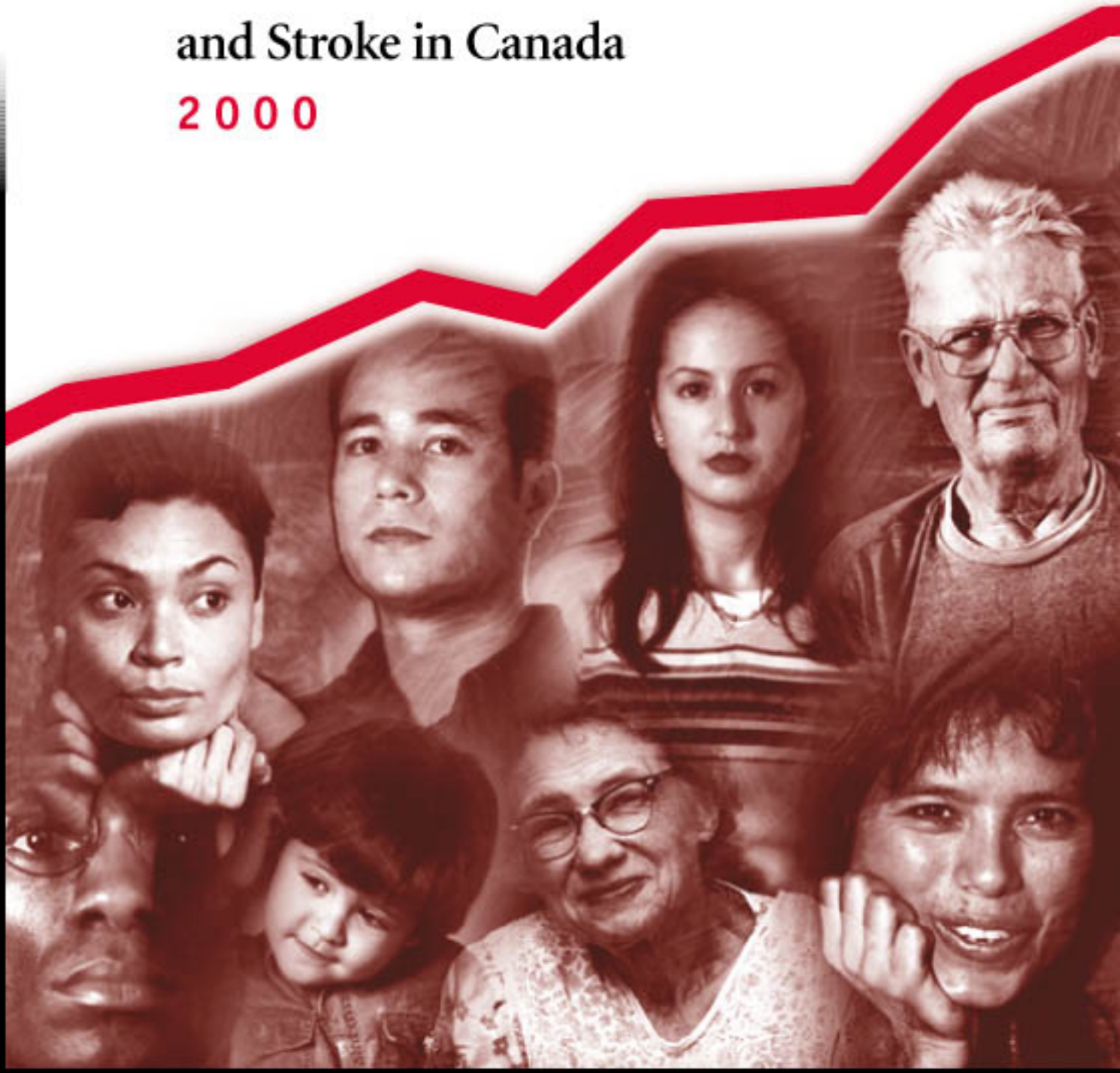
The CHANGING FACE of Heart Disease and Stroke in Canada 2000



HEART AND STROKE FOUNDATION OF CANADA

Statistics Canada / Statistique Canada

Health Canada / Santé Canada

Canadian Cardiovascular Society / Société canadienne de cardiologie

The Changing Face of Heart Disease and Stroke in Canada

2000

Prepared in Collaboration with

Laboratory Centre for Disease Control, Health Canada
Statistics Canada
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Canadian Cardiovascular Society
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EXECUTIVE SUMMARY

Heart disease and stroke are major causes of illness, disability and death in Canada and they exact high personal, community and health care costs. The goal of *The Changing Face of Heart Disease and Stroke in Canada*, the fifth in a series of reports from the Canadian Heart and Stroke Surveillance System (CHSSS), is to provide health professionals and policy makers with an overview of current trends in risk factors, interventions and services, and health outcomes of heart disease and stroke in Canada.

Risk Factors

The high prevalence rate of the major risk factors – smoking, physical inactivity, high blood pressure, dyslipidemias, obesity, and diabetes - continues to contribute to the epidemic of heart disease and stroke in Canada. There is a lack of significant improvement in these risk factors. Differences in risk factors exist among men and women, various age groups and individuals living in different regions of the country.

Recent research findings on the underlying causes of heart disease and stroke related to infection, micronutrients, homocysteine and oxidants, as well as genes provide possible new avenues for prevention.

Ongoing data captured through a surveillance system are necessary to monitor risk factors in the population. The most recent national level data for risk factors that require personal measures such as blood pressure, blood sugar for diabetes, blood lipids, and weight and height for obesity, are over ten years old. This limits our ability to assess the impact of prevention initiatives. In addition, better data are needed on nutrition and the dietary habits of Canadians.

Implications

More effective preventive measures with adequate resources targeted at individuals and communities, and supported by policies and legislation, will help reduce risk factors for heart disease and stroke.

Sub-groups such as youth, First Nations and Inuit, and sedentary overweight middle-aged individuals merit a more concerted effort with health promotion and prevention programs tailored to meet their needs to decrease the risk of heart disease and stroke.

At a time of constrained resources, health organizations for various diseases (for example, heart and stroke, diabetes, cancer) could derive benefit from working together on the reduction of common risk factors and conditions.

More research on the underlying pathophysiology of heart disease and stroke and the effectiveness of prevention interventions will enhance the evidence base for the development of effective programs and services.

Ongoing population surveys that include personal measures of blood pressure, blood sugar, blood lipids, and weight and height would provide valuable information for planning and evaluation of services, policies and legislation. Ideally, this data would be available at the community, provincial/territorial, and national level for all Canadians, including First Nations and Inuit people.

Interventions, Services and Costs

Cardiovascular disease (heart disease and stroke) is the leading cause of hospitalization for men and women (excluding childbirth). Based on the rates of hospitalization by age group, acute myocardial infarction and ischemic heart disease become important health problems starting at age 45 for men and 55 for women. Congestive heart failure and stroke affect older individuals with much higher admission rates over age 75 for both men and women. Marked differences exist in the rate of hospitalization and procedures for men and women that are still unexplained.

Clinical practice guidelines based on the latest research evidence provide direction for the appropriate use of the wide range of therapeutic interventions by health professionals. Gaps exist between recommendations for practice and actual practice, not only for treatment but also for prevention. Greater adherence to these guidelines would improve the treatment of heart disease and stroke. Recent initiatives by the pharmaceutical industry to promote a more holistic approach to treatment are a welcome step toward achieving better health outcomes.

An increase in the number of elderly in the population who have high risk profiles will lead to an increased need for the full range of health services required to manage heart disease and stroke effectively – ambulatory care, acute and chronic care hospitals, rehabilitation, home care and support, pharmaceuticals, health education, and other interventions. Improved data at the community, provincial/territorial and national level on interventions and health services would assist health service providers and funders in planning for and evaluating these services more effectively.

Implications

Service providers and funders will have to provide the full range of health services for an increased number of elderly individuals, many of whom may have several illnesses.

More widespread use of clinical practice guidelines is required to improve evidence-based practice.

The expansion of hospital-based clinical databases with standardized indicators in all hospitals will promote continuous quality improvement and increase the ability to compare health services and interventions across the country.

Future surveillance that includes such indicators as length of hospital stay, access to surgical procedures and ambulatory care services, use of interventions according to clinical practice guidelines, and satisfaction with services will provide useful information to health service providers and funders.

The linkage of physician, hospital, home care, pharmaceutical, and mortality databases at the provincial/territorial levels would add to the knowledge base that could be used to improve clinical practice and health outcomes. This would be facilitated by a unique identifier that could track an individual over time.

Health Outcomes

Cardiovascular disease (heart disease and stroke) is the leading cause of death of over one-third of Canadians. It not only affects the elderly but is also the third leading cause of premature death under age 75. Mortality rates for ischemic heart disease and acute myocardial infarction continue to decrease, but mortality rates for stroke have not changed significantly during the past ten years.

The number of elderly in the Canadian population has been increasing in recent years. As a result of this trend, there has been an increase in the number of deaths due to stroke and ischemic heart disease. This trend is expected to continue for the next fifteen years.

Heart disease has a major impact on an individual's quality of life, including chronic pain or discomfort, activity restriction, disability, and unemployment.

While there are detailed data on deaths from heart disease and stroke, there is a lack of data on other critical health outcomes, such as incidence, prevalence and quality of life, needed to plan and evaluate prevention and management interventions.

Implications

Both primary and secondary prevention efforts must attain priority to decrease the incidence of fatal and non-fatal heart disease and stroke in the population.

Collaborative efforts are required by health service providers to assume a wide range of services that will enhance the quality of life of individuals living with heart disease and stroke as well as their families.

The Canadian Heart and Stroke Surveillance System (CHSSS) needs to be enhanced to provide more useful information to decision-makers on

- ⇒ quality of life – activity restriction, side-effects of drugs, psychological reaction, impact on family dynamics, social life, personal and economic, sexuality;
- ⇒ incidence of heart disease and stroke and linked to morbidity and mortality for longitudinal follow-up; and
- ⇒ mortality rates for Aboriginal people and by ethnic background.

Youth

Behaviours that increase the risk of heart disease and stroke and the underlying pathophysiologic changes begin early in life. Therefore, it is essential that prevention begins in early childhood.

Greater effort must be made to prevent children and youth from starting to smoke cigarettes. The rates of smoking among youth aged 15 to 19 continue to increase with the greatest increase evident among young women. The factors that influence smoking include personal factors such as low self-esteem but also include smoking patterns in the family and the accessibility of cigarettes.

Young children are physically active but physical activity decreases during the teenage years, particularly among young women.

Obesity is a problem for a significant proportion of children aged 7 to 12. Programs to promote healthy weights must also address the concern young women have about the need to be thin, as this contributes to the decision to smoke.

There is a lack of data on congenital heart disease in Canada. This limits the ability to track this important health problem and plan effectively for health services for this population group.

Implications

A greater effort is needed to address smoking among youth. This includes programs and policies specifically for youth. Programs, policies and legislation are also needed to decrease smoking in the population as a whole, which will in turn have a positive effect on the incidence of youth smoking.

More attention to the promotion of healthy nutrition and weight and regular physical activity throughout childhood and adolescence will help to promote lifelong healthy behaviour.

Ongoing collection of data on physical activity, nutrition, weight, height, and skin-fold measures among children and youth will enable effective planning and evaluation of health promotion programs, policies and legislation.

The development of a national surveillance system on congenital heart disease with data on incidence, prevalence, quality of life, use of health services, costs, and mortality will facilitate planning for health services for individuals living with this disease.

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INTRODUCTION

Heart disease and stroke are major causes of illness, disability and death in Canada and they exact high personal, community and health care costs. The goal of *The Changing Face of Heart Disease and Stroke in Canada*, the fifth in a series of reports from the Canadian Heart and Stroke Surveillance System (CHSSS), is to provide health professionals and policy makers with an overview of current trends in risk factors, interventions and services, and health outcomes of heart disease and stroke in Canada. It is a collaborative effort of the Heart and Stroke Foundation of Canada, the Laboratory Centre for Disease Control, Health Canada, Statistics Canada, the Canadian Institute for Health Information, the Canadian Cardiovascular Society, and the Canadian Stroke Society. Its tables and figures are available on the Internet at www.hc-sc.gc.ca/hpb/lcdc/bcrdd/cardio.

