

Figure 2-13 Number of hospitalizations for ischemic heart disease by age group and sex, Canada, 2000/01 (excluding pregnancy and childbirth)

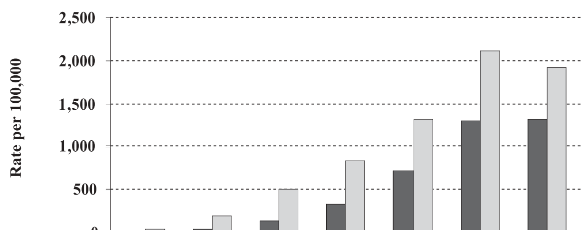


Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Acute Myocardial Infarction

Hospitalization rates for acute myocardial infarction (AMI) were much higher among men than women in all age groups in 2000. They increased steadily with age, beginning at age 40 for men and age 50 for women (Figure 2-14).

Figure 2-14 Hospitalization rates for acute myocardial infarction* by age group and sex, Canada, 2000/01

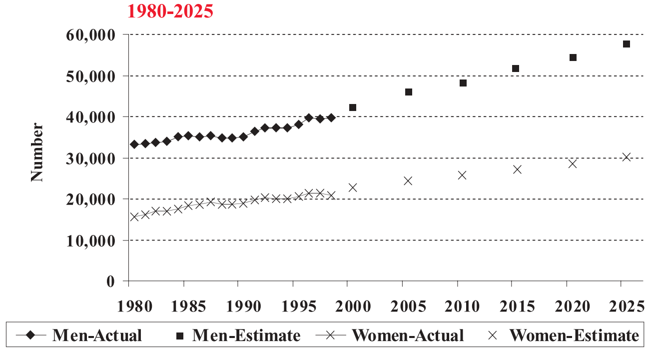


	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	9	42	134	341	726	1,313	1,326
Men	38	206	511	851	1,327	2,120	1,940

Age Group (years)

*Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Figure 2-15 Number of hospitalizations for acute myocardial infarction*, actual and projected, by sex, Canada, 1980-2025

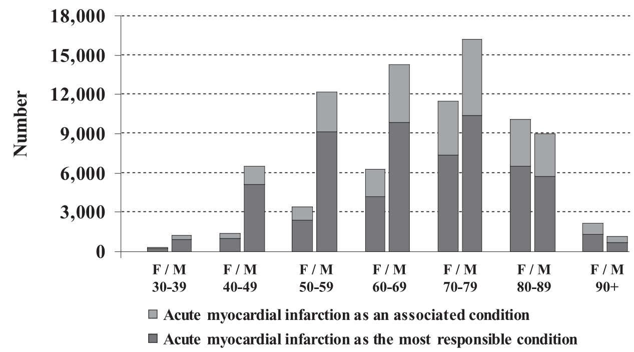


*Using most responsible diagnosis only
Source: Statistics Canada, using data from the Hospital Morbidity Database, Canadian Institute for Health Information

The actual number of hospitalizations for acute myocardial infarction (either first time or recurrent) has been increasing since 1980 and will likely continue to do so through the early part of the new century due to the aging population (Figure 2-15).

In all age groups, if an individual was hospitalized for acute myocardial infarction in 2000, it was usually the primary contributor to length of stay in hospital (Figure 2-16).

Figure 2-16 Number of hospitalizations for acute myocardial infarction by age group and sex, Canada, 2000/01 (excluding pregnancy and childbirth)



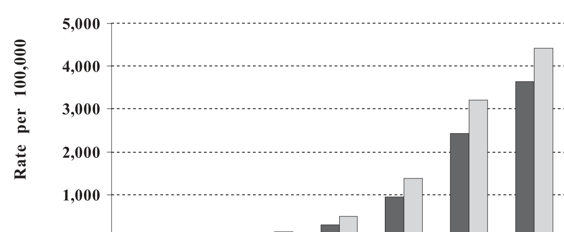
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Congestive Heart Failure

Rates of hospitalization for congestive heart failure were greater for men than women in 2000/01, though the sex difference was less than for ischemic heart disease and acute myocardial infarction. Rates increased with age, especially after the age of 70 years (Figure 2-17).

From 1979 to the mid-1990s, the number of hospitalizations for congestive heart failure increased, then stabilized and decreased in the latter 1990s (Figure 2-18). The number of hospitalizations for congestive heart failure was similar for

Figure 2-17 Hospitalization rates for congestive heart failure* by age group and sex, Canada, 2000/01

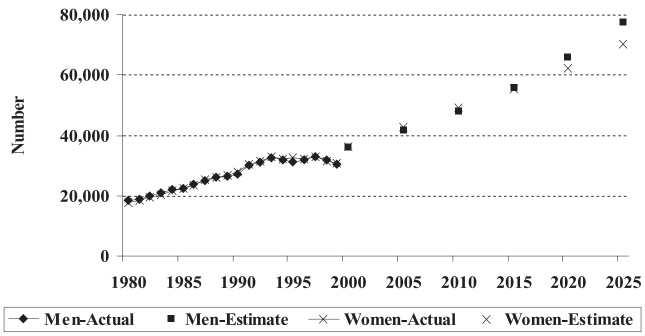


	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	5	15	71	298	939	2,436	3,644
Men	7	29	127	486	1,376	3,206	4,419

Age Group (years)

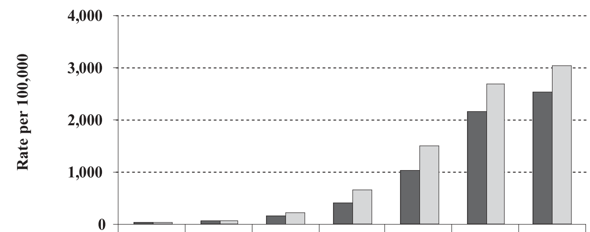
*Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Figure 2-18 Number of hospitalizations for congestive heart failure*, actual and projected, by sex, Canada, 1980-2025



*Using most responsible diagnosis only
Source: Statistics Canada, using data from the Hospital Morbidity Database, Canadian Institute for Health Information

Figure 2-20 Hospitalization rates for cerebrovascular disease* by age group and sex, Canada, 2000/01



	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	21	55	144	392	1,034	2,138	2,508
Men	17	58	209	646	1,497	2,670	3,025

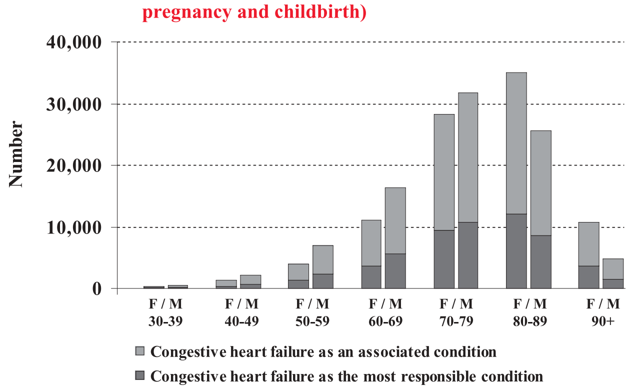
Age Group (years)

*Using most responsible diagnosis only
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

both men and women. They are projected to increase in the future based on the experience from 1989 onward. It will be important to monitor whether the decrease in the latter part of the 1990s continues, as this will influence the projected numbers.

Congestive heart failure was commonly an associated condition, rather than the most responsible condition, contributing to the length of stay in hospital in 2000/01 (Figure 2-19). Data that track only the most responsible diagnosis will underestimate the contribution of congestive heart failure to hospitalization.

Figure 2-19 Number of hospitalizations for congestive heart failure by age group and sex, Canada, 2000/01 (excluding pregnancy and childbirth)



Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Cerebrovascular Disease

The rates of hospitalization for cerebrovascular disease (mostly stroke) increased over the age of 60 among both men and women (Figure 2-20). Rates were higher among men than women, but this difference decreased over the age of 80 years.

Stroke is one of the most common presentations of cerebrovascular disease. Among men and women under the age of 50 years, stroke can be due to subarachnoid hemorrhage, intracerebral hemorrhage or occlusion of cerebral arteries with cerebral infarction (Table 2-1).[1] In 2000/01, intracerebral hemorrhage and infarction increased dramatically with age. The hospitalization rate for intracerebral hemorrhage increased among men over the age of 60 years and for women over the age of 70 years. The hospitalization rate for occlusion of cerebral arteries with cerebral infarction increased markedly at age 50 for both men and women, and continues to increase exponentially.

Between 1979 and the mid-1990s, the number of hospitalizations for cerebrovascular disease increased, then decreased, then increased again, and in the last four years decreased again (Figure 2-21). This instability makes it difficult to project the number of hospitalizations in the future. Nevertheless, the general trend in the 1980s has shown an increase which is expected to continue because of the aging population.

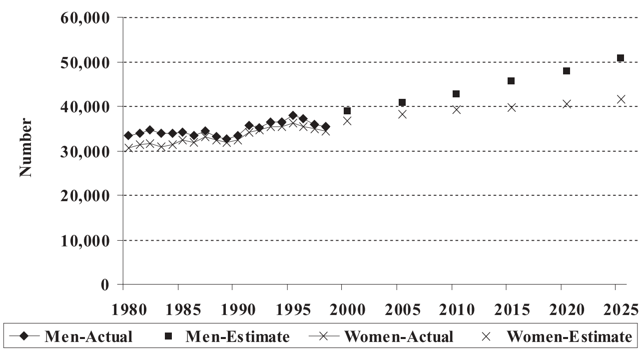
[1] For this report, stroke is defined as ICD-9 code 430-432, 434 and 436. The overall cerebrovascular range includes ICD-9 code 430-438. The components not included in the stroke category are:

433: Occlusion and stenosis of precerebral arteries
435: Transient cerebral ischemia
437: Other and ill-defined cerebrovascular disease
438: Late effects of cerebrovascular disease

Table 2-1 Hospitalizations* for Stroke by Age and Sex, Canada, 2000/01							
Type of Stroke (ICD-9 code)	Crude Rates of Hospitalization per 100,000 (Age group)						
MEN	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**80-89**	**90+**
All Stroke (430-432, 434, 436)	12	41	135	385	928	1,841	2,201
Subarachnoid hemorrhage (430)	4	10	14	15	14	21	14
Intracerebral hemorrhage (431)	3	7	17	53	107	166	145
Occlusion of cerebral arteries with cerebral infarction (434,436)	5	23	97	298	758	1,548	1,889
WOMEN							
Stroke (430-432, 434, 436)	15	36	88	239	687	1,522	1,896
Subarachnoid hemorrhage (430)	6	14	22	22	24	24	18
Intracerebral hemorrhage (431)	2	4	10	27	74	145	127
Occlusion of cerebral arteries with cerebral infarction (434,436)	6	17	54	182	568	1,311	1,703

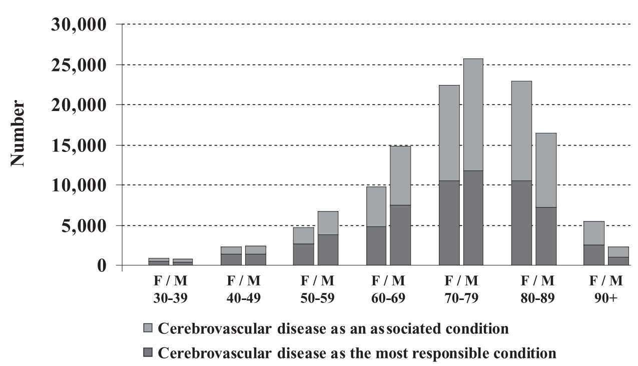
* Acute care hospitals only, out-of-province hospitalizations excluded   Source: Hospital Morbidity Database, Canadian Institute for Health Information

Figure 2-21 Number of hospitalizations for cerebrovascular disease* actual and projected, by sex, Canada, 1980-2025



*Using most responsible diagnosis only
Source: Statistics Canada, using data from the Hospital Morbidity Database, Canadian Institute for Health Information

Figure 2-22 Number of hospitalizations for cerebrovascular disease by age group and sex, Canada, 2000/01 (excluding pregnancy and childbirth)



Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

When an individual was hospitalized with cerebrovascular disease in 2000/01, it was as likely to be the most responsible condition as it was to be an associated condition contributing to the length of stay in hospital (Figure 2-22).

Hospital Procedures

Several surgical procedures can improve the quality of life and decrease illness and death for individuals with heart disease and stroke (Figures 2-23 to 2-33). Coronary bypass grafting and angioplasty are effective treatments for ischemic heart disease. Valve surgery can improve chances of survival. Pacemaker implants can support the electrical functioning of the heart. Carotid endarterectomy can improve the circulation to the brain and decrease the risk of stroke for some individuals.

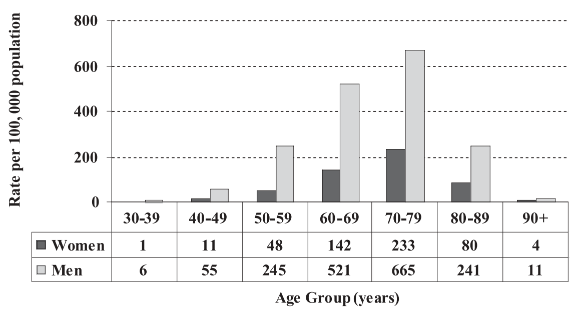
The data in this report do not include procedures done on an outpatient basis since the Hospital Morbidity Database only includes inpatient admissions.

Coronary Artery Bypass Grafting

Coronary artery bypass grafting (CABG) uses arteries or veins to bypass or go around blockages in the coronary arteries. The increased use of arteries instead of veins to bypass blocked coronary vessels has significantly improved outcomes.

In 2000, men had much higher rates of CABG than women at all ages. The rate of CABG increased to age 70-79 years for both men and women and then decreased (Figure 2-23).

Figure 2-23 **Rates of hospital procedures for coronary artery bypass grafting by age group and sex, Canada, 2000/01**

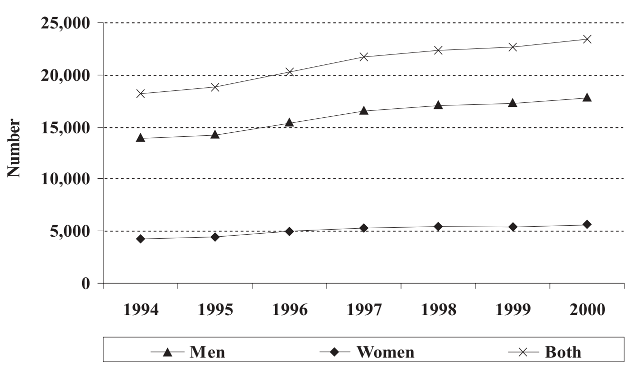


	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	1	11	48	142	233	80	4
Men	6	55	245	521	665	241	11

Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

The number of coronary artery bypass surgeries increased among both men and women between 1994/95 and 2000/01 (Figure 2-24).

Figure 2-24 **Number of coronary artery bypass surgeries by sex, Canada, 1994/95-2000/01**



Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

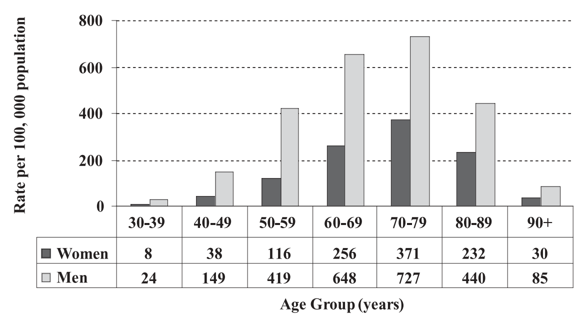
Coronary Angioplasties

Coronary angioplasty opens a blocked or narrowed coronary artery. The merits of immediate angioplasty in acute myocardial infarctions are being studied intensively and it appears likely that angioplasty will become the intervention of choice. By restoring blood flow to a coronary artery, balloon angioplasty preserves heart muscle function and improves outcomes. Hospital stay is minimized with many angioplasties being done as an outpatient procedure. The addition of a stent, particularly one that elutes an anti-thrombotic drug, has markedly improved the patency results of angioplasty.

An analysis of 1998/99 hospitalization records identified 40,680 individuals who had an acute myocardial infarction. Of these, 24.8% underwent a revascularization procedure. Among men under the age of 75 years, 38.8% underwent revascularization (36.0% had surgery (CABG) and 63.5% had angioplasty). Among men aged 75+ years, 13.1% underwent revascularization (45.9% had surgery and 53.7% had angioplasty). Among women under the age of 75 years, 33.3% were revascularized (34.7% had surgery and 63.6% had angioplasty). Among women aged 75+ years, 9.1% underwent revascularization (34.8% had surgery and 63.4% had angioplasty).

In 2000/01, the rate of angioplasties was higher among men than women in all age groups (Figure 2-25). The rate increased with age and more than doubled between the 40-49 and 50-59 year age groups.

Figure 2-25 **Rates of coronary angioplasties by age group and sex, Canada, 2000/01**

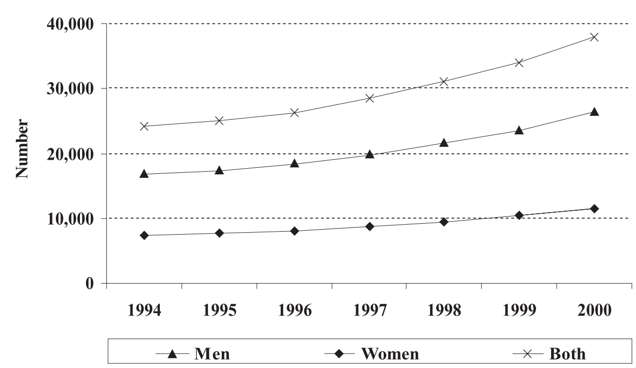


	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	8	38	116	256	371	232	30
Men	24	149	419	648	727	440	85

Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

The number of coronary angioplasties has surpassed that of bypass operations (1.6 times higher). Between 1994/95 and 2000/01, the number of angioplasties performed on both men and women increased by 36% (Figure 2-26). The male:female ratio remained the same at 2.3:1.

Figure 2-26 **Number of coronary angioplasties by sex, Canada, 1994/95-2000/01**



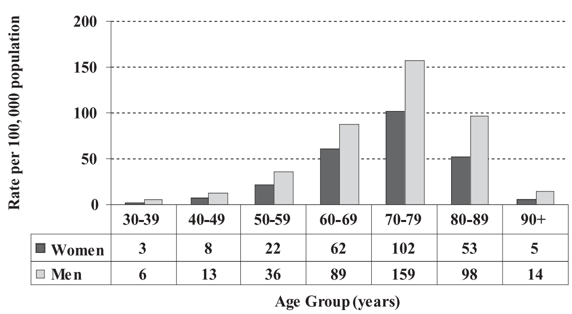
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Valve Surgery

Many diseased valves can be repaired; others are replaced either with a prosthetic tissue valve or a mechanical one. Since the lifespan of a prosthetic valve is limited, younger patients in particular may need to undergo repeat valve surgery. The majority of operations involve one diseased valve, although some individuals require repair and/or replacement of more than one. Older patients are typically examined for coronary artery disease, as they often require bypass surgery in addition to their valve surgery.

In 2000/01, the rate of valve surgery increased with age among men and women to age 70-79 years and decreased after the age of 80 (Figure 2-27). The rate among men was higher than women for all age groups.

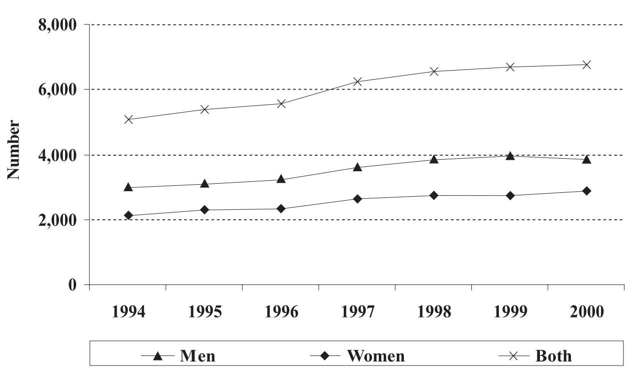
Figure 2-27 Rates of valve surgery by age group and sex, Canada, 2000/01



Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

The number of valve surgeries increased between 1994/95 and 1998/99 (Figure 2-28). In 2000/01, they decreased among men while they continued to increase slightly among women.

Figure 2-28 Number of valve surgeries by sex, Canada, 1994/95-2000/01



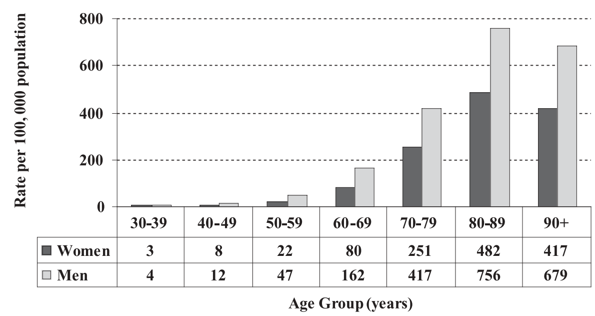
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Pacemaker Implantation

Even as their size decreases, pacemakers are becoming more and more sophisticated. Consequently, their performance can be better matched to an individual patient's needs, not only preventing catastrophic events but also improving the quality of life. The indications for pacemaker implantation are broadening as the range of response capabilities increases.

The rate of pacemaker implantations increased steadily with age among men and women in 2000/01, and was highest in the 80-89 year age group (Figure 2-29). The rate among men was higher than among women in all age groups.

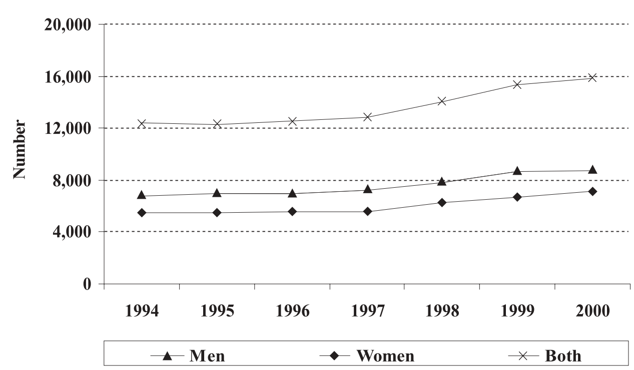
Figure 2-29 Rates for pacemaker implantation by age group and sex, Canada, 2000/01



Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Between 1994/95 and 2000/01, the number of pacemaker implants increased, mostly due to a continued increase among women (Figure 2-30). This increase has been particularly noticeable since 1997. The aging of the population and broadening of the indications for pace-maker use have also contributed to the increase.

Figure 2-30 Number of pacemaker implantations by sex, Canada, 1994/95-2000/01



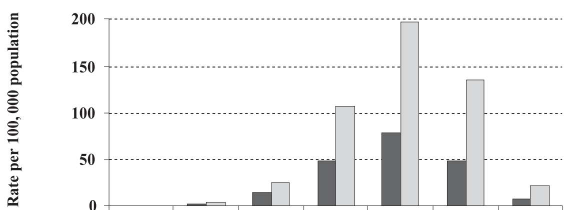
Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Carotid Endarterectomy

Carotid endarterectomy is a surgical treatment for the prevention of stroke. Benefit from the procedure is greatest for symptomatic patients with at least 70% stenosis of the internal carotid artery. Symptomatic patients with 50% to 69% stenosis experience less benefit, and those with less than 50% stenosis do not benefit from the operation. The role of endarterectomy in the treatment of asymptomatic patients with carotid stenosis remains unclear and controversial.

In 2000/01, the rate of carotid endarterectomy peaked among adults aged 70-79 years (Figure 2-31). The rate among men was at least twice the rate among women in all 50+ age groups.

Figure 2-31 Rates of carotid endarterectomy by age group and sex, Canada, 2000/01



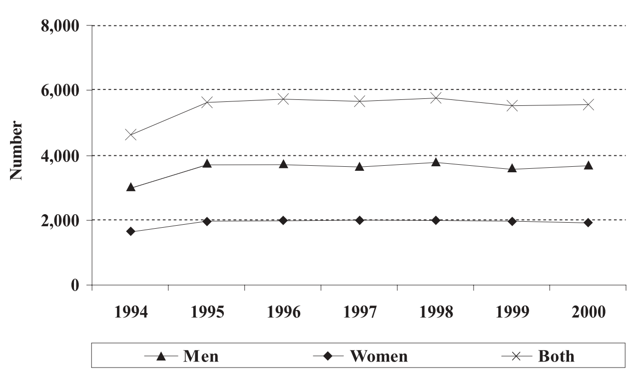
	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	0	2	13	48	78	47	7
Men	0	3	25	106	198	134	20

Age Group (years)

Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

The number of carotid endarterectomies has changed very little among either men or women since 1995/96 (Figure 2-32).

Figure 2-32 Number of carotid endarterectomies by sex, Canada, 1994/95-2000/01



Source: Health Canada, using data from the Hospital Morbidity Database, CIHI

Heart Transplantation

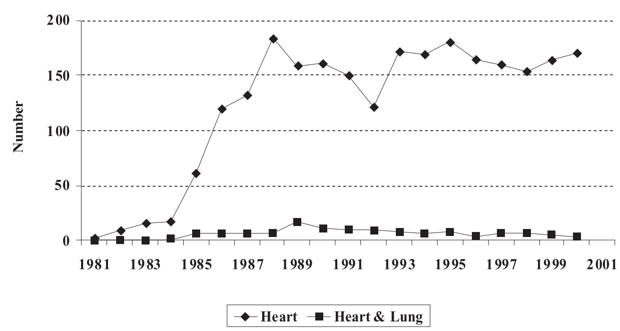
Heart transplantation is a lifesaving procedure for an otherwise fatal condition. The number of heart and combination heart and lung transplantations performed in Canada each year does not reflect the need; the limited availability of donor organs remains a major challenge.

Mechanical devices to support or replace cardiac function offer some hope for the future and, once available, should result in dramatic growth in the number of operations.

In 2000, 171 heart transplantations and 4 heart and lung transplantations were carried out in all of Canada. In 1995, the most common primary diagnosis for heart transplantations was coronary artery disease (46%), followed by cardiomyopathy (41%). Congenital heart disease and valvular heart disease were the underlying health problems in 6% and 3% of heart transplantations, respectively.

The number of heart transplantations increased dramatically in the 1980s, largely due to improvements in technology and drugs (Figure 2-33). The numbers were virtually the same in 1993 and 2001, with minor variations in intervening years.

Figure 2-33 Number of heart transplantations, Canada, 1981-2001



Source: Canadian Organ Replacement Registry, CIHI

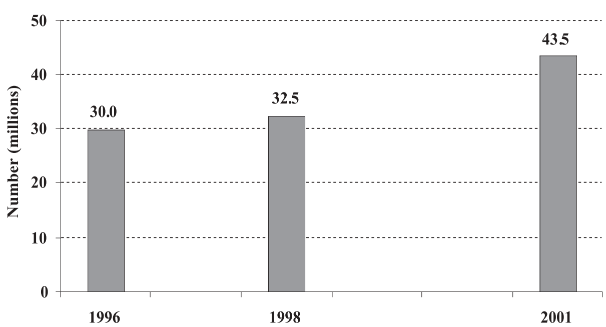
Heart and lung transplantations increased to a high of 17 in 1989, then decreased to 4 in 2001.

Between 1991 and 2000, the one-year survival rate for heart transplantations was 83.7%. For 3 years, it was 79.0%, and for 5 years, 74.7%. The 5-year survival rate actually increased over that time period from 69.1% in 1989-1997 to 77.4% in 1995-2000.

Medication Use

In 2001, an estimated 43.5 million prescriptions were dispensed for the treatment of cardiovascular disease, an increase of 34% from the 32.5 million prescriptions in 1998, and an increase of 45% from the 30.0 million prescriptions in 1996 (Figure 2-34). Two drug groupings showed the greatest increase: ACE inhibitors (from 7.5 million in 1996 to 8.5 million in 1998); and cholesterol reducers (from 4.8 million in 1996 to 7.3 million in 1998). Use of these drugs increased steadily throughout the 1990s.