The publication of *The Changing Face of Heart Disease and Stroke in Canada* comes at a time of change on several fronts:

- Change in the age structure *and* ethnic make-up of the population, with more elderly and more Canadians from a variety of backgrounds;
- Change in the management of AMI and stroke with the use of care maps, innovative technology and evidence-based interventions;
- Change in the organization and delivery of health services; and
- Increased recognition of the need to target programs for risk reduction to children and adolescents, and to ensure that the specific needs of women, Aboriginal peoples, and individuals from a variety of ethnic backgrounds are met.

It is hoped that the information contained in this report will lead to responses that not only acknowledge these changes but, more importantly, will build effectively upon them.

The report is organized into three general sections – Risk Factors and Conditions; Interventions; Services and Costs; and Health Outcomes – and it includes a special chapter on Youth. This latter chapter takes an in-depth look at risk factors for heart disease and stroke among children and adolescents. It includes evidence from the research literature on factors that influence the early adoption of healthy behaviours. Each chapter concludes with a section on policy implications for programs and services, and specific recommendations for improving data in each subject area. These policy implications are not exhaustive but are intended to serve as a starting point for organizations and individuals in planning their responses.

The 1997 report in this series highlighted stroke in Canada by devoting a separate chapter to the topic. In contrast, *The Changing Face of Heart Disease and Stroke in Canada* integrates data on stroke with data on heart disease within each chapter. This approach not only recognizes the similarity of their risk factors, but also emphasizes the need to consider the prevention of both heart disease and stroke as a common effort.

The data for this report have been obtained from a variety of sources. Several new sources of data that were not used in previous reports are included, but many gaps in the data still remain. Before heart disease and stroke in Canada can be fully understood, more effort is needed toward closing these gaps.

The Changing Face of the Canadian Heart and Stroke Surveillance System (CHSSS)

Surveillance is "the on-going, systematic collection, analysis and interpretation of health data in the process of describing and monitoring a health event closely integrated with timely dissemination of information to those who need to know. This information is used for planning, implementing and evaluating public health interventions and programs. Surveillance data are used to determine the need for public health action and to assess the effectiveness of programs."[1]

In 1998, the existing Canadian Heart and Stroke Surveillance System (CHSSS) was reviewed. Barriers to the timely procurement of data were identified. These include lack of co-ordination, high costs, poor timing of surveys, and delays in the release of data. More comprehensive data are needed at the local/regional, provincial/territorial, and national levels. Expanded dissemination strategies would ensure that the data are available to policy makers, service providers and the public in their efforts to make effective changes.

A Canadian Heart Disease and Stroke Surveillance System Network has been formed to develop an expanded surveillance system. Members in the Network include both data suppliers and data users from government, professional organizations and voluntary health organizations. The Network has developed goals, outcomes and indicators for the expanded system. Work is underway to improve existing data sources, create new ones, and improve dissemination strategies. The expanded CHSSS will provide more timely, high quality, and comprehensive information on heart disease and stroke for service providers, government, voluntary health organizations, academics and researchers, and the general public.

The expanded system will work to provide data on

- health outcomes of the population related to cardiovascular disease – diseases, disability, quality of life, and death;
- risk factors influencing cardiovascular disease in the population; and
- interventions for cardiovascular disease – prevention, treatment and rehabilitation.

Data on a core set of indicators will be collected on a regular basis. These will be enhanced with one-time projects designed to add detailed information for deeper understanding of observed trends. The core set of indicators will be expanded over time as resources and technology permit. The research literature will be reviewed and summarized on a regular basis to add to the understanding of the observed indicators.

The CHSSS will not develop one massive database. Instead, it will collate data from existing databases and promote the development of new ones as necessary in order to address gaps. It will improve access and data linkages among existing databases through the use of linkage variables and standard definitions. In essence, the surveillance system will use technology to create a virtual database by inter-linking existing databases. Projects working toward this concept are currently in process at Health Canada. The CHSSS will be able to take advantage of this work when it is completed.

Several dissemination strategies will be used including

- an annual report,
- data access through the Laboratory Centre for Disease Control website for cardiovascular disease (http://cyphera.ic.gc.ca/spansweb/) with links to other websites, and
- report templates for standardized reports, bulletins and research reports and presentations.

The system will be evaluated to assess the quality of data in the system, to measure the satisfaction of its users with the information derived and with its dissemination, and to assess the system's impact on policy makers' decisions.

Priority Indicators for Development

A formal system has been developed for identifying and establishing priorities among indicators for each component. The usefulness of each indicator is assessed using the following criteria.

- **Importance to public health** - There is good evidence that the indicator has a serious impact on health; there are a significant number of people affected; it has a significant impact on costs; there is potential for improvement of cardiovascular health.
- **Feasibility -**Data are available at a reasonable cost in a timely manner.
- **Quality of data** - Data collection tools and methods provide valid and reliable data.

The following indicators have been identified for further development in each of the three categories: Risk Factors and Conditions; Interventions, Services and Costs; and Health Outcomes.

Risk Factors and Conditions

- Age
- Sex
- Family history
- Tobacco smoking
- Physical inactivity
- High blood pressure
- Dyslipidemia
- Overweight
- Diabetes
- Excessive alcohol use
- Hyperhomoscysteinemia
- Oxidant diet/Antioxidant use
- Mental Stress
- Exertion in the cold/Snow shovelling
- Infections and inflammatory agents
- Atrial fibrillation
- Ethnicity

Interventions, Services and Costs

Physician Ambulatory Visits

Prescriptions for CVD

Investigations

- Stress tests
- Coronary angiograms
- Coronary angioplasty
- Cerebral angiograms
- Echocardiograms
- Carotid doppler
- PVD doppler
- Brain Imaging
- Myocardial perfusion imaging
- Ambulatory ECG recording

Community Response

- CPR training courses
- Population trained in CPR
- Knowledge of CPR
- Persons with CPR training
- 911 in place
- Paramedics in place
- Automatic defibrillator in field
- Symptom to service time

Surgery

- Congenital heart disease
- Carotid endarterectomy
- Abdominal aortic aneurysm repair
- Coronary artery bypass grafting
- Peripheral vascular surgery
- Pacemaker implant

Hospitalization for Specific Diseases

Rehabilitation and support programs

- Stroke rehabilitation community programs
- MI rehab community programs
- Presence of and use of home care program
- Respite services

Prevention Programs

- Knowledge of risk factors
- Policies to protect against second-hand smoke
- School heart health programs
- Screening for blood lipids
- Screening for hypertension
- Supportive workplace programs
- Communities with heart health coalition
- Communities with adequate physical activity opportunities
- Smoking cessation

Costs

Health Outcomes

Incidence, prevalence, mortality for (International Classification of Disease codes):

- All CVD (390-459)
- IHD (410-414)
- Acute MI (410)
- Congestive Heart Failure (428)
- Cerebrovascular (430-438)
- All stroke (430-432,434,436)
- Sub-arachnoid hemorrhage (430)
- Intracerebral hemorrhage (431)
- Cerebral Infarction (434, 436)
- Aortic Aneurysm (441)

Summary

The impact of heart disease and stroke in Canada can be reduced through

reduction of risk factors and their predisposing and facilitating conditions;

the promotion of health; and

effective use of interventions and health services.

This report summarizes existing national data on these two important health problems. Readers are encouraged to consider the implications that the data in each chapter hold for both their area of interest and their personal health.

The development of a more comprehensive Canadian Heart and Stroke Disease Surveillance System (CHSSS) will assist in the prevention and effective management of heart disease and stroke in Canada. The formation of CHSSS will facilitate this process. The improvement of existing data and the development of new data sources, combined with an enhanced dissemination strategy, will improve decision-makers' access to ongoing, timely data on heart disease and stroke in Canada.

References

[1] Guidelines for Evaluating Surveillance Systems. Atlanta, GA: Centers for Disease Control and Prevention. Available at: URL: cwus@cdc.gov.

Chapter 1 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.[1]

There is a growing body of evidence that the determinants of health go beyond individual genetic endowment, lifestyle behaviour and the health care system to 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 in populations 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 that these underlying determinants need to be addressed 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.

While this report will discuss each risk factor individually, the reality is that many people have more than one risk factor. The Canada Heart Health surveys from 1985-90[2] found that 41% of men and 33% of women aged 18 to 74 had two or more of the major risk factors (smoking, high blood pressure, elevated cholesterol, physical inactivity, or obesity). The risk of heart disease and stroke increases with an increased number of risk factors.

Age

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

Sex

At younger ages, men are at much higher risk than women of developing coronary artery disease (CAD). There appears to be a ten-year lag for women in the development of CAD. The risk of stroke is also higher for men. (See Chapter 3 "Health Outcomes" for differences among men and women in mortality rates for heart disease and stroke.) Women have an increased incidence of stroke in the first six weeks post partum, but the absolute risk is low (less than .01%).[3]

Studies suggest that hormone replacement therapy (HRT) may protect postmenopausal women from heart disease. However, the benefits of HRT for certain subsets of the population, such as women who already have coronary heart disease, is unclear at this time. Clinical trials are underway to provide further information on this question.

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 dyslipidemias, lifestyle and molecular defects in vascular physiology which render the vessel wall more susceptible to atherosclerosis. Promising research findings are likely to result in genetic typing and gene-specific treatment to prevent heart disease. However, the extent to which the findings will be of benefit to the general population is as yet unclear.

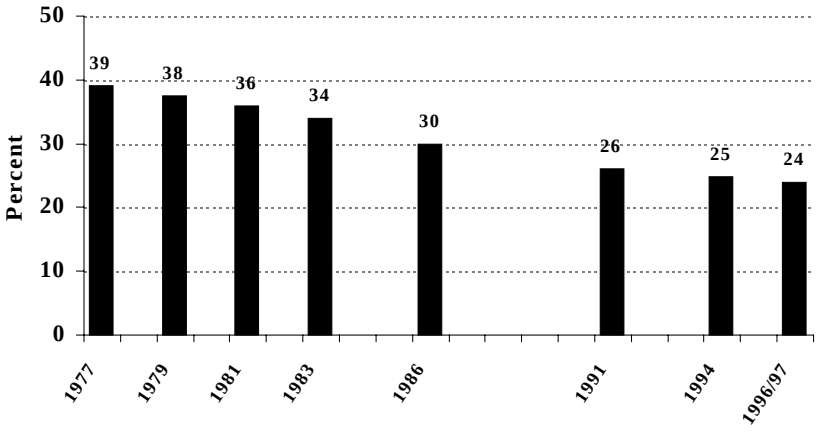
Tobacco Smoking

Cigarette smoking is the major cause of preventable death in Canada. Contrary to popular belief, smoking is responsible for more deaths due to heart disease and stroke than deaths due to cancer. Smoking increases the incidence of all major forms of heart disease and stroke. In addition, women who smoke and use oral contraceptives have an increased risk of subarachnoid hemorrhage.[4] In the 1996/97 National Population Health Survey (NPHS), over 90% of adults (93% of women and 95% of men in every age group) agreed that smoking can cause heart problems. A lower proportion (85%) agreed that smoking can lead to stroke.

In 1996/97, 29% of adults aged 15 years and over smoked cigarettes; 24% were daily smokers and 4% were occasional smokers. (Figure 1-1)

An estimated 329,000 Canadians (aged 15 years and over) began smoking in 1996/97. There has been little change in overall smoking rates since 1991.

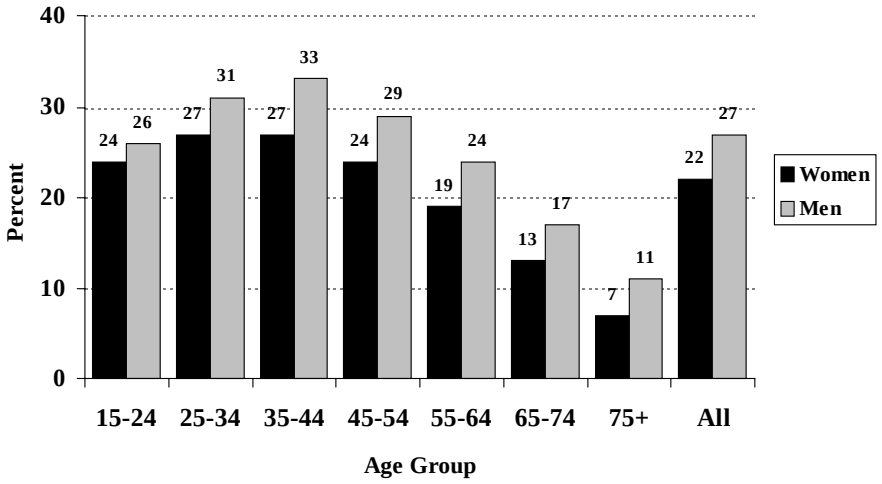
Figure 1-1 Proportion of adults aged 15+ years who are daily smokers, Canada, 1977-1996/97.