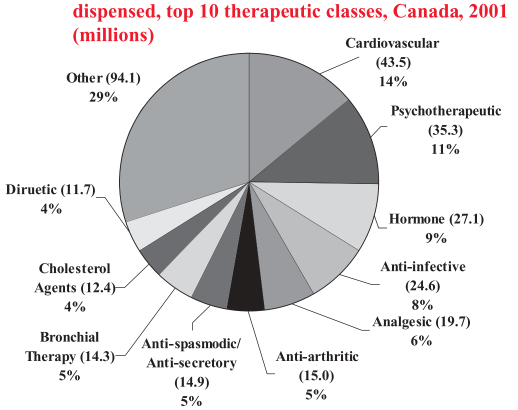
Figure 2-34 Number of prescriptions for treatment of cardiovascular diseases, Canada, 1996-2001 (millions)



Source: Health Canada, using data from IMS Health, Canada

Cardiovascular disease prescriptions accounted for 13.9% of the total 312.6 million prescriptions dispensed in Canada in 2001 (Figure 2-35). Although diuretics are analyzed separately from cardiovascular prescriptions per se, most are utilized in the treatment of hypertension and congestive heart failure. They account for 3.7% (11.7 million) of all prescription drugs dispensed in Canada. Pharmacists dispensed approximately 48.9 million prescriptions for anti-hyptertensive agents in 2001.

Figure 2-35 Estimated number and percent of prescriptions dispensed, top 10 therapeutic classes, Canada, 2001 (millions)



Source: Health Canada, using data from IMS Health, Canada

These tabulations do not account for homeopathic and herbal treatments, which continue to increase in popularity.

As in Canada, the greatest number of prescriptions in Japan, Germany, France, Italy and the United Kingdom are for the treatment of cardiovascular diseases. In the United States, cardiovascular disease-related prescriptions rank second to treatment of central nervous system problems. Unfortunately, prescriptions and sales do not indicate adherence with treatment.

Physician Visits

Using data from the Intercontinental Medical Statistics (IMS) Canada database, it has been estimated that in 2001, 29.6 million (10%) of visits made by Canadians to physicians were for cardiovascular diseases. Of these cardiovascular disease-related visits, 59% were for the management of high blood pressure, 16% for ischemic heart disease including angina, 12% for other heart disease, and 4% for cerebrovascular disease.

Seniors made 15,182 visits to physicians in 1999 for cardiovascular diseases, twice the number for any other disease category.

There were 17.2 million visits to office-based physicians for high blood pressure in 2001, an increase of 30% since 1997. These comprised almost 6% of all visits to community physicians in Canada. High blood pressure was the main diagnosis from physician visits among adults aged from 38 to 57 years and those 65 years of age and over.

Discussion

Cardiovascular diseases are a major cause of hospitalization among both men and women, as either the primary or an associated health problem. Although national data are unavailable, it is reasonable to assume that cardiovascular diseases are also a major factor in emergency department and outpatient visits. Although hospitalization rates for cardiovascular diseases (except for congestive heart failure) are decreasing, the actual numbers of hospitalizations will increase in the future because of the aging of the population.

While hospitalization rates have been decreasing, the number of prescriptions for cardiovascular diseases has increased during the 1990s. Improved treatment, including the introduction of new drugs, may have decreased the need for hospitalization. Unfortunately, national data do not exist on either the health effect of this increased prescription use, the appropriateness of prescriptions, or patient compliance.

The number of several interventional procedures, including coronary artery bypass grafting, angioplasties, valve surgery, pacemaker implantation and heart transplantation, has been increasing. This may reflect the increase in the aging population in Canada. The actual number of procedures is actually much higher, since many procedures are being performed on an outpatient basis and are, therefore, not included in hospitalization data. In fact, this increased use of outpatient facilities for procedures that were previously performed in hospital may, in part, account for the decrease in hospitalization rates for cardiovascular diseases.

The increase in procedures has a major impact on health care costs. It also puts a strain on the limited availability of both human resources and equipment.

Sex differences exist in cardiovascular disease hospitalization rates and procedures. Men have higher hospitalization rates than women for all cardiovascular diseases. The difference is smallest for cerebrovascular disease and congestive heart failure. All procedures are performed more often on men than women. Whether these differences reflect gender attitudes of health professionals or biology, or both, requires further study.

Implications for Action

- Improve cardiovascular disease surveillance by developing data sources to provide comparative information on such indicators as: use of emergency and outpatient services; use of therapy and rehabilitation programs; access to surgical procedures and ambulatory care services; use of interventions according to clinical practice guidelines; and satisfaction with services.
- Review present cardiovascular health resources (human and technological) and future needs, based on the projected increase in a number of hospitalizations and procedures because of the aging population.
- Develop cost-effective programs and services to meet the projected increase in the need for cardiovascular disease services.
- Conduct more research on the differences between the sexes in hospitalization and procedures for cardiovascular diseases.

COST OF CARDIOVASCULAR DISEASES

Cardiovascular diseases have a significant economic impact in Canada. In its report, *Economic Burden of Illness in Canada, 1998*, Health Canada estimated the total cost of cardiovascular diseases on the health sector of the Canadian economy to be $18,472.9 million (11.6% of the total cost of all illnesses), which includes a direct cost of $6,818.1 million (8.1% of the total direct cost of all illnesses) and an indirect cost of $11,654.8 million (15.4% of the total indirect cost of all illnesses).

> "Direct costs are defined as the value of goods and services for which payment was made and resources used in treatment, care and rehabilitation related to illness or injury. The five direct cost components in this report are organized and measured in terms of hospital care expenditures; drug expenditures; physician care expenditures; expenditures for care in other institutions; and additional direct health expenditures (including other professionals, capital, public health, prepayment administration, health research, etc). Other direct costs borne by patients or other payers (such as costs for transportation to health providers, special diets and clothing) are not included.
>
> Indirect costs are defined as the value of economic output lost because of illness, injury-related work disability, or premature death. The three indirect cost components in this report are measured in terms of the value of years of life lost due to premature death (mortality costs), and the value of activity days lost due to short-term and long-term disability (morbidity costs due to long- and short-term disability). Other indirect costs, including the value of time lost from work and leisure activities by family members or friends who care for the patient, are not included in this report." (EBIC)

In 1998, the total economic burden of illness was $159,434.5 million dollars — $83,954.9 million in direct costs and $75,479.6 million in indirect costs. $38,266.0 million of total costs could not be assigned to any particular disease category. These "unattributable" costs constituted a significant proportion (24.0%) of the total costs. Thus, the total costs related to cardiovascular diseases could be much higher.

The direct, indirect and total costs for 1998 were less than those incurred in 1993, when calculated using 1998 dollars (Table 3-1). There is no clear explanation for this.

Table 3-1 Cost Components of Cardiovascular Diseases, Canada, 1993 and 1998 (in 1998 $000,000s)

Cost Type	Cost (in 1998 $000,000s)		Change*	
	1993	1998	$	%
Direct Costs	$7,845.5	$6,818.1	-$1,027.4	-13.1
Indirect Costs	$13,193.7	$11,654.8	-$1,538.9	-11.7
Total Costs	$21,039.2	$18,472.9	-$2,566.3	-12.2

* Interpretation is confounded by the increase in "unattributable" costs between 1993 and 1998.

Source: Health Canada. Economic Burden of Illness in Canada, 1998 (Catalogue #H21-136/1998E). Ottawa: Public Works and Government Services Canada; 2002.

However, unattributable costs were much higher in 1998 compared to 1993, (38,266.0 million compared to 29, 443.6 million, respectively) representing an increase from 17.6% to 24.0% of total costs. Their impact on the cost of cardiovascular diseases is uncertain. Nonetheless, understanding how to control costs and maximize efficiency is an imperative.

In terms of the direct costs of cardiovascular diseases in Canada in 1998, the major cost components were: hospital care ($4,161.8 million; 61.0% of CVD direct costs), drugs ($1,772.8 million; 26.0%), physician care ($822.3 million; 12.1%), and additional direct health expenditures including research ($61.2 million; 0.9%).

The major components of the indirect cost of cardiovascular diseases in 1998 were: costs due to mortality (as cost of premature death) ($8,250.0 million; 70.8% of CVD indirect costs), morbidity due to long-term disability ($3,151.5 million; 27.0%), and morbidity due to short-term disability ($253.3 million; 2.2%).

Direct and Indirect Costs of Cardiovascular Disease Compared to Other Diagnostic Categories

In 1998, costs attributable to cardiovascular diseases were the largest among all diagnostic categories in terms of total cost, followed by musculoskeletal, cancer and injuries (Figure 3-1).

In terms of direct costs, cardiovascular diseases were the most costly disease category and 1.5 times higher than mental disorders, the next largest disease category. Although they were third highest in indirect costs after musculoskeletal conditions and cancer, the difference between cardiovascular diseases and cancer was small. There was a significant drop (approximately $2 billion) between these two conditions and the fourth-ranked diagnostic category (injuries).

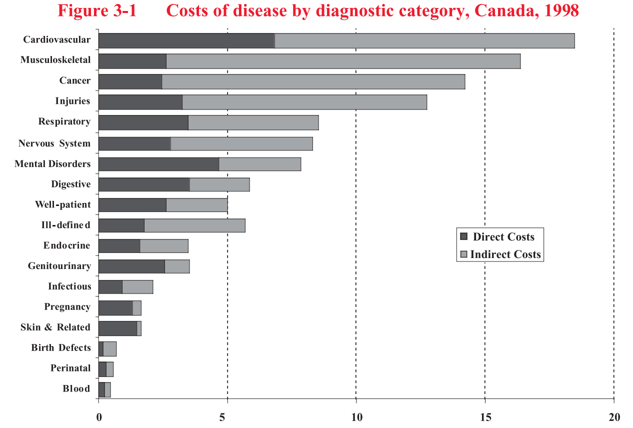
Demographics of the Costs of Cardiovascular Diseases

The costs of cardiovascular diseases in Canada were higher for men than for women in all categories except drugs (Table 3-2). Costs were highest in the 65+ year age group for all components, except for long-term and short-term disability, both of which were highest in the 35-64 year age group (Table 3-3). Costs were low in the <35 year age group in comparison to older Canadians.

Costs of Cardiovascular Diseases by Province/Territory

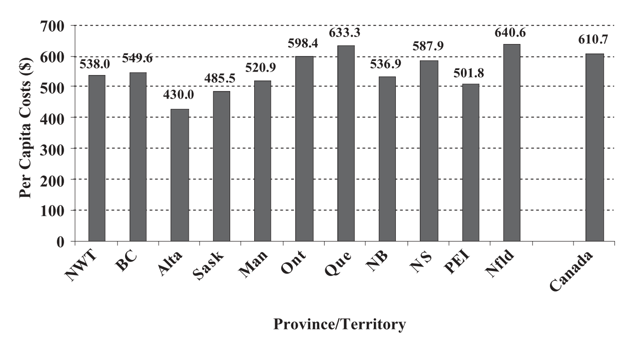
Per capita health costs related to cardiovascular diseases vary among the provinces and territories (Figure 3-2). The variation may be due to differences in physician practices or coding practices across the country. Table 3-4 outlines selected costs for cardiovascular diseases by province/territory.

Figure 3-1 Costs of disease by diagnostic category, Canada, 1998



Source: Health Canada: Economic Burden of Illness in Canada, 1998

Figure 3-2 Per capita health costs related to cardiovascular diseases by province, Canada, 1998.



Source: Health Canada: Economic Burden of Illness in Canada, 1998

Table 3-2 Selected Costs, Cardiovascular Diseases by Sex, Canada, 1998 (in $000,000s)

Component	Males	Females	All
Hospital Care	$2,338.0	$1,823.8	$4,161.8
Drugs	$836.0	$903.2	$1,772.8
Physician Care	$432.3	$389.2	$822.3
Mortality (as cost of premature death)	$5,280.1	$2,970.0	$8,250.0
Long-Term Disability	$1,976.3	$1,175.2	$3,151.5
Short-Term Disability	$176.3	$77.0	$253.3

Source: Health Canada. EBIC On-line. Policy Research Division, Strategic Policy Directorate.
URL: <http://www.ebic-femc.hc-sc.gc.ca/> Date of access: February, 2003.

Table 3-3 Selected Costs, Cardiovascular Diseases by Age Group, Canada, 1998 (in $000,000s)

Component	Age Group			
	0-14 years	15-34 years	35-64 years	65+ years
Hospital Care	$47.5	$97.9	$1,278.0	$2,730.3
Drugs	$10.6	$46.0	$735.3	$963.3
Physician Care	$7.2	$31.8	$323.5	$459.8
Mortality (as cost of premature death)	$36.5	$215.5	$3,891.2	$4,106.8
Long-Term Disability	Data N/A	$208.8	$1,664.6	$1,061.3
Short-Term Disability	Data N/A	$44.6	$166.1	$42.7

Source: Health Canada. EBIC On-line. Policy Research Division, Strategic Policy Directorate.
URL: <http://www.ebic-femc.hc-sc.gc.ca/> Date of access: February, 2003.

Table 3-4 Selected Costs, Cardiovascular Diseases by Province/Territory, Canada, 1998 (in $000,000s)

	Category					
Province	Hospital Care	Drugs	Physician Care	Mortality (as cost of premature death)	Long-Term Disability	Short-Term Disability
British Columbia	532.5	192.5	95.4	939.7	394.8	41.8
Alberta	349.0	143.1	60.0	674.2	309.5	23.7
Saskatchewan	116.7	52.5	23.9	299.7	49.9	4.8
Manitoba	153.2	59.0	25.3	346.2	143.1	8.9
Ontario	1,521.0	770.6	383.3	2,957.8	1,084.8	95.6
Quebec	1,096.4	411.7	178.2	2,231.6	668.0	52.1
New Brunswick	106.1	42.6	16.8	230.2	203.4	8.9
Prince Edward Island	18.8	8.8	2.0	37.9	20.0	1.2
Nova Scotia	150.5	59.2	24.8	304.4	146.2	11.4
Newfoundland	91.3	28.1	11.7	213.1	131.8	5.0
Yukon	3.8	1.5	0.1	Data N/A	Data N/A	Data N/A
Northwest Territories	22.3	3.0	0.8	10.3	Data N/A	Data N/A

Source: Health Canada. EBIC On-line. Policy Research Division, Strategic Policy Directorate.
URL: <http://www.ebic-femc.hc-sc.gc.ca/> Date of access: February, 2003.