Source: Statistics Canada, catalogues 91-002, vol. 7, no. 3; 91-512;91-213. Canadians and smoking: An update. Health and Welfare Canada, 1991. General Social Survey, Statistics Canada, 1991. Survey on Smoking in Canada, Cycle 3, 1994. National Population Health Survey, Statistics Canada, 1996/97.

In 1996/97 more men than women were daily smokers in all age groups, except in the under-20 group. (Figures 1-2 and 4-2 (see Chapter 4))

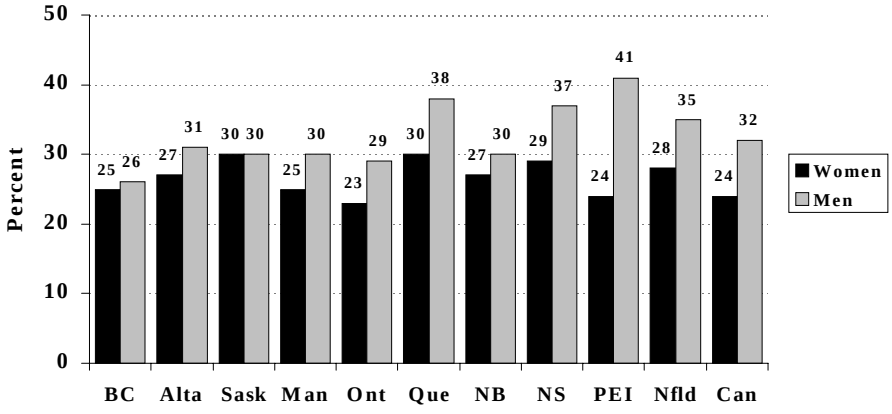
Figure 1-2 Proportion of adults who are daily smokers by age group and sex, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, 1996/97

Smoking rates tend to be higher in Quebec and the Atlantic provinces than in the rest of Canada. (Figure 1-3)

Figure 1-3 Proportion of adults aged 15+ years who are daily or occasional smokers by sex and province, Canada, 1996/97.

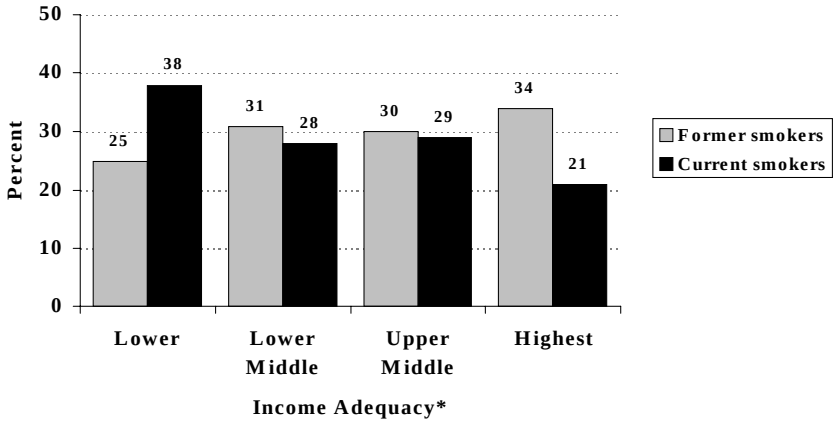


Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

In 1996/97, a higher (63%) proportion of adults in the "lower" income group were either current or former smokers compared to "middle" (59%) or "highest" income (55%) groups. The proportion of current smokers in the "lower" income group (38%) was nearly double the proportion in the "highest" income group (21%). (Figure 1-4)

(See Glossary for a more detailed explanation of "Income Adequacy".)

Figure 1-4 Proportion of adults aged 15+ years who are current or former smokers by income adequacy* level, Canada, 1996/97.

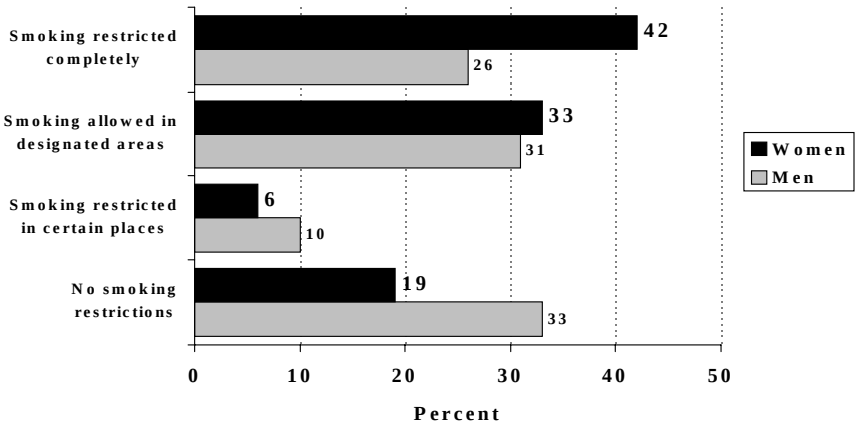


*Income adequacy - based on the number of individuals and total income in a household.

Source: Statistics Canada, National Population Health Survey, 1996/97

In 1996/97, the woman's workplace was less tolerant of smoking than the man's. Smoking was completely restricted in the workplace for 42% of women compared to only 26% of men. One-third of men who are daily smokers reported that there were no restrictions in the workplace compared to only 19% of women. (Figure 1-5)

Figure 1-5 Proportion of daily smokers aged 15+ years who reported workplace smoking restrictions by sex, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

Physical Inactivity

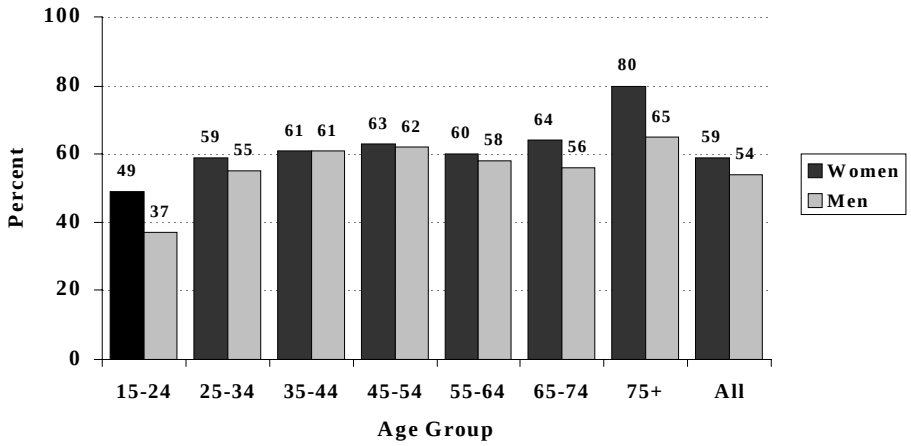
Physical inactivity is a risk factor for heart disease and stroke.[5] Regular physical activity can reduce body weight, improve serum lipids and cholesterol, blood pressure and diabetes, and thereby overall cardiovascular risk. National guidelines recommend the development of an active lifestyle that includes 60 minutes of light physical activity every day, or 30 minutes of moderate physical activity each day[6].

In 1996/97, over half (57%) of adults were physically inactive in their leisure time. (See Glossary for definition of Physical Inactivity.) There was virtually no change from 1994/95 to 1996/97 (58% versus 57%, respectively).

More women than men were physically inactive in the 15 to 24-year-old age group, and in the over-65 age groups. Physical inactivity increased for both men and women after the age of 25. (Figure 1-6)

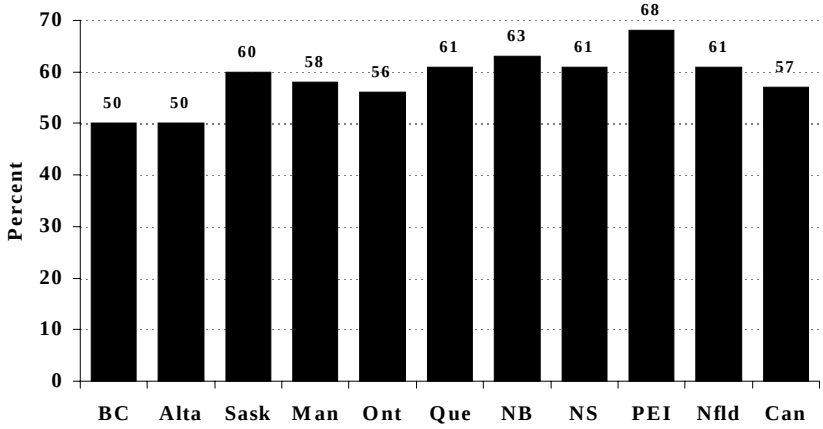
The proportion of adults that are physically inactive is lowest in B.C. and Alberta and highest in P.E.I. (Figure 1-7)

Figure 1-6 Proportion of adults who are physically inactive by age group and sex, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, 1996/97

Figure 1-7 Proportion of adults who are physically inactive by province, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

High Blood Pressure

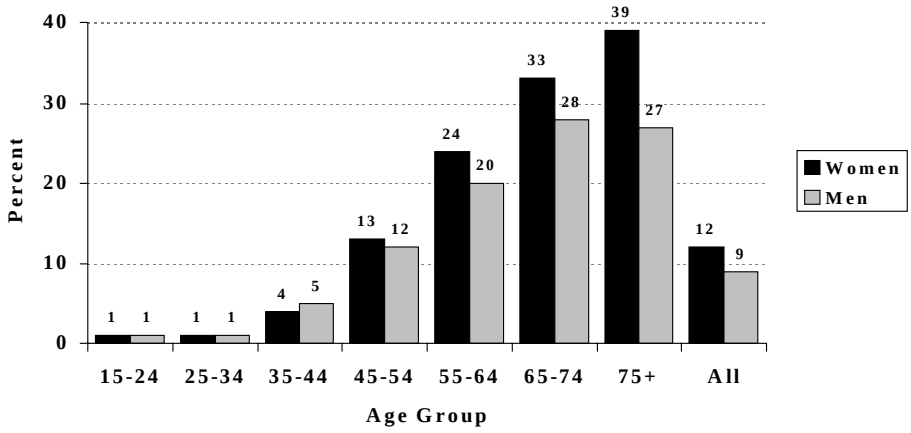
High blood pressure (defined as a systolic blood pressure $\geq$140 mmHg or diastolic blood pressure $\geq$90 mmHg) is a major risk factor for both coronary artery disease and stroke peripheral vascular disease and congestive heart failure. It increases overall cardiovascular risk by 2 to 3 fold.[7] 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 disease, and overall death rate.[8]

Individuals who have excess weight, are physically inactive, use alcohol heavily, or have excessive salt intake are more likely to develop high blood pressure[9]. High blood pressure is commonly associated with other metabolic cardiovascular risk factors such as insulin resistance, obesity, hyperuricemia, and dyslipidemia.

The Heart Health Surveys of 1985-90[10] found that 22% of adult Canadians (26% of men and 18% of women) had high blood pressure. Only 13% of the population had been diagnosed with high blood pressure, however.