Direct and Indirect Costs of Cardiovascular Disease by Disease Subcategory

Ischemic heart disease led stroke (30.6% versus 17.2% respectively) as the leading contributor to hospital care costs for cardiovascular diseases (Table 3-5). Among birth defects, congenital cardiovascular disease contributed to 37.2% of hospital care costs.

In 1998, hypertension was the leading contributor to drug costs among cardiovascular diseases (49.6% of cardiovascular disease drug costs). Drugs for ischemic heart disease accounted for 28.9% of the cost of cardiovascular disease drugs.

One-third (33.5%) of the costs associated with mortality (as cost of premature death) due to cardiovascular diseases were attributed to acute myocardial infarction. When combined with all other listings of ischemic heart disease, this percentage rose to 58.7%. Stroke also made a major contribution to mortality costs (15.2%). Among all birth defects, congenital cardiovascular disease contributed to 47.0% of the cost associated with mortality (as cost of premature death).

The major contributors to costs of long-term disability due to cardiovascular diseases were ischemic heart disease (18.0%) and stroke (13.2%).

Methodology

The *Economic Burden of Illness in Canada, 1998* report includes a description of the methodology for determining direct and indirect costs (p. 1).
The full report is available at the following Web site:
http://www.hc-sc.gc.ca/pphb-dgspsp/publicat/ebic-femc98/

> "With the exception of mortality costs, a prevalence-based approach was used to estimate all direct and indirect costs that accrued to existing (or prevalent) cases of illness, injury, or disability in 1998. This approach makes the best use of the survey and

Table 3-5 Selected Costs for Cardiovascular Diseases Diagnostic Subcategory, Canada, 1998 ($000,000s)

	Cost $000,000 (% of CVD Costs in Category)			
Cardiovascular Disease Condition	**Hospital Care**	**Drugs**	**Mortality (as cost of premature death)**	**Long-Term Disability**
Aortic Aneurysm	$103.2 (2.5%)		$236.9 (2.9%)	
Cerebrovascular Disease (excluding Stroke)	$158.8 (3.8%)			$71.8 (2.3%)
Stroke	$714.4 (17.2%)		$1,255.4 (15.2%)	$415.7 (13.2%)
Cerebral Infarction		$29.1 (1.7%)		
Ischemic Heart Disease (including AMI)	$1,274.8 (30.6%)	$512.7 (28.9%)	$4,845.8 (58.7%)	$567.9 (18.0%)
Ischemic Heart Disease (not including AMI)			$2,081.5 (25.2%)	$346.6 (11.0%)
Acute Myocardial Infarction (AMI)			$2,764.3 (33.5%)	$221.3 (7.0%)
Hypertension		$880.0 (49.6%)		
Congenital CVD	$48.5 (37.2% of birth defects)		$168.3 (47.0% of birth defects)	

Source: Health Canada. Economic Burden of Illness in Canada, 1998 (Catalogue #H21-136/1998E). Ottawa: Public Works and Government Services Canada; 2002.

administrative data that are available for calculating core direct and indirect costs and, in turn, for distributing these costs across primary diagnostic categories. A limitation of this approach is that the data do not always allow for an assessment of the impact of co-morbid conditions.

"For mortality costs, an incidence-based human capital approach most commonly used in cost-of-illness studies was used. Mortality cost estimates are based on the discounted value of current and future costs of premature deaths occurring in 1998, rather than a prevalence-based approach in which estimates would be based on the 1998 dollar value of premature deaths that occurred prior to 1998. While it would have been preferable to use a prevalence-based approach for all cost components, this approach is used here for several reasons: the availability of reliable statistics, the relative simplicity of calculations compared with other methods, and consistency across studies using the same approach. The limitations of this approach, which include the possibility of over-estimating mortality costs and under-valuing psychosocial consequences, are discussed further in the mortality cost chapter and EBIC 1993."

Discussion

Cardiovascular diseases are the most costly contributors to both direct and indirect health costs in Canada — they are also largely preventable. Approximately 80% of the population has at least one modifiable risk factor for cardiovascular diseases. Therefore, decreasing these risk factors in the population can have a great impact on reducing the costs of cardiovascular disease.

The commonly held perception is that cardiovascular diseases affect primarily older people. While many of the health care costs are associated with individuals 65 years of age and over, cardiovascular diseases among younger adults also have a major economic impact. Preventing cardiovascular diseases in this age group, then, has long-term economic implications.

Hospitalization for cardiovascular diseases costs over $4 billion annually. Since hospitalization rates increase with age (see Chapter 2) and the number of individuals over the age of 65 years in Canada is growing, hospital costs are likely to increase in the future.

The number of prescription drugs for cardiovascular diseases has been increasing. Thus, the cost due to prescription drugs is also likely to increase in the future.

The *Economic Burden of Illness in Canada, 1998* faced significant challenges in the use of existing data to describe the economic burden of illness in Canada from a health perspective. One major obstacle that EBIC faced is that health care costs associated with other aspects of health problem management, such as home care, residential care and therapy are difficult to capture and difficult to assign to particular disease categories and are, therefore, assigned as "unattributable" costs. The high proportion of "unattributable" costs makes analysis and interpretation of the data difficult, and calls for a refinement and improvement in data collection. In addition, greater detail in the data analysis would permit tracking of changes in one cost component in relation to others for specific diseases.

The most recent report on the economic burden of illness uses data from 1998. While this is useful from a research perspective, the time lag limits its application for surveillance. Policy-makers who are making decisions for the year 2003 need more current information.

Implications for Action

- Invest in the prevention and reduction of risk factors for cardiovascular diseases to decrease the economic burden of cardiovascular diseases in Canada.
- Develop effective and less expensive alternatives to hospital care for cardiovascular disease problems to mitigate against the anticipated increase in hospital costs associated with acute care.
- Improve the timeliness and quality of existing administrative data and develop additional data sources to enhance the use of economic data for surveillance.

HEALTH OUTCOMES

When considering health outcomes from cardiovascular disease (heart disease and stroke), mortality tends to receive the greatest attention due to the availability of the data. But since many individuals live with cardiovascular diseases, it is important to consider who develops it (incidence), who is currently living with it (prevalence), and the nature of their disabilities and the quality of their lives.

Incidence and Prevalence

Unfortunately, since the existing surveillance system for cardiovascular diseases in Canada relies on administrative physician billing, and hospitalization and mortality data, the incidence of the diseases (the rate of people developing cardiovascular diseases) is not routinely determined. In fact, few reports on the incidence of cardiovascular diseases in Canada exist.

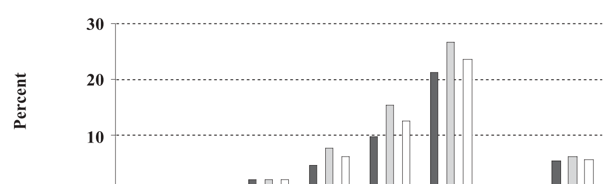
Some sense of the prevalence of cardiovascular diseases (the proportion of the population with heart disease or stroke) can be obtained from Statistics Canada's National Population Health Survey (NPHS) and, more recently, its Canadian Community Health Survey (CCHS). This approach is limited, however, by the fact that the collected data are self-reported and dependent not only on the individuals having already been diagnosed with heart disease by a physician, but also on their reporting this correctly in the survey.

In 2000, the prevalence of self-reported heart problems was low among men and women up to the age of 50 years (Figure 4-1). Prevalence increased after this age, with the increase much greater among men than women. By the age of 70 years, 1 in 5 women and 1 in 4 men reported having been told by a physician that they had heart problems.

Quality of Life

Heart disease has a major impact on quality of life. In 2000, 90.0% of the population without heart disease reported their health as being good, very good or excellent. The percentage was much lower among those with self-reported heart disease (51.0%) or stroke (36.8%). Among people with chronic diseases, those with stroke had one of the lowest percentages reporting good or better health.

Figure 4-1 Percentage of adults aged 20+ years who report having heart problems by age group and sex, Canada, 2000

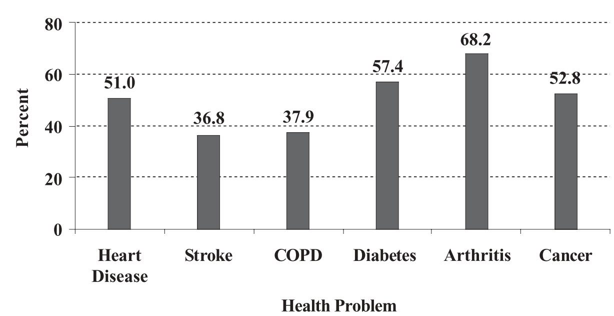


	20-29	30-39	40-49	50-59	60-69	70+		All
Women	0.7 *	1.0	2.0	4.4	9.8	21.2		5.2
Men	0.5 *	0.9	2.0	7.6	15.2	26.6		6.1
Both	0.6	1.0	2.0	6.0	12.4	23.4		5.7

Age Group (years)

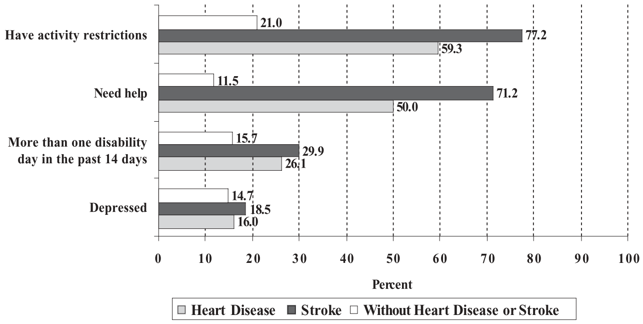
* Interpret with caution: based on small sample size.
Source: Statistics Canada, Canadian Community Health Survey

Figure 4-2 Percentage of adults with a chronic condition who rated their health as good or better, Canada, 2000



Source: Statistics Canada, Canadian Community Health Survey

Figure 4-3 Percentage of population aged 12+ years with self-reported heart disease or stroke who report specific limitations in their lives, compared to those without heart disease or stroke, Canada, 2000



(Age-standardized)
Source: Statistics Canada, Canadian Community Health Survey

In 2000, a high percentage of individuals who had had a stroke reported having activity restrictions and needing help with activities of daily living (Figure 4-3). The percentage was also high among those with self-reported heart disease, but lower than among those with stroke. Slightly more than one-quarter of individuals with either heart disease or stroke reported more than one disability day in the previous 14 days. Of those with heart disease, 16.0% reported being depressed during the previous 12 months, as did 18.4% with stroke. A much lower percentage of individuals without heart disease or stroke reported specific limitations in their lives.

Mortality

Leading Cause of Death

In 1999, cardiovascular diseases were the leading cause of death in Canada (36%) (Figure 4-4). Ischemic heart disease accounted for the greatest percentage of deaths (20%), of which half were attributable to acute myocardial infarction. Cerebrovascular disease (mainly stroke) accounted for 7% of deaths.

Table 4-1 Percent of Total Deaths Due to Cardiovascular Diseases by Sex, Canada, 1987-1999

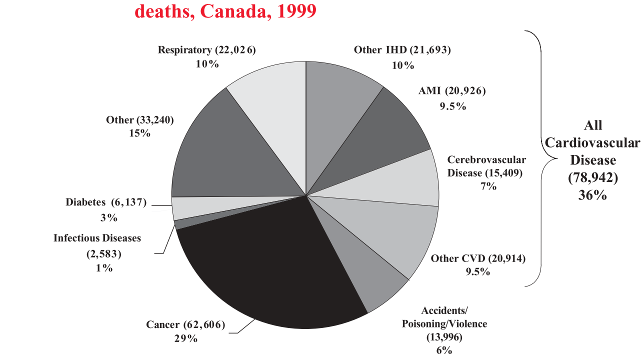
Year	Men	Women	All
1987	40.48	43.97	42.06
1988	39.47	43.42	41.26
1989	39.06	42.61	40.67
1990	37.34	41.21	39.12
1991	37.11	40.95	38.88
1992	37.12	40.72	38.78
1993	37.03	40.19	38.50
1994	36.35	39.75	37.94
1995	35.99	39.29	37.54
1996	35.93	38.84	37.32
1997	36.03	38.64	37.28
1998	35.34	37.53	36.40
1999	35.02	36.97	35.96

Source: Health Canada, using data from Mortality File, Statistics Canada

The percentage of all deaths due to cardiovascular diseases has decreased since 1987 by 14% among men and 16% among women (Table 4-1).

Among men of all ages, 35% of deaths in 1999 were attributable to cardiovascular diseases, while the percentage among women was slightly higher at 37% (Figure 4-5; Table 4-2). Among women, the percentage of all deaths due to cardiovascular diseases increased after the age

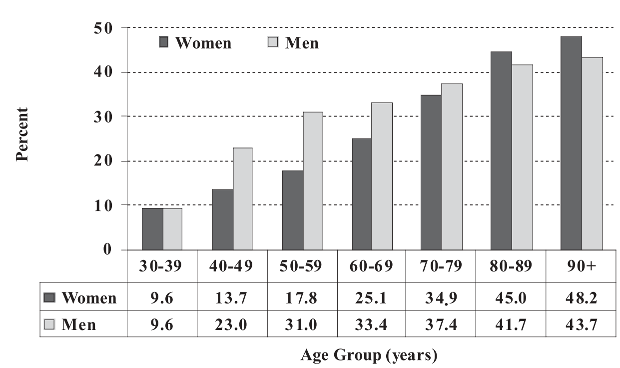
Figure 4-4 Leading causes of death, number and percentage of deaths, Canada, 1999



Total Number of Deaths: 219,530
Cardiovascular (ICD-9 390-459); Respiratory (ICD-9 460-519); Diabetes (ICD-9 250); Cancer (ICD-9 140-239); Infectious Diseases (ICD-9 001-139); Accidents/Poisonings/Violence (ICD-9 E800-E999)

Source: Health Canada, using data from Mortality File, Statistics Canada

Figure 4-5 Percentage of total deaths due to cardiovascular diseases by age group and sex, Canada, 1999



Source: Health Canada, using data from Mortality File, Statistics Canada

of 50 years. In men, the percentage of all deaths due to cardiovascular diseases increased steadily after the age of 40 years.