In 1996/97, 10% of adults reported having had high blood pressure diagnosed by a physician. The overall rate for 1994/95 was 9%. The diagnosis of high blood pressure increased with age. One-third of seniors over the age of 65 years had had high blood pressure diagnosed by a physician. A higher proportion of women than men aged 45 and over reported having been diagnosed with high blood pressure. The higher rates among women reflect a greater level of detection, rather than a higher rate of disease. (Figure 1-8)

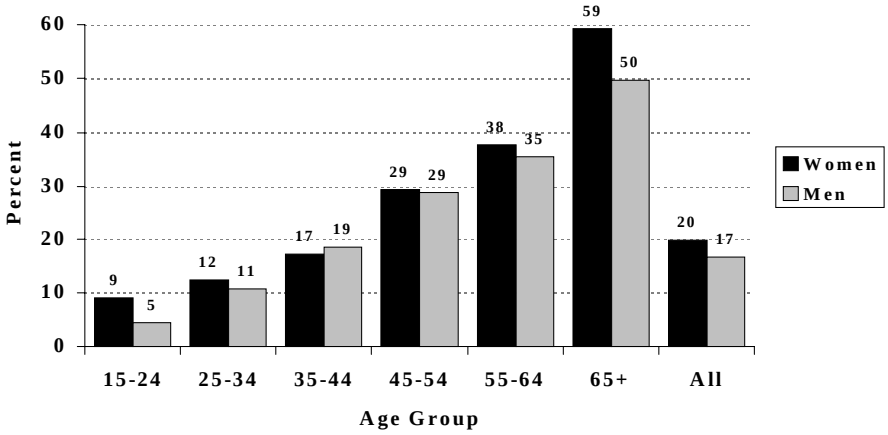
Figure 1-8 Proportion of adults who report that they have high blood pressure by age group and sex, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, 1996/97

In 1997, 18% of First Nations and Inuit adults were diagnosed with high blood pressure. (See Glossary for definition of First Nations.) After adjusting for differences in the age distribution with the non-native population, the prevalence of self-reported physician diagnosed high blood pressure among First Nations and Inuit adults was 2.8 times higher in men and 2.5 times higher in women. The rates of diagnosis started to rise at the age of 35 years to a high of 55% in the over-65 age group. There was very little difference between men and women, except among the over-65 age group where more women than men had been diagnosed with high blood pressure. (Figure 1-9)

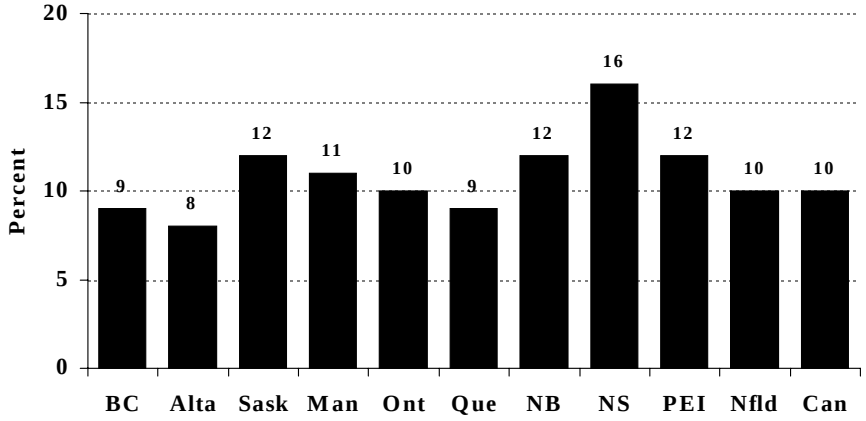
Figure 1-9 Proportion of First Nations and Inuit adults who report having high blood pressure by age group and sex, Canada, 1997.



Source: Assembly of First Nations, National Steering Committee, First Nations and Inuit Regional Health Survey 1997

The variation among provinces was minimal except for higher rates in Nova Scotia. This may be the result of the success of an active Heart Health Program that encourages screening for high blood pressure rather than a true higher rate of high blood pressure. (Figure 1-10)

Figure 1-10 Proportion of adults who have high blood pressure by province, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

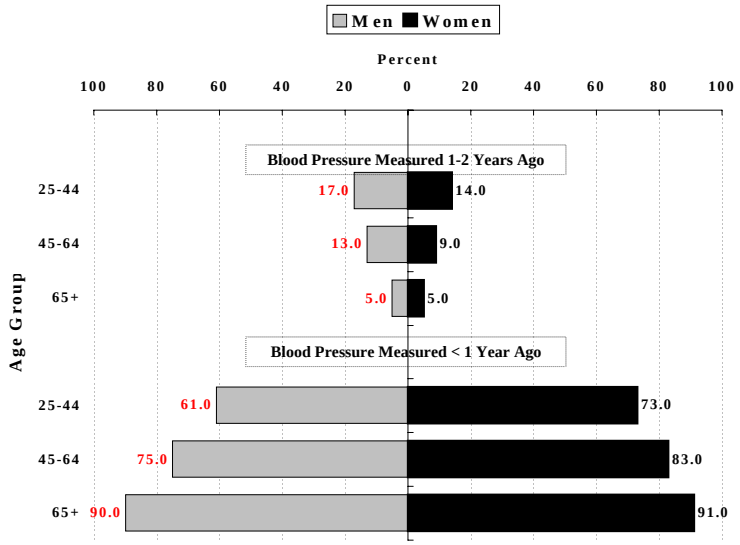
The early detection and treatment of high blood pressure is associated with a decreased risk of health problems associated with high blood pressure.[11] The Canadian Task Force on the Periodic Health Exam recommends that all adults over the age of 20 have blood pressure assessments every two years.[12]

The Canadian Heart Health Surveys in the late 1980s found that 42% of people with high blood pressure ($\geq$140 systolic or $\geq$90 diastolic averaged on four occasions or on medication for high blood pressure) were unaware that they had high blood pressure. Thus, about 9% of the population (42% of the 22% of the population with high blood pressure) have undetected high blood pressure. Of those with undetected high blood pressure, 61% were in the 35 to 64 year old age group, 27% were in the 65 to 74 year old age group, while only 12% were in the 18 to 34 year old age group.

According to the 1996/97 National Population Health Survey:

About 84% of the population had had their blood pressure assessed in the previous two years – the recommended Canadian guideline. The rates were highest in the over-65 age group and lowest in the 25 to 44 age group. (Figure 1-11) Only 1 to 2% of the women and 1 to 5% of the men in each age group had never had their blood pressure taken.

Figure 1-11 Proportion of adults who have had blood pressure measured by age group and sex, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, 1996/97.

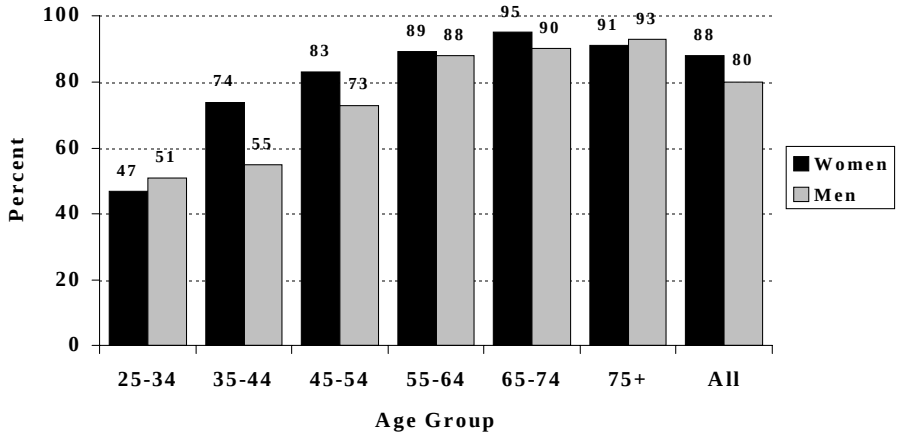
It is essential that individuals with a high reading at the time of screening be followed up by a physician to confirm the diagnosis of high blood pressure according to clinical practice guidelines.

The Canadian Heart Health Surveys identified a major problem in the control of high blood pressure in Canada. Of those who were diagnosed with high blood pressure, only 28% were treated and controlled. Another 40% were being treated but were not controlled, and 33% were neither treated nor controlled.

According to the 1996/97 NPHS, 84% of people (88% women and 80% men) who had been diagnosed with high blood pressure by a physician reported they were on treatment (medication or lifestyle adjustment) for high blood pressure. (Figure 1-12)

Only about one-half of men between the ages of 25 and 44 were on treatment for high blood pressure.

Figure 1-12 Proportion of adults who receive treatment for high blood pressure by age group and sex, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, 1996/97

Of those who received treatment, 98% were on medication, 12% were on a diet, and 1% were receiving some other treatment.

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.[13,14] Pharmacological treatment of high blood cholesterol levels has proven to be very valuable in the management of coronary artery disease, reducing AMI 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.[15,16]

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 ($\geq$ 6.2 mmol/L); and
- the proportion of men and women with a high cholesterol level ($\geq$5.2 mmol/L) increased with age, almost doubling from the 25-34 age group to 35-44 age-group among men and from the 35-44 age group to age 45-54 age group among women.

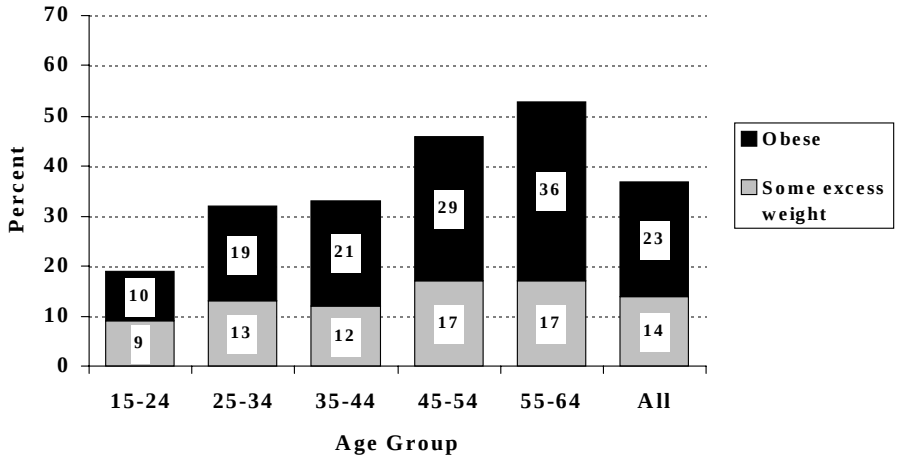
Overweight

Being overweight - either excess weight (defined as a body mass index (BMI) of 26 or 27) or obesity (BMI) >27) - is one of the most common factors influencing the development of high blood pressure and diabetes. These conditions, in turn, are two important risk factors for heart disease and stroke. The greater the obesity, the greater the risk of heart disease and stroke.[17] In general, excess weight and obesity can be reduced with healthy nutrition and regular physical activity.

In the 1996/97 NPHS, 48% of adults were overweight - 19% had some excess weight and 29% were obese. There was very little change from 1994/95 when 49% were overweight, 19% had some excess weight, and 30% were obese.

The survey revealed being overweight as a very common risk factor among Canadian women with 37% of adult women between the ages of 15 and 65 being overweight. The proportion increased with age. In the 55-64 age group over one-half were overweight: 36% were obese and 17% had some excess weight. (Figure 1-13)

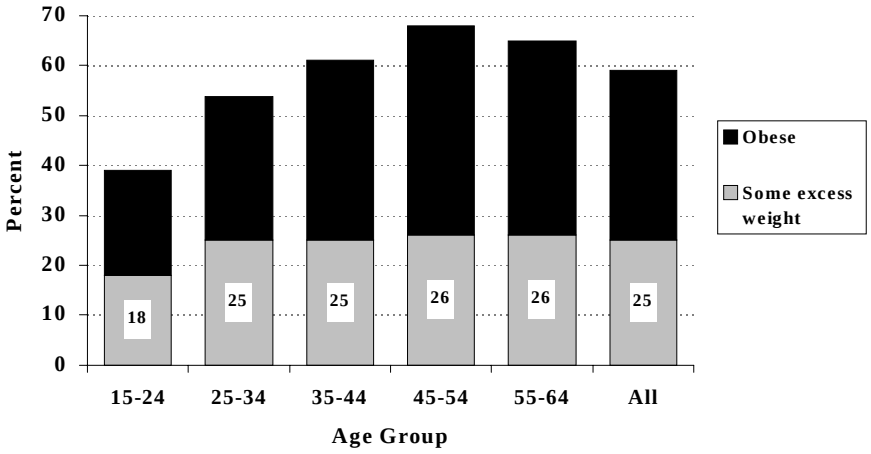
Figure 1-13 Proportion of women who are overweight by age group, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, 1996/97

Being overweight was even more common among Canadian men than women (59% compared to 37%, respectively). The highest proportion of overweight men was in the 45-54 age group (68%): 42% were obese and 26% had some excess weight.

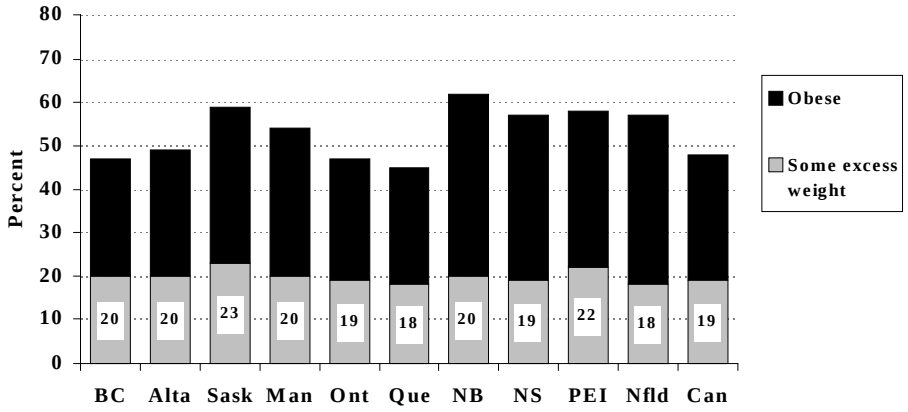
Figure 1-14 Proportion of men who are overweight by age group, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, 1996/97

There was considerable variation in the proportion of the population that was overweight by province, with the highest rates in the eastern provinces and Saskatchewan. (Figure 1-15)

Figure 1-15 Proportion of adults who are overweight by province, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

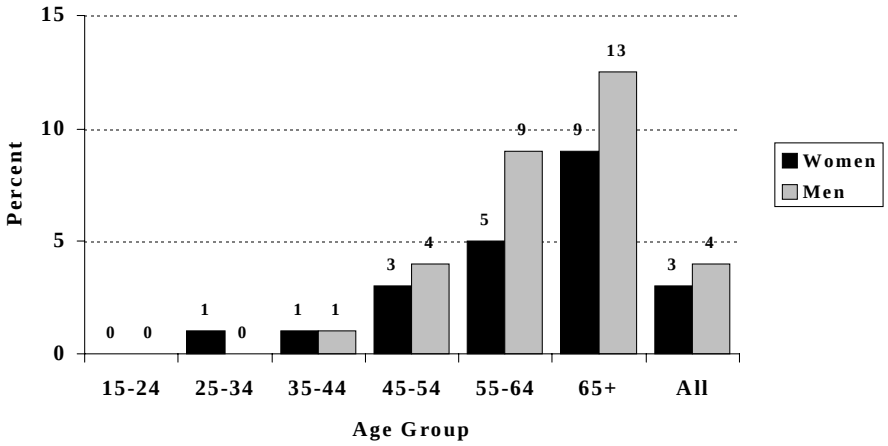
Diabetes

Adult onset diabetes (often referred to as Type 2 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 disease, but adversely influences outcome as well. Individuals with diabetes have a higher mortality rate from heart disease. Diabetes can be prevented by the maintenance of healthy weight through healthy nutrition and regular physical activity. Effective management of diabetes can decrease the risk of heart disease and stroke and other diabetes- associated complications.

Determining the prevalence of diabetes in the population is very difficult. At the present time, it is necessary to rely 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 used by physicians in making the diagnosis vary. Some studies suggest that up to 50% of cases of diabetes in North America are undiagnosed, and therefore unreported.

The 1996/97 NPHS found that 3% of adults (4% of men and 3% of women) aged 15 years and over had diabetes diagnosed by a physician, a similar proportion to 1994/95. The prevalence increased with age and was higher among men in all age groups. (Figure 1-16)

Figure 1-16 Proportion of adults who have diabetes by age group and sex, Canada, 1996/97.



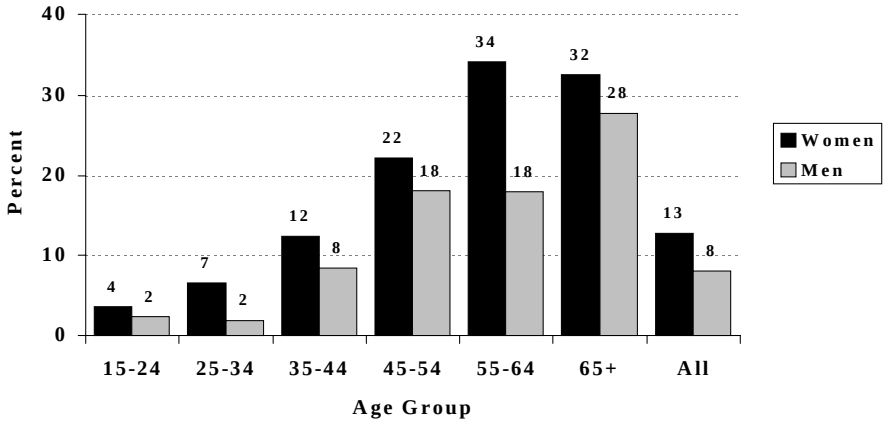
Source: Statistics Canada, National Population Health Survey, 1996/97

The 1997 First Nations and Inuit Regional Health Survey found a prevalence of diabetes of 6.0% among First Nations people, 8.5% among North American Indian people on reserves, 5.3% among North American Indian people off reserves, 5.5% among Métis, and 1.9% among Inuit.

The rates among First Nations people increased dramatically over the age of 35 for both men and women. (Figure 1-17)

After adjusting for differences in the age distribution with the non-native population, the prevalence of self-reported, physician diagnosed diabetes was 3.3 times higher in men and 5.5 times higher in women among First Nations and Inuit adults.

Figure 1-17 Proportion of First Nations and Inuit adults who report having diabetes by age group and sex, Canada, 1997.



Source: Assembly of First Nations, National Steering Committee, First Nations and Inuit Regional Health Survey 1997

Excessive Alcohol Use

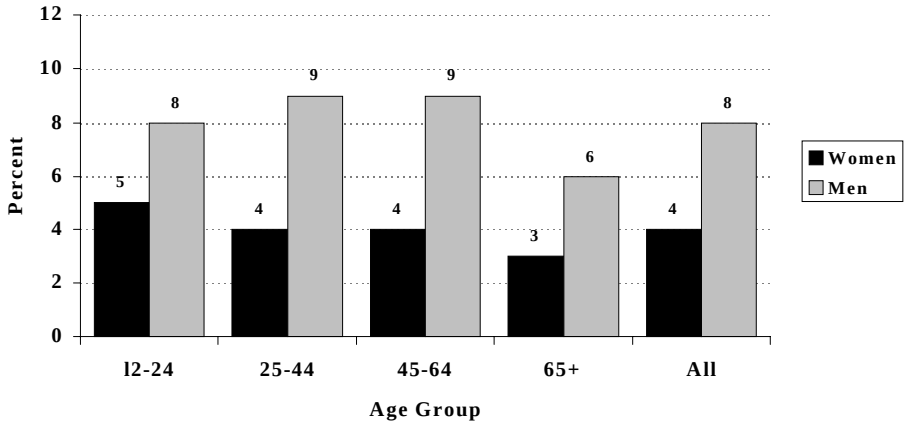
Alcohol use in excess of 2 drinks per day is associated with an increased risk of high blood pressure[18] and heart disease. Alcohol abuse is also a risk factor for hemorrhagic stroke and subarachnoid hemorrhage.[19] The evidence is less clear whether it is also a risk factor for ischemic stroke.

It is difficult to make recommendations about safe levels of drinking alcohol because there is a curvilinear relationship between the levels of alcohol consumption and the risk of mortality from heart disease. Individuals who do not drink alcohol are at a higher risk for heart disease than those individuals who consume one drink of alcohol a day. The reasons for this are not entirely clear. Canadian Low Risk Drinking Guidelines suggest that healthy adults who chose to drink should limit alcohol to two or fewer drinks per day with weekly consumption not exceeding 14 standard drinks in men and 9 standard drinks in women.

According to the 1996-97 NPHS, the proportion of men who reported consuming excessive amounts of alcohol was twice that of women (8% and 4%, respectively). Heavy alcohol use decreased over age 65 for men. (Figure 1-18)

The interpretation of any self-reported data on alcohol consumption must be viewed in light of the tendency for individuals to under-report the amount that they drink.

Figure 1-18 Proportion of adults who drink alcohol excessively* per week by age group and sex, Canada, 1996.



* Women drinking more than 9 drinks per week; men drinking more than 14 drinks per week
Source: Statistics Canada, National Population Health Survey, 1996/97

Hyperhomocysteinemia

Elevations of the naturally occurring sulfur-containing amino acid serum homocysteine are associated with early coronary artery disease and stroke, and with venous thromboembolic disease.[20,21,22] It is unclear as yet as to whether this association is in fact causal. Dietary supplementation with folate has been shown to reduce serum homocysteine levels,[23] but as of yet has not been shown to reduce CAD or stroke. There are several trials underway at this time to identify the impact of folate supplementation on coronary heart disease and stroke.

Oxidant Diet/Antioxidant Use

Oxidative stress is increasingly recognized as a component of the atherosclerotic process. This awareness has prompted interest in the use of antioxidants, such as Vitamin E. Several studies have established that there is often, but not always, an inverse association between dietary antioxidant (vitamin) intake and ischemic heart disease. Results from several ongoing prospective studies of vitamin E may help to determine clinical recommendations pertaining to its use.[24]

Mental Stress

It is now well accepted that myocardial ischemia may be precipitated by mental stress.[25,26] Mental stress may be initiated by common emotional states such as anxiety or anger.[27] It is believed that stress increases sympathetic nervous output, resulting in increased myocardial oxygen demand. It also may result in platelet aggregation and vasoconstriction which may be responsible for triggering cardiac events.[28] The impact of stress is mediated by the individual's ability to cope with it and by his/her surrounding support network. Stress can emanate from many sources, such as the workplace, family environment, poverty, prejudice, and violence.

Exertion in the Cold/Snow Shovelling

About half of cold-related deaths are attributable to myocardial infarction and stroke.[29] British data indicate that about half of myocardial infarctions occur in the winter and when temperatures are lowest, [30] with most deaths occurring after brief exposure to cold. It is believed that such deaths occur in individuals with underlying CAD, and that sympathetic activation leads to coronary thrombosis by increasing platelet aggregation and vasoconstriction.

Snow shovelling is associated with myocardial ischemia, and with infarction.[31] Emergency room visits for acute coronary syndromes and cardiac arrest increase after heavy snowfalls,[32] and myocardial infarction has been reported after snow shovelling.[33] It is well documented that snow

shovelling induces very high myocardial oxygen demands,[34] and it is believed that intense sympathetic output may precipitate coronary thrombosis or plaque rupture.[35]

Infectious and Inflammatory Agents

The role of infectious agents in the pathogenesis of coronary and carotid atherosclerosis is presently being investigated. *C. pneumoniae* and cytomegalovirus (CMV) have been isolated from atherosclerotic plaques.[36] Whether these are causally related or merely associations is unknown at this time. The hypothesis that inflammation contributes to the atherogenic process is supported by studies that associated serum makers of inflammation, such as C-reactive protein, with increased cardiovascular risks.[37,38,39,40,41] Clinical trials are underway to assess the impact of treatment with antibiotics on myocardial infarction among individuals with existing coronary artery disease.

Atrial Fibrillation

Atrial fibrillation is a well-known risk factor for ischemic stroke.[42] Atrial fibrillation increases with age and can be found in approximately 10% of patients over 75 years of age, along with the presence of other risk factors and medical conditions. There is a general consensus that prior systemic embolism or atrial fibrillation warrants anticoagulation with warfarin or aspirin to reduce the risk of stroke, depending on age, prior history, and other medical problems.[43]

Ethnicity

In Canada, 17% of the population was born outside of Canada. Research among South Asian-born and Chinese-born Canadians has identified different mortality rates from heart disease and stroke compared to individuals born in Canada (see Chapter 3). The prevalence of the risk factors for stroke and their contribution to heart disease and stroke among these two sub-groups is not known at this time. The Study of Health Assessment and Risk in Ethnic groups (SHARE) is being undertaken to provide answers to these questions.[44]

Conclusions

The high prevalence rate of the major risk factors – smoking, physical inactivity, high blood pressure, dyslipidemias, obesity, and diabetes - continues to contribute to the epidemic of heart disease and stroke in Canada. Differences in risk factors exist among men and women, various age groups and individuals living in different regions of the country.