In 1999, 78,942 deaths were attributed to cardiovascular diseases — 39,134 women and 39,808 men (Table 4-2). Ischemic heart disease accounted for 48.6% of these deaths among women and 59.3% among men. Cerebrovascular disease (mainly stroke) caused 15,409 deaths — 9,038 (8.5% of all deaths) among women and 6,371 (5.6% of all deaths) among men.

The total number of deaths from cardiovascular diseases was almost identical for men and women. More men died from ischemic heart disease and acute myocardial infarction, however, more women died from cerebrovascular disease and congestive heart failure.

Table 4-2 Numbers and Percent of Deaths Due to Cardiovascular Diseases by Age and Sex, Canada, 1999

Age	All Deaths	All CVD[1]		IHD[2]		CBVD[3]		AMI[4]		CHF[5]	
		Number	Percent Of All Deaths	Number	Percent Of All Deaths	Number	Percent Of All Deaths	Number	Percent Of All Deaths	Number	Percent Of All Deaths
WOMEN											
< 30	2,225	111	5.0	7	0.3	24	1.1	5	0.2	3	0.1
30-39	1,524	147	9.6	39	2.6	42	2.8	20	1.3	0	0.0
40-49	3,501	478	13.7	176	5.0	143	4.1	96	2.7	8	0.2
50-59	6,309	1,121	17.8	553	8.8	253	4.0	324	5.1	17	0.3
60-69	11,575	2,900	25.1	1,567	13.5	530	4.6	884	7.6	74	0.6
70-79	25,380	8,862	34.9	4,621	18.2	1,845	7.3	2,540	10.0	393	1.5
80-89	35,729	16,067	45.0	7,759	21.7	4,043	11.3	3,631	10.2	1,119	3.1
90+	19,618	9,448	48.2	4,280	21.8	2,158	11.0	1,478	7.5	1,032	5.3
All Ages	105,861	39,134	37.0	19,002	17.9	9,038	8.5	8,978	8.5	2,646	2.5
MEN											
< 30	4,231	148	3.5	18	0.4	20	0.5	8	0.2	6	0.1
30-39	3,054	294	9.6	150	4.9	37	1.2	80	2.6	1	0.0
40-49	5,775	1,330	23.0	868	15.0	146	2.5	492	8.5	18	0.3
50-59	9,972	3,094	31.0	2,176	21.8	287	2.9	1,238	12.4	34	0.3
60-69	19,140	6,388	33.4	4,221	22.1	753	3.9	2,377	12.4	138	0.7
70-79	33,745	12,636	37.4	7,579	22.5	1,993	5.9	3,944	11.7	485	1.4
80-89	29,596	12,355	41.7	6,810	23.0	2,428	8.2	3,148	10.6	787	2.7
90+	8,155	3,563	43.7	1,795	22.0	707	8.7	661	8.1	376	4.6
All Ages	113,668	39,808	35.0	23,617	20.8	6,371	5.6	11,948	10.5	1,845	1.6

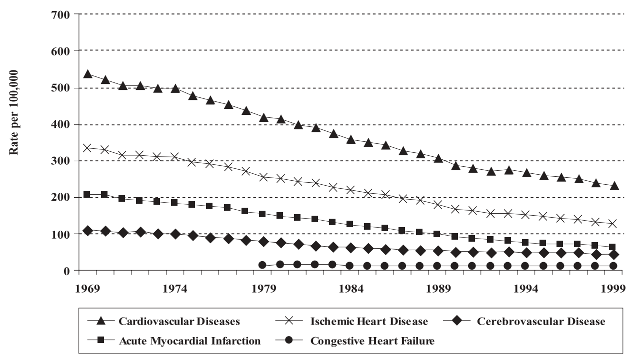
Table does not include deaths with a missing age.
[1] All CVD = All cardiovascular diseases (ICD code 9th revision 390-459)
[2] IHD = Ischemic heart disease (ICD code 9th revision 410-414)
[3] CBVD = (ICD code 9th revision 430-438)
[4] AMI = Acute myocardial infarction (heart attack); (ICD code 9th revision 410), AMI is a sub-category of IHD
[5] CHF = Congestive heart failure (ICD code 9th revision 428)

Source: Health Canada; Statistics Canada, 2002

Mortality Trends

Between 1969 and 1999, mortality rates for all cardiovascular diseases decreased by 56% (Figure 4-6). Rates for ischemic heart disease and cerebrovascular disease decreased by 62%, and for acute myocardial infarction by 70%. In comparison, between 1979 and 1999 the mortality rate due to congestive heart failure decreased by only 14%.

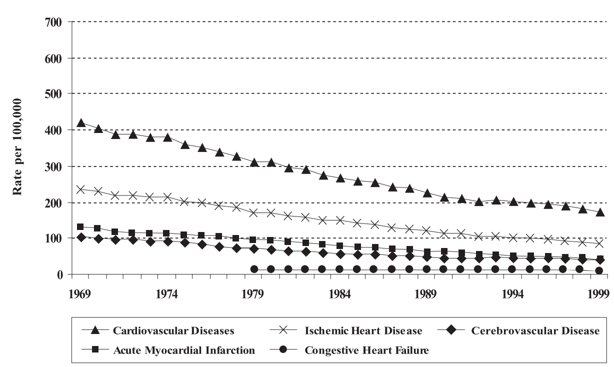
Figure 4-6 Mortality rate, Canada, 1969-1999



Age-standardized to 1991 Canadian Population
Source: Health Canada, using data from Mortality File, Statistics Canada

Among women, since 1969 mortality rates due to cardiovascular diseases decreased by 58% and by 64% due to ischemic heart disease, 62% due to cerebrovascular disease, and by 68% due to acute myocardial infarction (Figure 4-7). Rates for congestive heart failure decreased by 12%.

Figure 4-7 Mortality rate, women, Canada, 1969-1999



Age-standardized to 1991 Canadian Population
Source: Health Canada, using data from Mortality File, Statistics Canada

Mortality rates for cardiovascular diseases among men showed a decrease of 55% between 1969 and 1999 (Figure 4-8). Ischemic heart disease mortality rates decreased by 61%; rates for cerebrovascular disease decreased by 59%, and the decrease in rate for acute myocardial infarction was 71%. Between 1979 and 1999, mortality among men due to congestive heart failure decreased by 16%.

In 1999, 39,808 and 39,134 women died from cardiovascular diseases. Although mortality rates for all cardiovascular diseases have been declining during the 1990s, the actual number of deaths has remained steady at approximately 40,000 among men since the early 1990s, and at approximately 39,000 among women since the mid-1990s. This reflects the increase in the size of the population over the age of 65 years during this time period.

Based on Statistics Canada population projections and current trends in age-specific mortality rates, projections to 2025 suggest that, while the number of cardiovascular disease deaths for men will not increase, the number for women will increase until 2015 and then decrease (Figure 4-9). The number of deaths among women will likely surpass deaths among men in the near future, since women tend to live longer than men and the cardiovascular disease mortality rate increases with age.

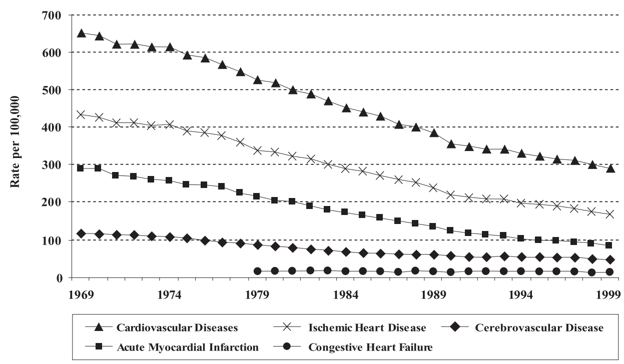
The number of deaths due to ischemic heart disease among men is projected to continue on its downward trend (Figure 4-10). Among women, the numbers are projected to plateau and then decrease after 2010.

The number of deaths from acute myocardial infarction appears to be on a continuous downward trend for both men and women (Figure 4-11). After 2015, deaths among men are projected to fall below deaths among women.

Deaths due to congestive heart failure among both men and women increased between 1985 and 1995 (Figure 4-12). Since then, the number of deaths has been constant. The numbers are projected to increase for both men and women, however, due to increasing numbers in the elderly population.

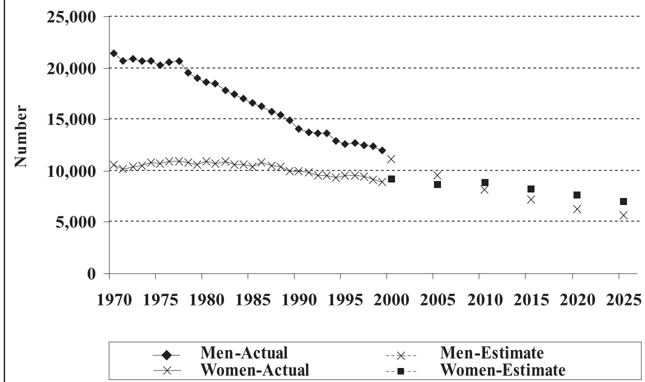
The number of deaths from cerebrovascular disease is expected to increase among women until 2015, and then plateau (Figure 4-13). Among men, deaths are projected to increase through to 2025.

Figure 4-8 Mortality rate, men, Canada, 1969-1999



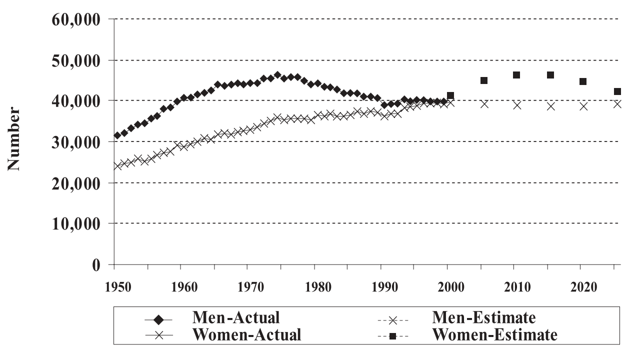
Age-standardized to 1991 Canadian Population
Source: Health Canada, using data from Mortality File, Statistics Canada

Figure 4-11 Number of acute myocardial infarction deaths by sex, actual and projected, Canada, 1970-2025



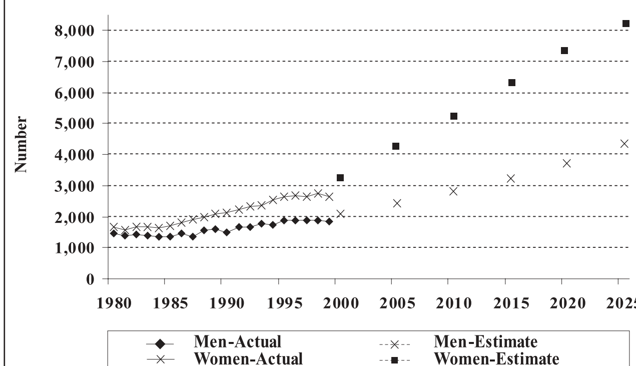
Source: Statistics Canada

Figure 4-9 Number of cardiovascular disease deaths by sex, actual and projected, Canada, 1950-2025



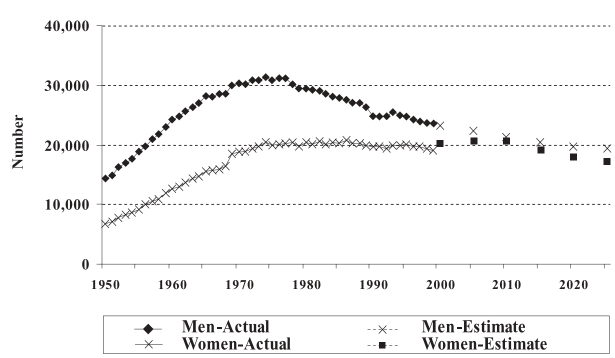
Source: Statistics Canada

Figure 4-12 Number of congestive heart failure deaths by sex, actual and projected, Canada, 1980-2025



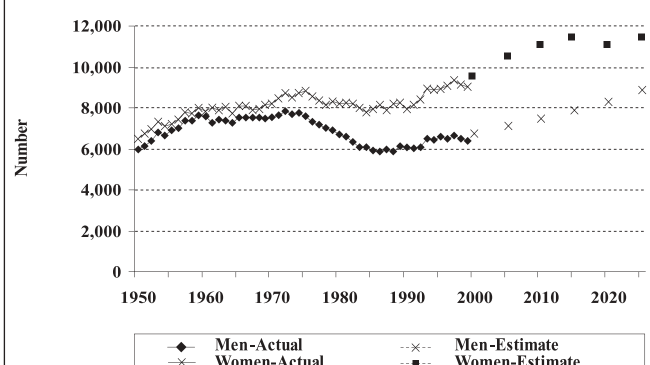
Source: Statistics Canada

Figure 4-10 Number of ischemic heart disease deaths by sex, actual and projected, Canada, 1950-2025



Source: Statistics Canada

Figure 4-13 Number of cerebrovascular disease deaths by sex, actual and projected, Canada, 1950-2025

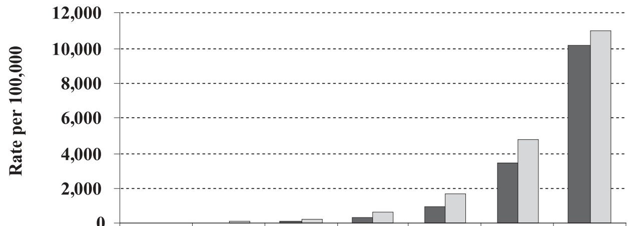


Source: Statistics Canada

Age- and Sex-Specific Death Rates

In 1999, mortality rates for cardiovascular diseases increased rapidly after age 65 and are higher for men than women at all ages (Figures 4-14).