Recent research findings on the underlying causes of heart disease and stroke related to infection, micronutrients, homocysteine and oxidants, as well as specific genes provide possible new avenues for prevention.

Ongoing data captured through a surveillance system are necessary to monitor risk factors in the population. Except for smoking, no risk factors that require personal measures (such as blood pressure, blood sugar for diabetes, blood lipids, and weight and height for obesity) have been monitored with consistent methodology over time. The most recent national level data for risk factors that require personal measures,are over ten years old. This limits our ability to assess the impact of prevention initiatives. In addition, better data are needed on nutrition and the dietary habits of Canadians.

Implications

More effective preventive measures with adequate resources targeted at individuals and communities, and supported by policies and legislation, will help reduce risk factors for heart disease and stroke.

Sub-groups such as youth, First Nations and Inuit, and sedentary overweight middle-aged individuals merit a more concerted effort with health promotion and prevention programs tailored to their needs to decrease the risk of heart disease and stroke.

At a time of constrained resources, health organizations dedicated to combatting various diseases, such as heart and stroke, diabetes, and cancer, could derive benefit from working together on the reduction of common risk factors and conditions.

More research on the underlying pathophysiology of heart disease and stroke and the effectiveness of prevention interventions will enhance the evidence base for the development of effective programs and services.

Ongoing population surveys that include personal measures of blood pressure, blood sugar, blood lipids, and weight and height would provide valuable information for planning and evaluation of services, policies and legislation. Ideally, these data would be available at the community, provincial/territorial, and national level for all Canadians, including First Nations and Inuit people.

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Chapter 2 INTERVENTIONS, SERVICES and COSTS

Heart disease and stroke are chronic lifelong diseases that can be treated to relieve symptoms, improve 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. A range of health services is needed to help individuals both in the immediate or acute phase and in the community with rehabilitation and support as needed. Community interventions are particularly important for individuals with a chronic illness such as heart disease or stroke, because much of their time is spent 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 on 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 will result in improved data.

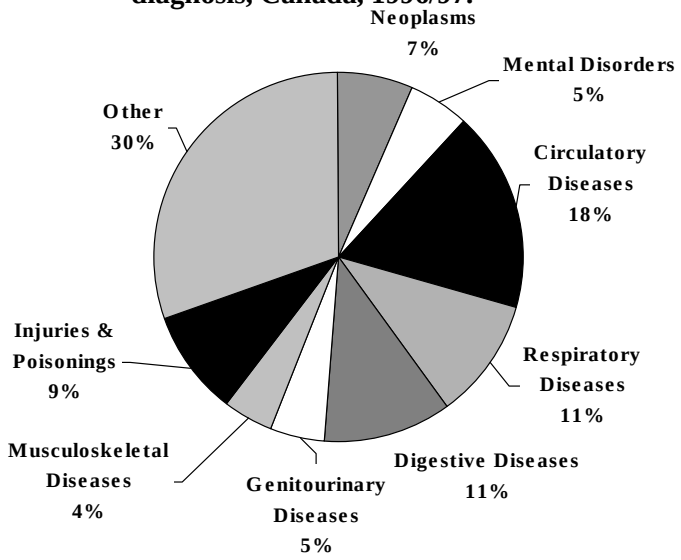
The Canadian Institute for Health Information's (CIHI) Hospital Morbidity Database provides valuable information on reasons for hospitalization and rates of procedures. However, it does not include outpatient visits. Some provinces use the Physician Billing Database to obtain information on ambulatory care, but this is not available in a consistent way across the country. Linkages between an individual's entry into the system and his/her health outcome would be ideal. Some provinces and Statistics Canada are working on this at the present time.

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 provide information on the use of hospital services and also give a picture of the characteristics of individuals with heart disease and stroke in the population. At the national level, these data are based on the number of hospitalizations in a given year, thus the same person may be counted more than once.

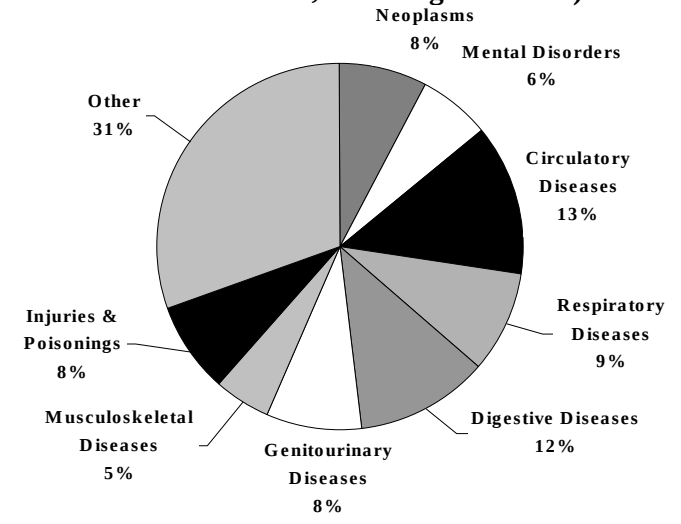
Cardiovascular disease is the leading cause of hospital admissions for men and women excluding childbirth and pregnancy. (Figures 2-1 & 2-2)

Figure 2-1 Proportions of hospitalizations for men by diagnosis, Canada, 1996/97.



Source: Hospital Morbidity Database, Canadian Institute for Health Information

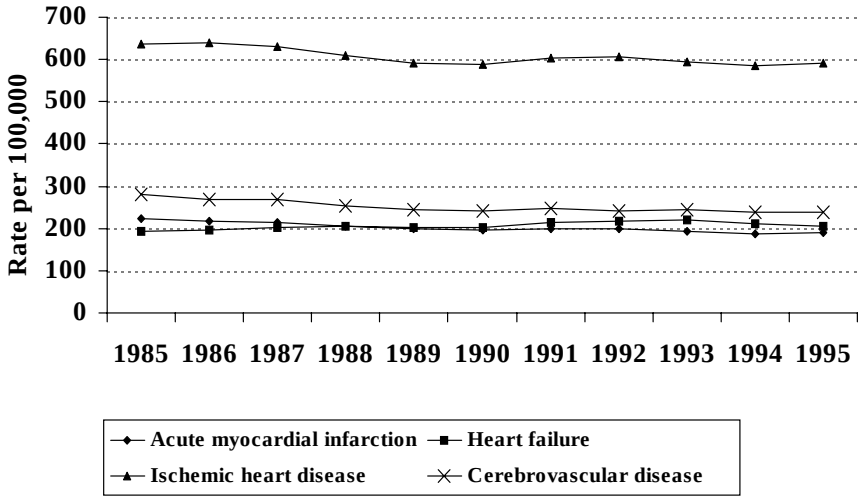
Figure 2-2 Proportions of hospitalizations for women by diagnosis, Canada, 1996/97 (excluding pregnancy and childbirth, including newborns).



Source: Hospital Morbidity Database, Canadian Institute for Health Information

Hospitalization rates for acute MI, heart failure, ischemic heart disease and stroke were decreasing in the late 1980s but this decrease appears to have slowed in the 1990s. (Figure 2-3)

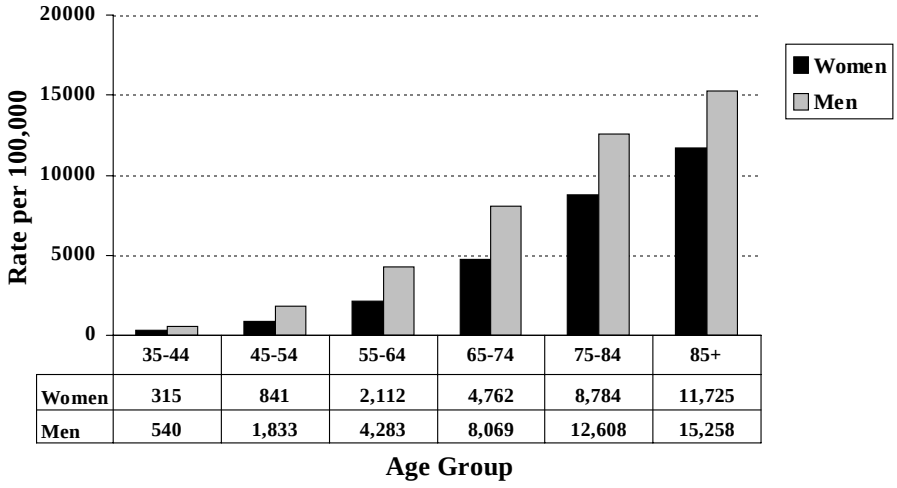
Figure 2-3 Rates of hospitalization over time, Canada, 1985-1995 (age-standardized, Canada 1991).



Source: Surveillance On-line, 1998 LCDC, Health Canada, Statistics Canada

Hospitalization rates increase with age for all cardiovascular disease and are higher for men than women. (Figure 2-4)

Figure 2-4 Crude rates of hospitalizations per 100,000 population for all cardiovascular disease by age group and sex, Canada, 1996/97.



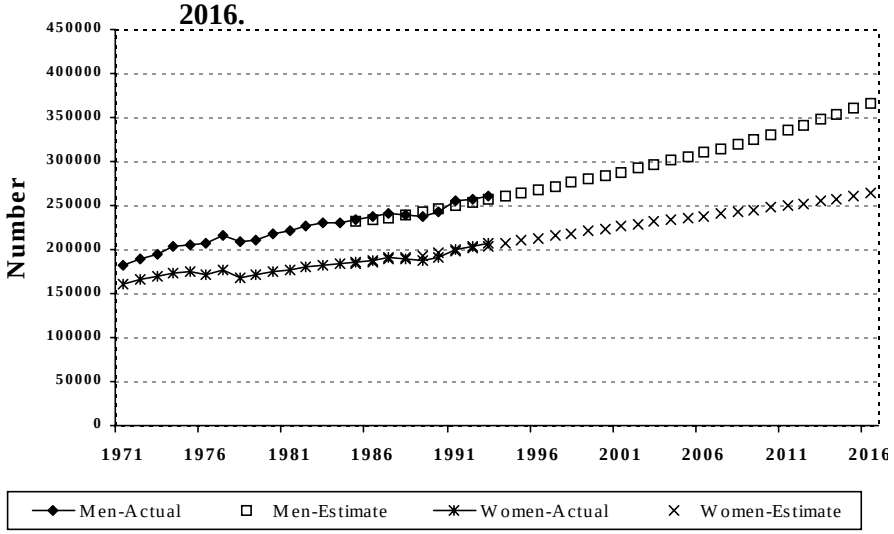
	35-44	45-54	55-64	65-74	75-84	85+
Women	315	841	2,112	4,762	8,784	11,725
Men	540	1,833	4,283	8,069	12,608	15,258

Age Group

Source: Hospital Morbidity Database, Canadian Institute for Health Information

While the hospitalization rates for heart disease and stroke have been decreasing slightly, the actual number of hospitalizations has been increasing, as a result of the higher proportion of seniors in the population. This reflects the increased need for health services that is likely to continue for the next twenty years. (Figure 2-5) Projections are based on current age-specific rates of hospitalization and Statistics Canada population projections.

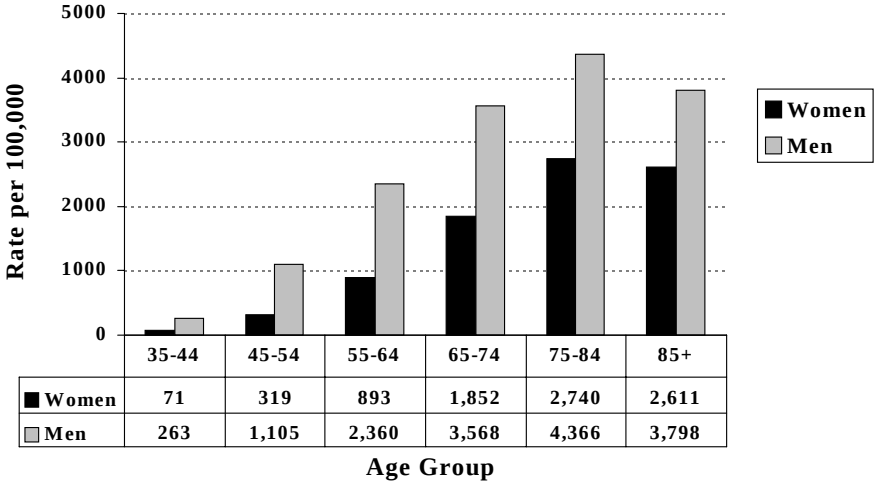
Figure 2-5 Number of hospitalizations for cardiovascular disease, actual and projected by sex, Canada, 1971-2016.