Figure 4-14 Rates of mortality for all cardiovascular diseases by age group and sex, Canada, 1999



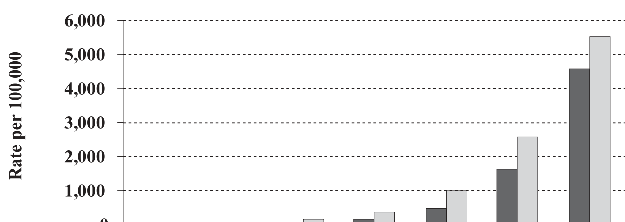
	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	6	20	64	237	881	3,344	10,073
Men	12	55	180	554	1,637	4,684	10,977

Age Group (years)

Source: Health Canada, using data from Mortality File, Statistics Canada

Mortality rates for ischemic heart disease increased with age (Figure 4-15). While the rates among men were higher than among women for all ages, the male:female ratio decreased steadily with age: from 5:1 in the 40-49 year age group, to 4:1 in the 50-59 year age group, 3:1 among those aged 60-69 years, 2:1 in the 70-79 year age group, 1.6:1 in the 80-89 year age group and 1.2:1 among those aged 90+ years.

Figure 4-15 Rates of mortality for ischemic heart disease by age group and sex, Canada, 1999



	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	2	7	32	128	459	1,615	4,563
Men	6	36	127	366	982	2,582	5,530

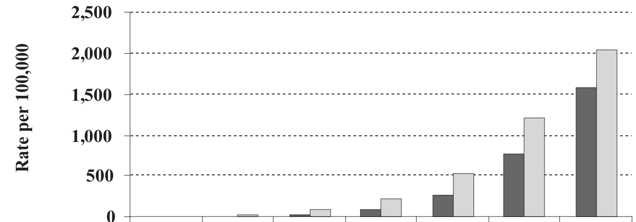
Age Group (years)

Source: Health Canada, using data from Mortality File, Statistics Canada

While mortality rates for acute myocardial infarction were lower than for ischemic heart disease, they showed very similar patterns by age group and sex (Figure 4-16).

In 1999, mortality rates due to congestive heart failure were very low among individuals under the age of 80 years (Figure 4-17). Over the age of 80 years, rates among men and women were very similar.

Figure 4-16 Rates of mortality for acute myocardial infarction by age group and sex, Canada, 1999

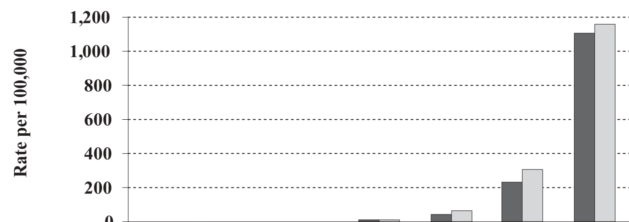


	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	1	4	19	72	252	756	1,576
Men	3	20	72	206	511	1,194	2,036

Age Group (years)

Source: Health Canada, using data from Mortality File, Statistics Canada

Figure 4-17 Rates of mortality for congestive heart failure by age group and sex, Canada, 1999



	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	0	0	1	6	39	233	1,100
Men	0	1	2	12	63	298	1,158

Age Group (years)

Source: Health Canada, using data from Mortality File, Statistics Canada

In 1999, men and women under the age of 60 years had very similar mortality rates for cerebrovascular disease (Figure 4-18). Men had slightly higher death rates between the ages of 60 and 89 years, after which the rate among women was higher than among men.

Figure 4-18 Rates of mortality for cerebrovascular disease by age group and sex, Canada, 1999

	30-39	40-49	50-59	60-69	70-79	80-89	90+
Women	2	6	15	43	183	842	2,301
Men	1	6	17	65	258	921	2,178

Age Group (years)

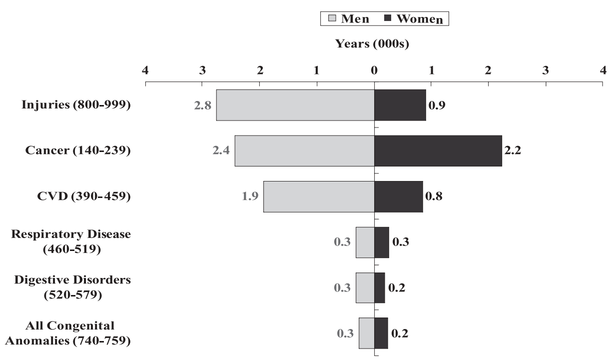
Source: Health Canada, using data from Mortality File, Statistics Canada

Potential Years of Life Lost

Calculating potential years of life lost (PYLL) provides an indication of the impact of premature death on society. PYLL is calculated as the sum of the number of years of life that individual Canadians "lost" — that is, did not live - due to premature death (considered, arbitrarily, as death prior to age 75 years).

In 1999, PYLL from cardiovascular diseases was responsible for an estimated 2,771 years and exceeded only by injuries and cancer, respectively (Figure 4-19).

Figure 4-19 Number of potential years of life lost (PYLL) prior to age 75 by disease category, 1999

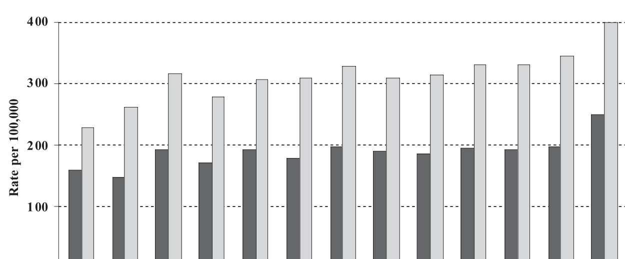


Source: Health Canada, using data from Mortality File, Statistics Canada

Regional Comparisons

The average cardiovascular disease mortality rates during 1995-1999 were much higher for men and women in Newfoundland than in all other provinces or territories (Figure 4-20). Rates in B.C., the Northwest Territories and Nunavut were at the lower end. (Provincial/territorial cardiovascular disease rates have been age-adjusted).

Figure 4-20 Cardiovascular disease mortality rates by sex and province/territory, Canada, 1995-1999

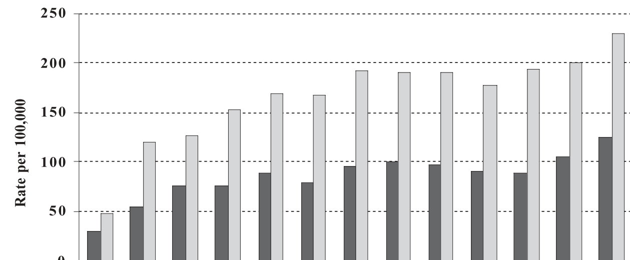


	Nu	NWT	Yukon	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
Women	158.7	146.1	190.6	170.6	192.6	178.3	196	190.3	184	195.2	191.3	196.5	247.8
Men	227.5	260.9	314.1	277.1	306	307.4	327.2	308	312.4	329.9	328.7	343.2	399.2

Age-standardized to 1991 Canadian population
Source: Health Canada, using data from Mortality File, Statistics Canada

Mortality rates due to ischemic heart disease among men followed a generally upward west-east gradient with the exception of New Brunswick, where rates for men were lower than in Manitoba, Ontario and Quebec (Figure 4-21). No clear pattern was seen among women.

Figure 4-21 Ischemic heart disease mortality rates by sex and province/territory, Canada, 1995-1999

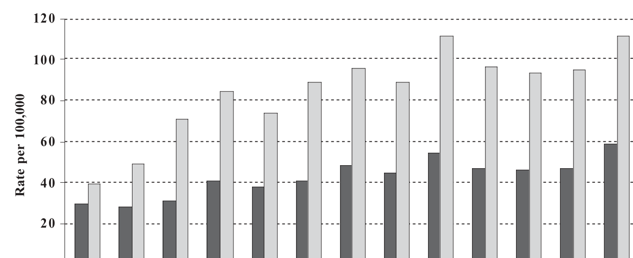


	Nu	NWT	Yukon	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
Women	29.5	53.9	74.4	74.5	88.3	78.5	94.4	100.2	96.7	90.3	88.4	104.3	124.5
Men	47.6	119.7	125.3	151.7	168.6	167.3	190.7	190.1	189.9	176.1	193.3	200.2	229.0

Age-standardized to 1991 Canadian population
Source: Health Canada, using data from Mortality File, Statistics Canada

Quebec and Newfoundland had higher mortality rates than the rest of the provinces and territories due to acute myocardial infarction, while Alberta, Nunavut, Northwest Territories and the Yukon had lower rates (Figure 4-22).

Figure 4-22 Acute myocardial infarction mortality rates by sex and province/territory, Canada, 1995-1999

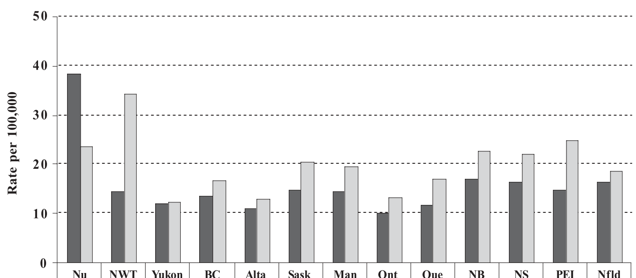


	Nu	NWT	Yukon	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
Women	29.5	27.4	30.6	40.2	37.3	40.4	47.6	44.4	54.3	46.2	45.4	46.4	58.5
Men	38.6	48.8	70.5	83.8	73.5	88.6	95.1	88.3	111.2	96.3	93.0	94.4	111.1

Age-standardized to 1991 Canadian population
Source: Health Canada, using data from Mortality File, Statistics Canada

The highest mortality rate among women due to congestive heart failure during 1995-1999 was found in Nunavut. It was 3 times higher than in any other province or territory, and higher than the rate for men in any of the provinces or territories (Figure 4-23). The rate for men in the Northwest Territories was also very high compared to other provinces and territories. Lower rates were found in the Yukon, Alberta and Ontario.

Figure 4-23 Congestive heart failure mortality rates by sex and province/territory, Canada, 1995-1999

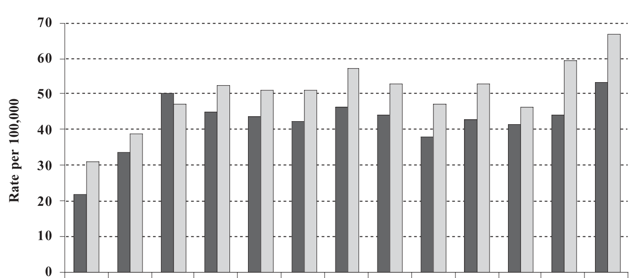


	Nu	NWT	Yukon	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
Women	38.3	14.2	11.9	13.3	11.0	14.6	14.3	10.0	11.6	16.8	16.1	14.6	16.3
Men	23.5	34.2	12.0	16.5	12.8	20.3	19.5	13.1	16.9	22.4	21.9	24.7	18.4

Age-standardized to 1991 Canadian population
Source: Health Canada, using data from Mortality File, Statistics Canada

Between 1995 and 1999, Nunavut reported the lowest rate of mortality from cerebrovascular disease in Canada for both men and women (Figure 4-24). For men, Newfoundland reported the highest rates, followed by P.E.I. and Manitoba, while Quebec and Nova Scotia reported the lowest. In the Yukon, rates among women were higher than among men.

Figure 4-24 Cerebrovascular disease mortality rates by sex and province/territory, Canada, 1995-1999



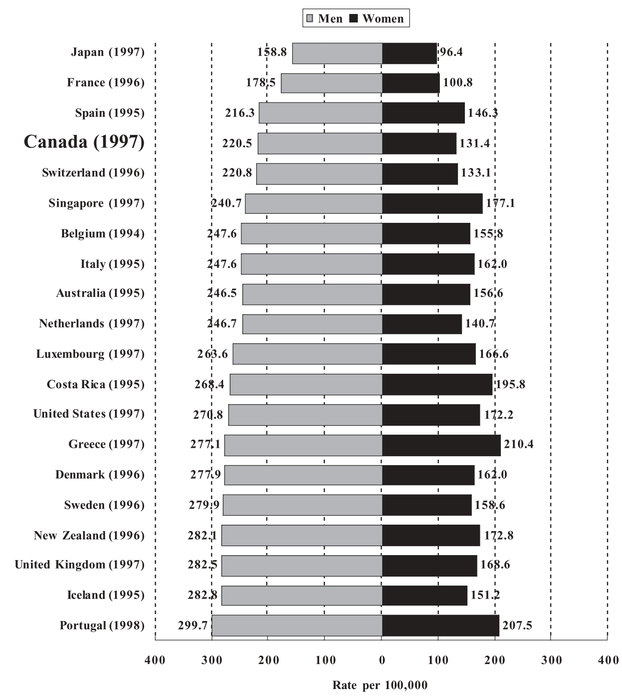
	Nu	NWT	Yukon	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
Women	21.9	34.0	50.3	45.1	44.0	42.4	46.6	44.3	38.0	43.0	41.7	44.1	53.4
Men	31.0	39.1	47.4	52.5	51.3	51.5	57.5	53.0	47.4	53.0	46.6	59.6	67.0

Age-standardized to 1991 Canadian population
Source: Health Canada, using data from Mortality File, Statistics Canada

International Comparisons

In the 1990s, cardiovascular diseases were the leading cause of death worldwide, but rates varied considerably among countries. (International cardiovascular disease rates have been age-adjusted). Among the 20 countries with the lowest mortality rates as reported to WHO, Canada ranked 4th for cardiovascular disease mortality among men and 3rd among women (Figure 4-25). While these international rates provide an overview of the world-wide situation, they were derived from the different countries in different years, using different methods, depending on when statistics were collated. Caution must be used, therefore, in making comparisons between countries.

Figure 4-25 Countries with <u>lowest</u> reported age-standardized mortality rates, cardiovascular diseases, mid- to late-1990s



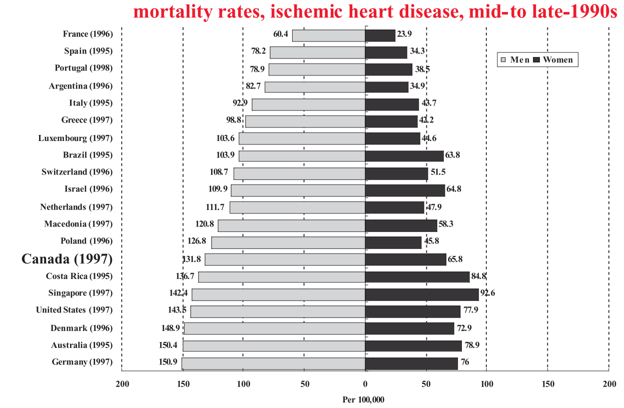
Source: World Health Organization (WHO)
http://www3.who.int/whosis/whsa/whsa_table4.cfm?path=whosis,whsa,whsa_table4&language=english

Overall, Canada ranks 14th lowest in mortality from ischemic heart disease among men and women (Figure 4-26). France has the lowest mortality rate (approximately 50% less than Canada). While the mortality rates from ischemic heart disease have been declining in Canada and other Western countries during the past decade, they have been increasing in the Russian Federation and in a number of countries in the developing world.

For cerebrovascular disease, Canada ranked 2nd lowest for men (behind Switzerland) and 3rd lowest for women behind Switzerland and France (Figure 4-27)

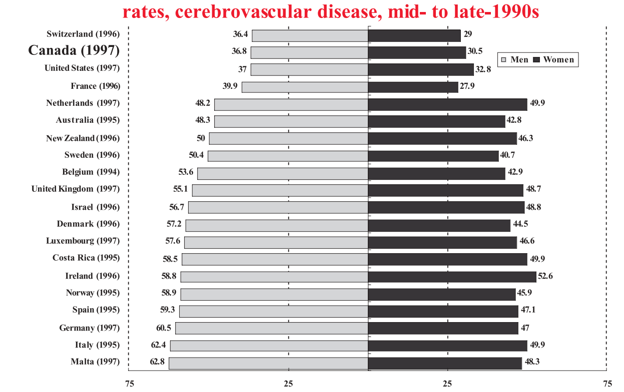
Although differences in risk factors and quality of treatment may account for international differences in mortality rates, much of the difference remains unexplained. The expectation is that, given the change to a western diet and increase in smoking rates, the rate of cardiovascular diseases in less-developed countries will rise in the future and become a major burden to their respective populations.

Figure 4-26 Countries with lowest reported age-standardized mortality rates, ischemic heart disease, mid-to late-1990s



Source: World Health Organization (WHO)
http://www3.who.int/whosis/whsa/whsa_table4.cfm?path=whosis,whsa,whsa_table4&language=english

Figure 4-27 Countries with lowest reported age-standardized mortality rates, cerebrovascular disease, mid- to late-1990s



Source: World Health Organization (WHO)
http://www3.who.int/whosis/whsa/whsa_table4.cfm?path=whosis,whsa,whsa_table4&language=english

Discussion

The data regarding mortality and quality of life show the tremendous burden of cardiovascular diseases in Canada.

Cardiovascular diseases are the underlying cause of death for 1 in 3 Canadians. The number of deaths, and by proxy the number of Canadians with cardiovascular diseases, will likely increase as the population ages. Thus, the burden of cardiovascular diseases will continue for many more years.

The mortality figures provide only part of the picture, however. Overall, 5.7% of Canadian adults, and nearly 1 in 4 aged 70+ years, report having heart problems and they, with their families, know personally the challenges of living with cardiovascular diseases. They feel less healthy than the rest of the Canadian population, many must restrict their activities, and many need help with the normal activities of daily living. While the 70+ age group has the highest rates of cardiovascular diseases, many Canadians develop the condition in their forties and fifties.

In comparison to other countries, Canada has one of the lowest mortality rates due to stroke. In contrast, Canada does not appear to fare as well when comparing its ischemic heart disease mortality rate to other countries (International cardiovascular disease rates have been age-adjusted). Canada may be able to learn successful approaches to reducing both the incidence and premature death rate due to ischemic heart disease from other countries.

Within Canada, cardiovascular disease rates vary among the provinces/territories. (Provincial/territorial cardiovascular disease rates have been age-adjusted). Newfoundland has consistently higher mortality rates than the other provinces/territories for cardiovascular diseases overall, and for ischemic heart disease, acute myocardial infarction and cerebrovascular disease. Newfoundlanders also reported a higher prevalence of all modifiable risk factors than the Canadian population overall (Chapter 1). With the exception of congestive heart failure, mortality rates from cardiovascular diseases were lower in the north than in Canada as a whole.

Mortality rates for both men and women for ischemic heart disease, acute myocarial infarction and cerebrovascular disease continue to decrease. The rate for congestive heart failure is decreasing as well, but at a slower pace. This may be a result of both the rising incidence of the disease and a possible shift in diagnostic labelling from ischemic heart disease.

Even though cardiovascular disease mortality rates have decreased, in the future the number of women who will die from cardiovascular diseases is expected to increase due to the aging population. As a result, the burden of cardiovascular diseases in the population will increase.

Cardiovascular diseases affect men and women differently. More men than women die from ischemic heart disease and acute myocardial infarction but more women than men die from congestive heart failure and cerebrovascular disease.

One of the gaps in our knowledge of health outcomes is the lack of data on the incidence and prevalence of cardiovascular diseases and the lack of more detailed data on its impact on quality of life and on outcomes of treatment.

Implications for Action

- Increase home care, pharmacare and palliative care services to cope with the projected increase in the number of people who will be dying from cardiovascular diseases in the future.
- Explore reasons behind the higher ischemic disease mortality rates in Canada compared to other countries.
- Develop an ongoing system of data collection to monitor the incidence and prevalence of cardiovascular diseases, their impact, and treatment outcomes.

DETERMINANTS OF CARDIOVASCULAR HEALTH

A wide variety of factors interact to influence health: income and social status, social support networks, education, employment and working conditions, social environments, physical environments, personal health practices and coping skills, healthy child development, biology and genetic endowment, health services, gender, and culture. Some of these, such as personal health practices, relate to the individual alone. Others, such as social environments, relate to the environment in which the individual lives.

Chapter 5 explores the relationship between three of these determinants associated with cardiovascular disease: education, income and personal health practices. The latter include the risk factors included in Chapter 1: smoking, physical inactivity, inadequate consumption of fruits and vegetables, being overweight, and the two health conditions associated with these risk factors (diabetes and high blood pressure).

Income and education influence the adoption of healthy behaviours. Increased income permits a wider array of lifestyle choices that can influence health. Higher levels of education not only increase knowledge and skills specific to healthy behaviours, but also provide access to more lucrative employment.

Individuals who live in poverty must cope with the daily stress of meeting basic needs. Lifestyle choices, such as smoking, may be adopted to help cope with this stress. Lack of income may limit an individual's ability to purchase healthy food, which in turn may lead to health problems. Likewise, the individual may lack the income to purchase medication that would improve a health problem such as high blood pressure.

This chapter also explores the relationship between cardiovascular disease mortality and neighbourhood income levels. While there are other outcomes of interest, mortality data are readily available.

Canadian Data

Modifiable Risk Factors and Income

As demonstrated in Chapter 1, according to the 2000 Canadian Community Health Survey (CCHS), physical inactivity, being overweight, inadequate consumption of fruits and vegetables, smoking, and self-reported high blood pressure and diabetes were associated with income adequacy (Table 5-1). With the exception of men who were overweight, a lower percentage of individuals in the highest income category than in the lowest income adequacy category reported each factor.

A significantly lower percentage of women in the highest income group than those in the upper middle income group reported each of the risk factors. This pattern was not as strong among men, where only 3 of the 6 factors showed the same association.

Table 5-1 Modifiable Risk Factors for Cardiovascular Disease by Income Adequacy and Sex, Canada, 2000

Risk Factor	Income Adequacy Category						
	Lowest	Stat. Sig.	Lower Middle	Stat. Sig.	Upper Middle	Stat. Sig	Highest
WOMEN							
Tobacco Smoking (Current) Daily and occasional; age 20+ years	33.2	*	26.4	2	5.1	*	19.7**
Physical Inactivity Age 12+ years	64.4		63.1	*	56.7	*	48.9**
Overweight BMI ≥ 25.0; age 20-59 years	42.3		42.4		40.3	*	35.9**
Inadequate Consumption of Fruits and Vegetables Age 12+ years	62.5	*	59.4	*	56.6	*	52.4**
High Blood Pressure Age 20+ years	21.2		20.3	*	14.5	*	9.3**
Diabetes Age 20+ years	7.7		6.5	*	3.4	*	1.8**
MEN							
Tobacco Smoking (Current) Daily and occasional; age 20+ years	42.7	*	33.0	*	30.2	*	24.0**
Physical Inactivity Age 12+ years	53.9		56.3	*	51.6	*	43.1**
Overweight BMI ≥ 25.0; age 20-59 years	47.8		50.6	*	56.0	*	60.4**
Inadequate Consumption of Fruits and Vegetables Age 12+ years	71.3		68.8		68.6	*	66.0**
High Blood Pressure Age 20+ years	14.4		15.7	*	12.7		11.3**
Diabetes Age 20+ years	6.4		7.3	*	4.5		3.7**

*Difference in values in adjacent income categories is statistically significant (p<0.05).
**Statistically significant difference between the highest and lowest income quintiles (p<0.05).
Source: Statistics Canada, Canadian Community Health Survey

Many risk factors showed similar prevalence rates with the two lower income groups. Among women only 2 of 6 were different, and among men only 1 out of the 6 risk factors was significantly different.

For only one risk factor, physical inactivity, was the pattern among the income groups identical for men and women. For being overweight, the pattern was diametrically opposed. While the proportion of women who were overweight decreased with increasing income, the reverse occurred among men.

Table 5-2 Modifiable Risk Factors for Cardiovascular Disease by Education and Sex, Canada, 2000

Risk Factor	Level of Education Completed						
	Less than Secondary	Stat. Sig.	Secondary	Stat. Sig.	Some Post-secondary	Stat. Sig	Post-secondary
WOMEN							
Tobacco Smoking (Current) Daily and occasional; age 20+ years	26.9		27.8		29.7	*	20.7**
Physical Inactivity Age 12+ years	59.8		60.8	*	53.6		54.2**
Overweight BMI ≥ 25.0; age 20-59 years	51.4	*	41.4	*	36.8		35.3**
Inadequate Consumption of Fruits and Vegetables Age 12+ years	60.6		61.3		58.4	*	52.3**
High Blood Pressure Age 20+ years	30.0	*	14.8	*	10.7		10.4**
Diabetes Age 20+ years	9.1	*	3.9		3.0		2.7**
MEN							
Tobacco Smoking (Current) Daily and occasional; age 20+ years	32.1		34.8		32.2	*	24.1**
Physical Inactivity Age 12+ years	48.9	*	52.6	*	46.8		49.4**
Overweight BMI ≥ 25.0; age 20-59 years	57.4		56.1	*	49.6	*	55.5**
Inadequate Consumption of Fruits and Vegetables Age 12+ years	68.0	*	71.5		68.1		66.6
High Blood Pressure Age 20+ years	19.3	*	11.6	*	9.5	*	11.3**
Diabetes Age 20+ years	8.9	*	3.8		3.9		3.9**

* Difference in values in adjacent income categories is statistically significant ($p<0.05$).
** Statistically significant difference between the highest and lowest income quintiles ($p<0.05$).
Source: Statistics Canada, Canadian Community Health Survey

Modifiable Risk Factors and Education

The pattern of risk factors by level of education was not as consistent as by income (Table 5-2). Some factors had the highest association with individuals who had completed secondary education. Others had the highest association with those who had less than secondary education. Overall, however, individuals with a post-secondary degree or diploma had lower prevalence rates of all risk factors than those with less than secondary education.

The percentages of both men and women with high blood pressure and diabetes were much higher among individuals with less than secondary education than for any with another education level.

Mortality

Potential Years of Life Lost (PYLL) are calculated by subtracting the age of an individual's death from age 75, based on the assumption of a life expectancy of at least 75 years.

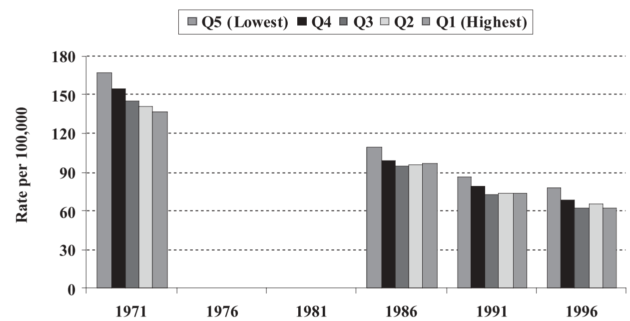
In 1996, the most important contributors to PYLL were all cancers (30.9%), injuries (19.2%) and cardiovascular diseases (17.6%). People with low income were more likely than people with high income to die before the age of 75 years. This means that preventing cardiovascular diseases and cardiovascular disease death among low income individuals can begin to close the gap between rich and poor mortality rates prior to age 75.

Among men, age-standardized mortality rates in 1971 due to ischemic heart disease were much higher among the lowest neighbourhood income quintile (Figure 5-1).

The mortality rates for all income groups have decreased since that time. Although a difference between the highest and lowest income groups still existed in 1996, it had narrowed considerably.

Women showed a similar pattern to men in mortality due to ischemic heart disease in 1971 (Figure 5-2). The mortality rates among all income groups decreased to 1996, but the relationship between the quintiles changed, so that the three upper quintiles had very similar mortality rates.

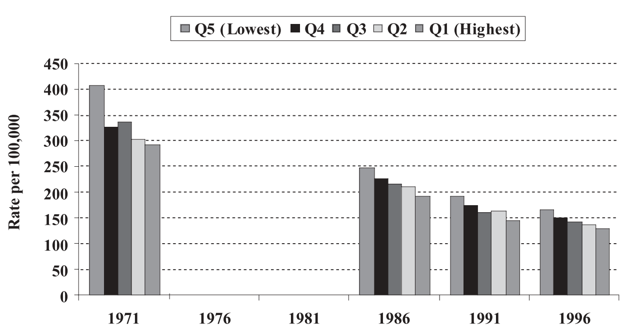
Figure 5-2 Mortality rates due to ischemic heart disease among women by neighbourhood income quintile, urban Canada, 1971-1996



Age-standardized to 1991 Canadian Population
Source: Wilkins R, Berthelot J, Ng E. , Health Reports 2002

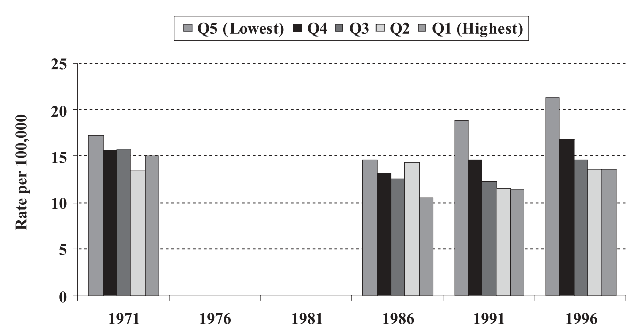
Diabetes is an important risk factor for cardiovascular diseases. Between 1971 and 1986, mortality rates due to diabetes decreased among men in all but the 2nd highest income quintile, and then increased steadily over the next decade (Figure 5-3). By 1996, the mortality rate among the lowest income quintile had increased to a point above that in 1971, and the difference between the highest and lowest income quintiles had become much greater.