Source: LCDC, Health Canada

Hospitalization rates for ischemic heart disease are much higher among men than women in all age groups. It increases steadily with age, beginning at age 45 for men and age 55 for women. (Figure 2-6)

Figure 2-6 Crude rates of hospitalization per 100,000 population for ischemic heart disease by age group and sex, Canada, 1996/97.

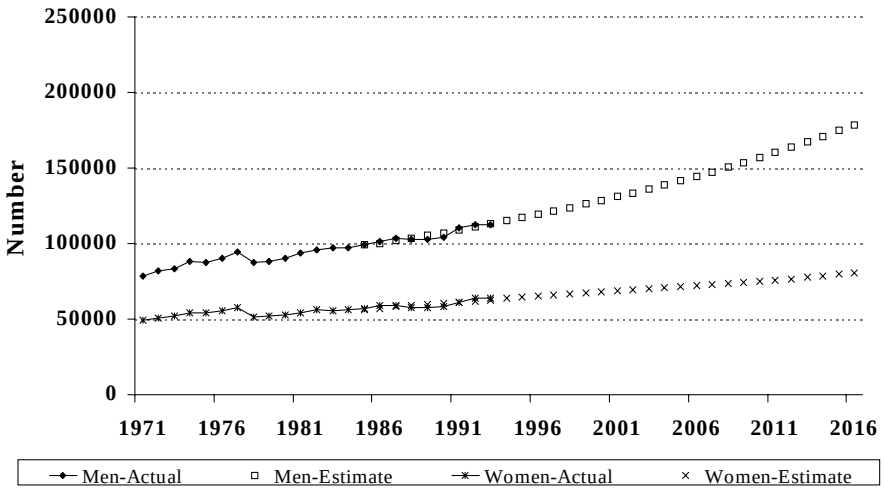


	35-44	45-54	55-64	65-74	75-84	85+
Women	71	319	893	1,852	2,740	2,611
Men	263	1,105	2,360	3,568	4,366	3,798

Source: Hospital Morbidity Database, Canadian Institute for Health Information

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 2-7)

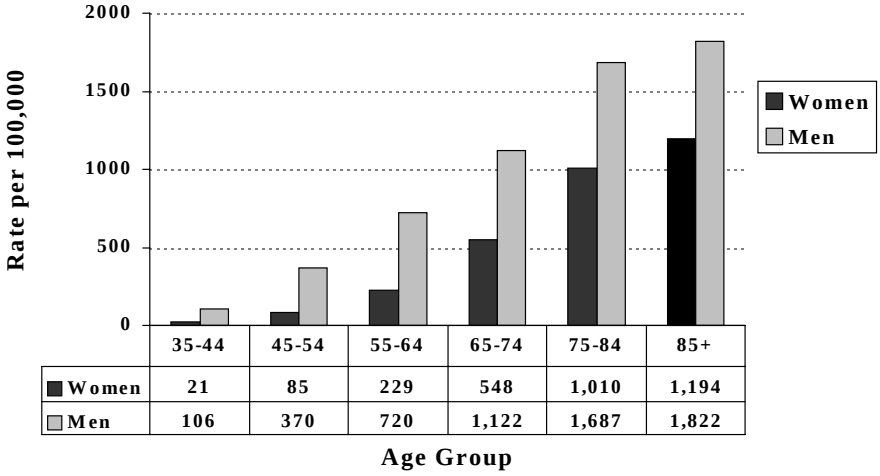
Figure 2-7 Number of hospitalizations for ischemic heart disease, by sex, actual and projected, Canada, 1971-2016.



Source: LCDC, Health Canada

Hospitalization rates for acute myocardial infarction are much higher among men than women in all age groups. They increase steadily with age, beginning at age 45 for men and age 55 for women. (Figure 2-8)

Figure 2-8 Crude rates of hospitalization per 100,000 population for acute myocardial infarction by age group and sex, Canada, 1996/97.

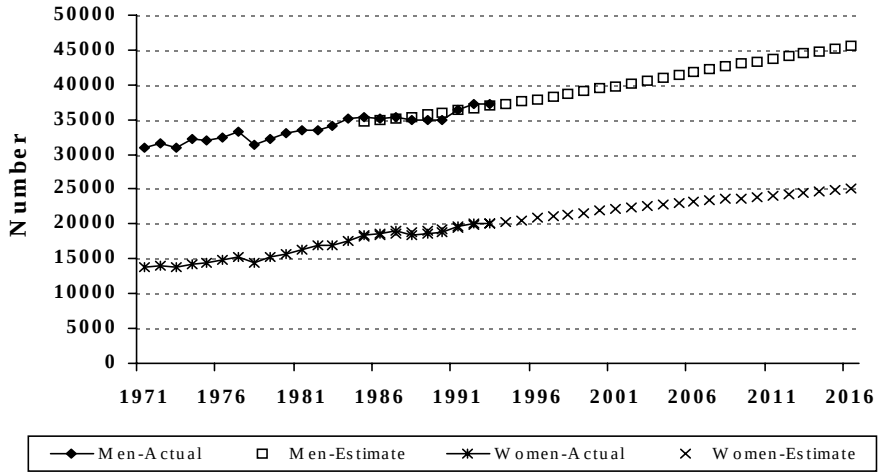


	35-44	45-54	55-64	65-74	75-84	85+
Women	21	85	229	548	1,010	1,194
Men	106	370	720	1,122	1,687	1,822

Source: Hospital Morbidity Database, Canadian Institute for Health Information

The actual number of hospitalizations for acute myocardial infarction has been increasing and will likely continue to do so into the next century (Figure 2-9) due to the aging population.

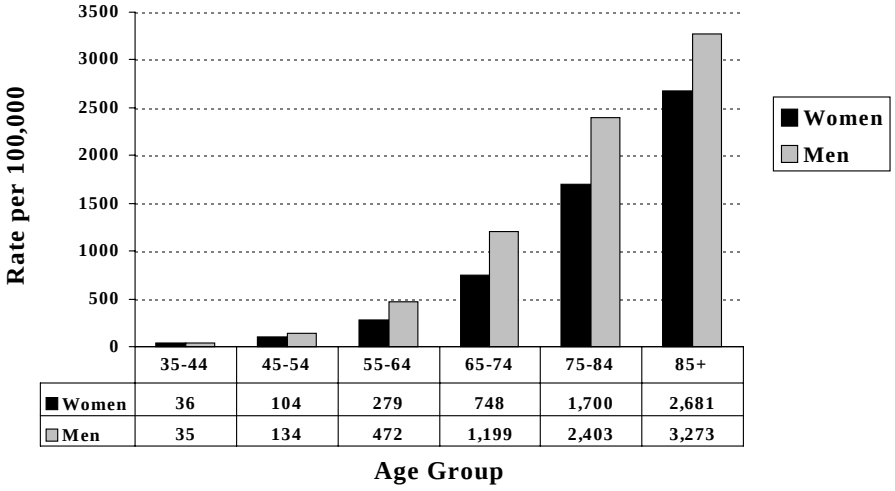
Figure 2-9 Number of hospitalizations for acute myocardial infarction by sex, actual and projected, Canada, 1971-2016.



Source: LCDC, Health Canada

The rates of hospitalization for cerebrovascular disease (mostly stroke) increase over the age of 65 for both men and women. (Figure 2-10)

Figure 2-10 Crude rates of hospitalization per 100,000 population for cerebrovascular disease by age group and sex, Canada, 1996/97.

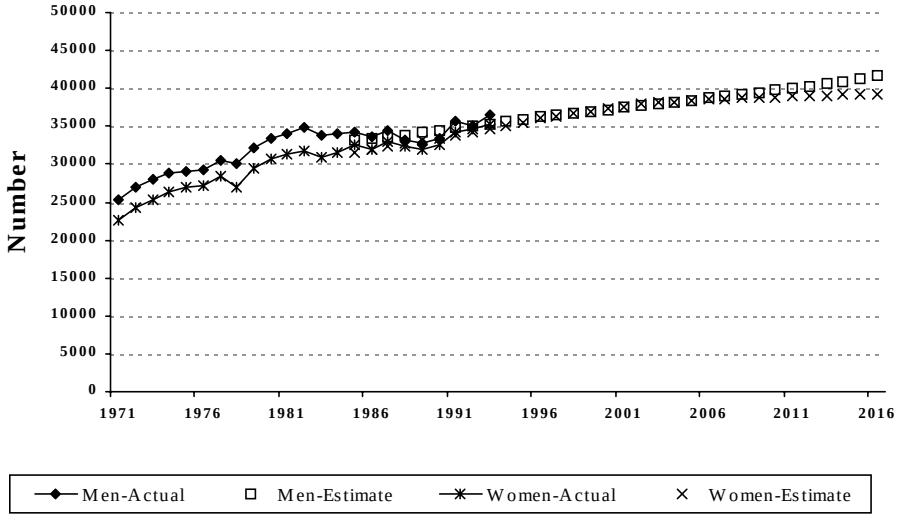


	35-44	45-54	55-64	65-74	75-84	85+
Women	36	104	279	748	1,700	2,681
Men	35	134	472	1,199	2,403	3,273

Source: Hospital Morbidity Database, Canadian Institute for Health Information

The number of hospitalizations for cerebrovascular disease (mainly stroke) has been increasing for the past twenty years and is projected to continue to increase over the next twenty years. (Figure 2-11)

Figure 2-11 Number of hospitalizations for cerebrovascular disease, actual and projected by sex, Canada, 1971-2016.



Source:LCDC, Health Canada

A detailed breakdown of the specific cerebrovascular causes of hospitalization are outlined in Table 2-1.

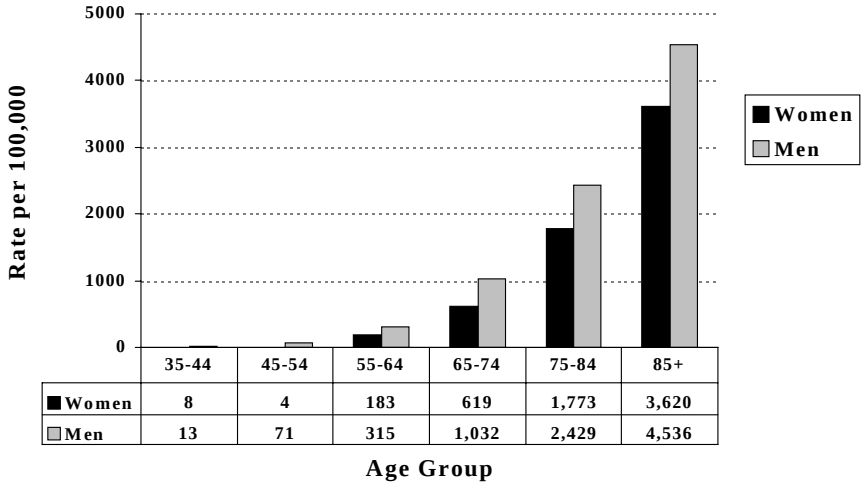
Table 2-1 Acute hospitalizations for stroke, Canada, 1996/97.

Disease description (ICD-9 code)	Crude Rates of Hospitalization per 100,000					
Men	35-44	45-54	55-64	65-74	75-84	85+
Stroke (430-432, 434, 436)	26	86	289	732	1612	2386
Sub arrachnoid hemmorrhage (430)	7	12	20	17	15	
Intracerebral infarction (431)	4	12	38	84	148	147
Cerebral infarction (434,436)	13	58	219	600	1371	2108
Women						
Stroke (430-432, 434, 436)	25	66	167	469	1183	1996
Sub arrachnoid hemmorrhage (430)	11	22	24	26	27	20
Intracerebral infarction (431)	3	9	20	53	103	136
Cerebral infarction (434,436)	10	33	119	379	1028	1803

Source: Hospital Morbidity Database, Canadian Institute for Health Information

Rates of hospitalization for congestive heart failure are greater for men than women, and increase with age, especially after the age of 75. (Figure 2-12)

Figure 2-12 Crude rates of hospitalization per 100,000 population for congestive heart failure by age group and sex, Canada, 1996/97.