Figure 5-1 Mortality rates due to ischemic heart disease among men by neighbourhood income quintile, urban Canada, 1971-1996



Age-standardized to 1991 Canadian Population
Source: Wilkins R, Berthelot J, Ng E. , Health Reports 2002

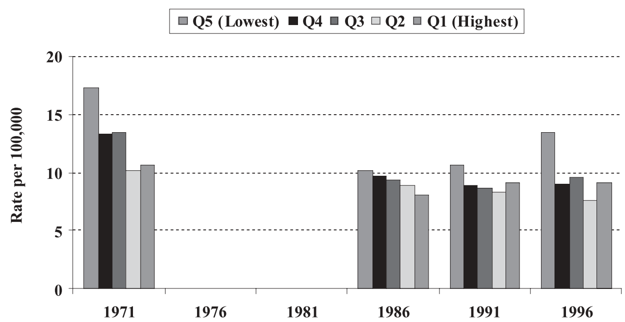
Figure 5-3 Mortality rates due to diabetes among men by neighbourhood income quintile, urban Canada, 1971-1996



Age-standardized to 1991 Canadian Population
Source: Wilkins R, Berthelot J, Ng E. , Health Reports 2002

From 1971 to 1996, mortality rates among women due to diabetes decreased in all income quintiles (Figure 5-4). However, from 1986 to 1996, rates among women in the lowest income quintile increased while rates for women in other quintiles remained relatively stable.

Figure 5-4 Mortality rates due to diabetes among women by neighbourhood income quintile, urban Canada, 1971-1996



Age-standardized to 1991 Canadian Population
Source: Wilkins R, Berthelot J, Ng E. , Health Reports 2002

Discussion

Several international studies have concluded that in order to reduce the incidence of and mortality due to heart disease, primary prevention programs must address socio-economic inequalities.

Ischemic heart disease mortality, including premature death, correlates with neighbourhood income, with the wealthiest quintile having the lowest rates and the poorest quintile the highest. Differences in health care after acute myocardial infarction are not responsible for most of the differences in survival across socio-economic categories.

Thus, socio-economic differences in mortality rates for ischemic heart disease appear to be due primarily to differences in incidence rather than in treatment and survival.

The analysis of the CCHS data provides one possible reason for the income disparity in mortality rates. Individuals in the lowest income quintile had a higher proportion of risk factors than those in the highest quintile. To be effective, then, preventive policies must address socio-economic disparities.

The increasingly higher mortality rates due to diabetes in the lowest income group may indicate higher rates of diabetes among low income groups. Since diabetes is a risk factor for ischemic heart disease, low income individuals with diabetes are also at increased risk for ischemic heart disease.

Public policies can mediate the effect of inequities in risk for cardiovascular diseases by decreasing exposure to risk factors or facilitating the adoption of healthy behaviours. For example, regulating exposure to environmental tobacco smoke in the service industry, where wages tend to be lower compared to other occupations, would reduce the risk of cardiovascular diseases by decreasing exposure to a risk factor and encouraging smoking cessation.

As a prerequisite to developing effective interventions, research is also required to provide a better understanding of the way in which socio-economic differences mediate their effects on outcomes.

Given the importance of the social determinants of health, the ability to report mortality and morbidity data linked to individual and family level socio-economic characteristics, such as education, occupation, race, ethnicity and period of immigration, is a desirable, essential component of a cardiovascular disease surveillance system.

Implications for Action

- Implement policies to address the socio-economic determinants of cardiovascular health.
- Target interventions to individuals in low income groups, where the prevalence of risk factors is high.
- Conduct research to identify reasons for socio-economic differences in cardiovascular risk factors and health outcomes.
- Include socio-economic indicators of health in the cardiovascular surveillance system.

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GLOSSARY

ACUTE MYOCARDIAL INFARCTION (ICD-9 410)

A manifestation of ischemic heart disease, describing a severe sudden onset of myocardial necrosis due to the formation of a thrombus in the coronary arterial system obstructing arterial blood flow to the area of cardiac muscle supplied by that artery.

AGE-STANDARDIZED RATES

The standardized rate represents what the crude rate would be if the population under study had the age distribution of the standard population. It is the weighted average of age-specific rates applied to a standard distribution of age.

ANGINA PECTORIS (ICD-9 413)

A symptomatic manifestation of ischemic heart disease, describing a severe squeezing or pressure-like thoracic pain, brought on by exertion or stress.

ANGIOPLASTY

The dilatation of a blood vessel by means of a balloon catheter where the balloon is inflated to flatten plaque against the artery wall. Canadian Classification of Procedure Code 48.00 to 48.09 and 51.59 (Percutaneous transluminal coronary angioplasty).

BODY MASS INDEX (BMI)

Weight in kilograms divided by the square of the height in metres. Among middle-aged adults, BMI is strongly correlated with fat mass. The risk of diabetes, high blood pressure or coronary heart disease increases with increasing BMI. Because there is no specific BMI associated with an increased risk of disease, various levels of BMI are used as guidelines for healthy targets. This report uses a level of BMI of 25.0-29.9 as excess weight, and a level of BMI ≥ 30 as obesity.

CANADIAN COMMUNITY HEALTH SURVEY CYCLE 1.1 (CCHS 1.1)

The CCHS was conducted by Statistics Canada. This survey provides cross-sectional estimates of health determinants, health status and health system utilization at a sub-provincial level (health region or combination of health regions). The target population of the CCHS includes household residents in all provinces and territories; with the principal exclusion of populations on Indian Reserves, Canadian Forces Bases, and some remote areas. There was one randomly selected respondent per household, although planned oversampling of youths resulted in a second member of certain households being interviewed. For the first collection cycle only those 12 years of age and over were eligible for selection. The CCHS Cycle 1.1 began data collection in September 2000 and the total sample size was 136,937 household respondents representing a response rate of 84.7%.

Classification of Overweight and Obesity in Adults According to BMI.
Obesity is classified as BMI ≥ 30 kg/m²

Classification	BMI (kg/m²)	Risk of Health Problems
Underweight	18.5	Low (but risk of other clinical problems increased)
Normal range	18.5-24.9	Average
Overweight	25.0-29.9	Mildly increased
Obese	**≥ 30.0**	
Class I	30.0-34.9	Moderate
Class II	35.0-39.9	Severe
Class III	≥ 40.0	Very severe

Note that these values are age-independent and correspond to the same degree of fatness across different populations.
Source: International Obesity Task Force   Web site: http://www.obesite.chaire.ulaval.ca/class_e.html

CANADIAN TOBACCO USE MONITORY SURVEY (CTUMS)

CTUMS was initiated in 1999 to provide Health Canada and its partners with reliable data on tobacco use and related issues. The primary objective is to track changes in smoking status and amount smoked, especially for populations most at risk for taking up smoking, such as 15-24 year olds.

The target population for CTUMS is all persons 15 years of age and older living in Canada, excluding residents of the Yukon, Nunavut, and the Northwest Territories, and full-time residents of institutions. In order to allow provincial comparisons of approximately equal reliability, the overall sample size for the survey is divided equally across all 10 Canadian provinces. In 1999, the sample was 22,013 individuals. The response rate was 82%.

CARDIOVASCULAR DISEASES

All diseases of the circulatory system classified according to ICD-9 390-459. They include acute myocardial infarction, ischemic heart disease, valvular heart disease, peripheral vascular disease, arrhythmias, high blood pressure and stroke.

CAROTID ENDARTERECTOMY

The excision of thickened atheromatous areas of the innermost layer of the carotid artery. Canadian Classification of Procedure Code 50.12

CASE FATALITY RATE

The proportion of persons contracting a disease, who die of that disease.

CEREBROVASCULAR DISEASE (ICD-9 430-438)

Disease of one or more blood vessels of the brain that can result in the sudden development of a focal neurologic deficit.

COMPUSCRIPT (IMS Health, Canada)

Compuscript provides estimates of the number of prescriptions dispensed in Canadian retail pharmacies on a monthly basis. Information about prescriptions dispensed is collected electronically from a sample panel of almost 2,000 pharmacies. The sample of pharmacies is designed to be representative of pharmacies in Canada and is stratified by province, store type (chain or independent) and store size (large or small). After electronic processing of the raw data to check for completeness, projection factors are applied to estimate the values for all of Canada.

CONGESTIVE HEART FAILURE (ICD-9 428)

The inability of the heart to maintain adequate pumping function.

CORONARY ARTERY BYPASS GRAFTING

Canadian Classification of Procedure Code 48.1 to 48.19

DIABETES

Diabetes mellitus is a condition associated with an elevation of blood glucose levels.

ELEVATED SERUM CHOLESTEROL

Elevated serum cholesterol is here defined as a total serum cholesterol level greater than or equal to 5.2 mmol/litre.

FIRST NATIONS

Those persons who are registered as Indians under the terms of the *Indian Act* and whose names appears in the Indian Register maintained by the Department of Indian Affairs and Northern Development.

HIGH BLOOD PRESSURE

High blood pressure is defined as diastolic blood pressure equal to or greater than 90 mmHg or systolic blood pressure equal to or greater than 140 mmHg and/or on treatment, either pharmacologic or non-pharmacologic (weight control and/or salt restriction), for the purpose of lowering blood pressure.

ICD

International Classification of Diseases — 9th Revision, 1977.

INCOME ADEQUACY

This variable is derived for 2 to 5 categories based on total annual household income and the size of the household. (See Tables A and B)

INCIDENCE

The number of instances of illness commencing, or of persons falling ill, during a given period in a specified population.

ISCHEMIC HEART DISEASE (ICD-9 410-414)

Any condition in which heart muscle is damaged or works inefficiently because of an absence or relative deficiency of its blood supply; most often caused by atherosclerosis, it includes angina pectoris, acute myocardial infarction, chronic ischemic heart disease, and sudden death.

TABLE A: 5-Category Definition			
Code	Description	Income	Household Size
1	Lowest income	Less than $10,000	1 to 4 persons
		Less than $15,000	5 or more persons
2	Lower middle income	$10,000 to $14,999	1 or 2 persons
		$10,000 to $19,999	3 or 4 persons
		$15,000 to $29,999	5 or more persons
3	Middle	$15,000 to $29,999	1 or 2 persons
		$20,000 to $39,999	3 or 4 persons
		$30,000 to $59,999	5 or more persons
4	Upper middle income	$30,000 to $59,999	1 or 2 persons
		$40,000 to $79,999	3 or 4 persons
		$60,000 to $79,999	5 or more persons
5	Highest Income	$60,000 or more	1 or 2 persons
		$80,000 or more	3 or more persons

TABLE B: 4-Category Definition			
Code	Description	Income	Household Size
1	Lowest income	Less than $15,000	1 or 2 persons
		Less than $20,000	3 or 4 persons
		Less than $30,000	5 or more persons
2	Lower middle income	$15,000 to $29,999	1 or 2 persons
		$20,000 to $39,999	3 or 4 persons
		$30,000 to $59,999	5 or more persons
3	Upper middle income	$30,000 to $59,999	1 or 2 persons
		$40,000 to $79,999	3 or 4 persons
		$60,000 to $79,999	5 or more persons
4	Highest Income	$60,000 or more	1 or 2 persons
		$80,000 or more	3 or more persons

OBESITY

Obesity is defined in several ways. This report uses the WHO definition: individuals are considered obese if they have a Body Mass Index (BMI) ≥ 30.

PACEMAKER IMPLANTATION

The implantation of an electronic device that monitors the electronic function of the heart and generates an electrical impulse when required. Canadian Classification of Procedure Codes 49.71 to 49.74. These codes include the following ICD-9 CM procedure codes: 37.70 to 37.74, 37.78, 37.80 to 37.83, and 37.94 to 37.96.

PERSON-ORIENTED HOSPITAL DATA

Information derived by Statistics Canada by linking all the hospital discharge records for the same person together in order to determine health outcomes.

PHYSICAL INACTIVITY

In the National Population Health Surveys of 1994/95 and 1996/97, individuals were considered physically inactive or ‘sedentary’ if they reported a usual daily leisure-time energy expenditure of less than 1.5 kcal/kg/day.

POTENTIAL YEARS OF LIFE LOST

The sum of the number of years of life that individual Canadians 'lost' due to premature death. It is calculated with death prior to age 75 being considered premature. Since the average life expectancy for men is 75 years, and 81 years for women, death prior to age 75 can be considered an average for both men and women.

PREVALENCE

The number of instances of a given disease or other condition in a given population at a designated time. The term usually refers to the situation at a specified point in time.

RELATIVE RISK

The ratio of the risk of disease or death among the exposed (to a risk condition) to the risk among the unexposed.

SMOKING

Individuals are considered to be daily smokers if they regularly smoke at least one cigarette per day. Current smokers include both daily and occasional smokers.

STANDARD MORTALITY RATIO (SMR)

The ratio of the number of events observed in the population to the number that would be expected if the population had the same specific rates as the standard population, multiplied by 100.

THROMBOLYSIS

The action of pharmacologic lysis (breakup) of a coronary artery occlusion. Occlusions are thrombi composed of platelets, fibrin, erythrocytes, and leukocytes and are usually superimposed on or adjacent to atherosclerotic plaques. The pharmacologic agent (one of 7 currently available in Canada) may be used in combination with other therapy, such as heparin, a betablocker and antiplatelet agent.

TRANSIENT ISCHEMIC ATTACK

Reversible neurological or retinal deficits secondary to a temporary deficit in blood flow. Symptoms last for less than 24 hours, usually less than half an hour. There is complete recovery of function within 24 hours.

VALVE SURGERY

Repair or replacement of a diseased heart valve. Canadian Classification of Procedure Codes 47.01 to 47.29

NOTES

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