	35-44	45-54	55-64	65-74	75-84	85+
Women	8	4	183	619	1,773	3,620
Men	13	71	315	1,032	2,429	4,536

Age Group

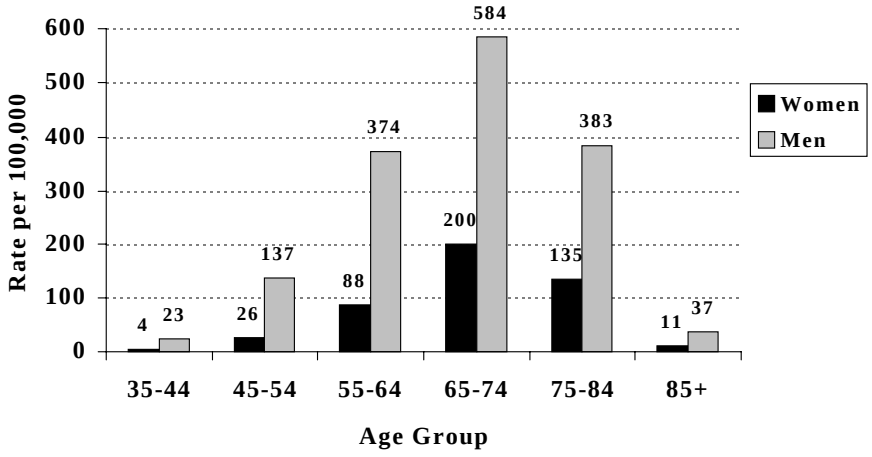
Source: Hospital Morbidity Database, Canadian Institute for Health Information

Hospital Procedures

Several surgical procedures can improve the quality of life and decrease illness and death for individuals with heart disease and stroke. (Figures 2-13 to 2-16). Coronary bypass grafting and angioplasty are effective treatments for ischemic heart disease. Valve surgery can improve mortality. 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.

Men have much higher rates of coronary artery bypass grafting (CABG) than women at all ages. The reason for this is unknown. The rate of CABG increases to age 65-74 for both men and women and then decreases. (Figure 2-13)

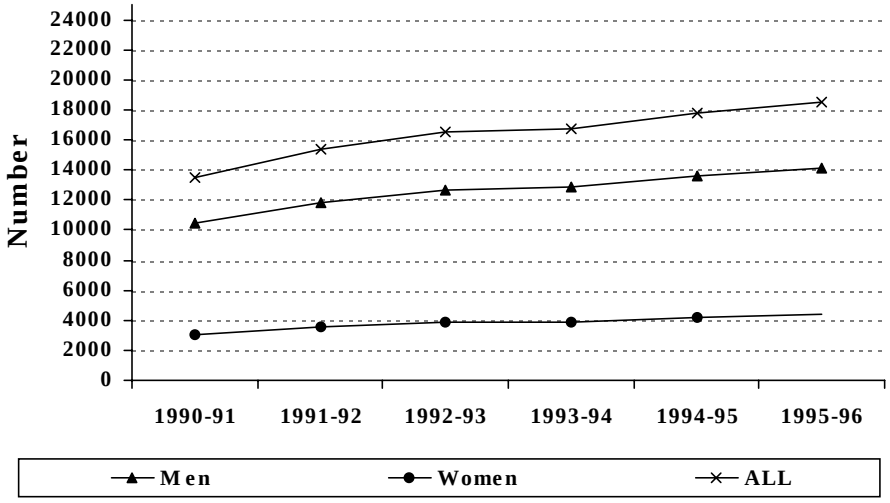
Figure 2-13 Crude rates of hospital procedures for coronary artery bypass grafting by age group and sex, Canada, 1996/97.



Source: Hospital Morbidity Database, Canadian Institute for Health Information

The number of revascularization procedures continues to increase with angioplasties outpacing bypass procedures. (Figures 2-14 and 2-15)

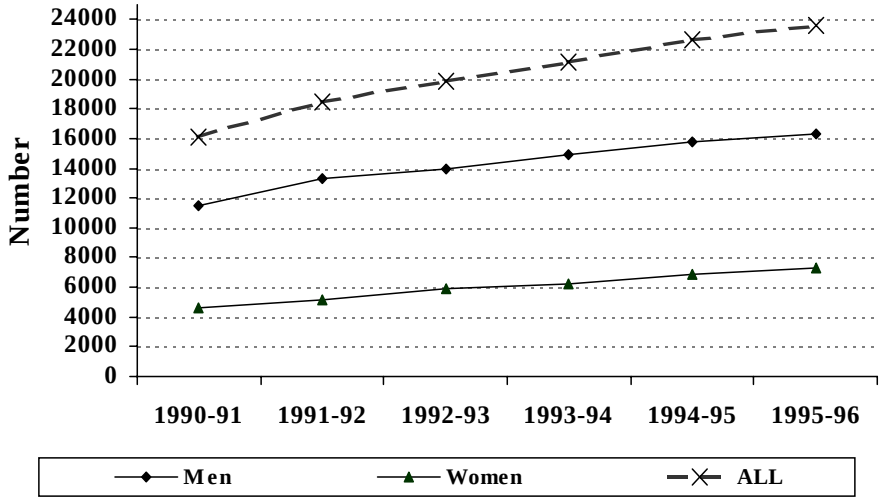
Figure 2-14 Number of bypass surgeries by sex, Canada: 1990/91 to 1995/96.



Source: Statistics Canada

The increasing trends noted here may have several explanations, including aging of the population, increasing numbers of facilities, and changes in accessibility.

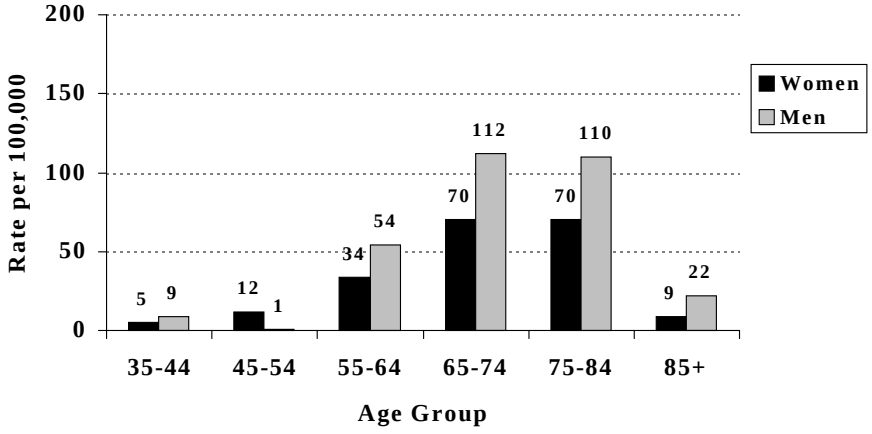
Figure 2-15 Number of angioplasties, by sex, Canada, 1990/91 to 1995/96.



Source: Statistics Canada

The use of valvular surgery increases steadily among men and women at age 55-64 and decreases at age 85+. (Figure 2-16)

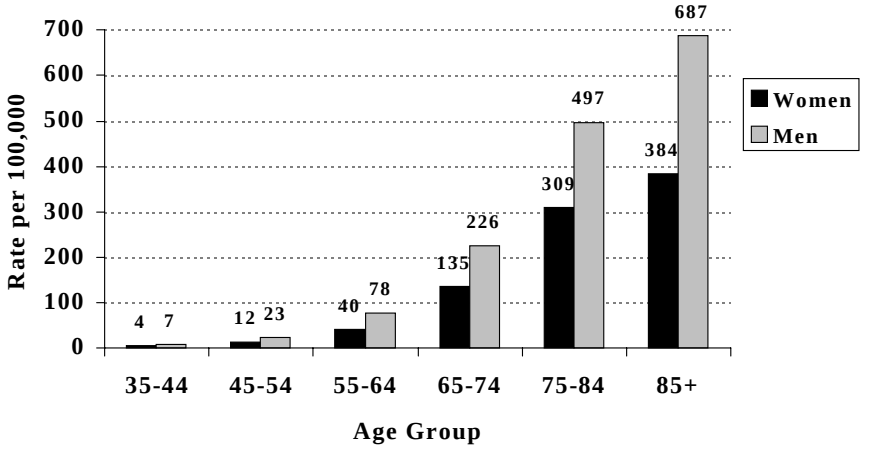
Figure 2-16 Crude rates of valve surgery by age group and sex, Canada, 1996/97.



Source: Hospital Morbidity Database, Canadian Institute for Health Information

The use of pacemaker implants increases steadily with age among men and women and is highest in the 85+ age group. (Figure 2-17)

Figure 2-17 Crude rates for pacemaker implantation by age group and sex, Canada, 1996/97.

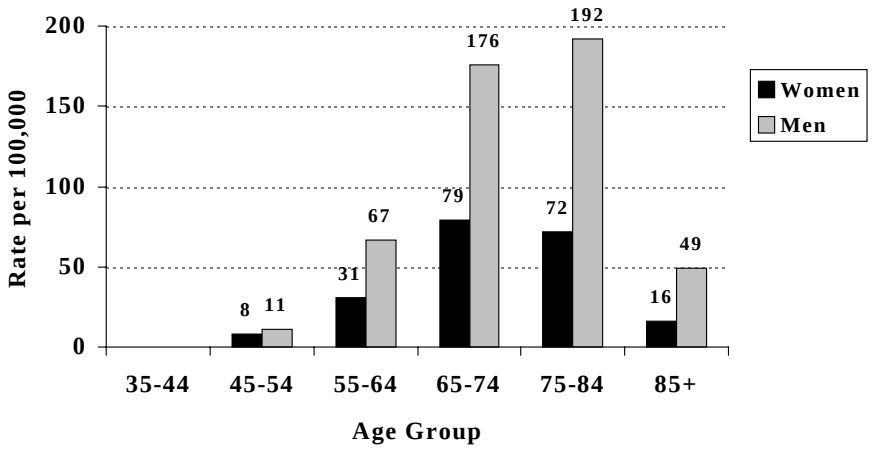


Source: Hospital Morbidity Database, Canadian Institute for Health Information

Carotid endarterectomy will reduce the risk of recurrent transient ischemic attack and stroke in symptomatic patients with carotid stenosis >50%.[1] Approximately 8 to 10% of acute TIA or stroke are due to carotid stenosis. The benefit of surgery is greatest in patients with high grade stenosis (70-99%) in whom the risk of subsequent stroke is higher.[2,3] Despite the publication of a large American trial suggesting otherwise[4], the benefit to patients who are asymptomatic and have carotid stenosis detected incidentally is uncertain because benefit accrues only if the surgical centre has a very low rate (<3%) of complications.[5]

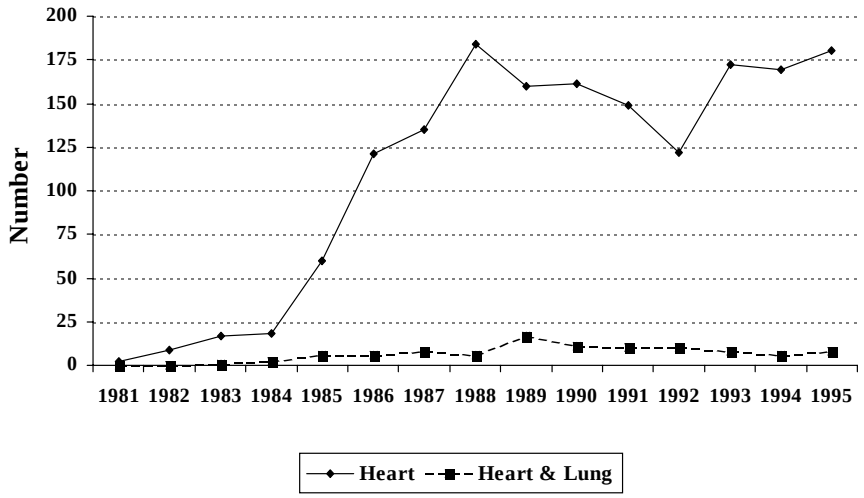
Carotid endarterectomy is a procedure used more commonly between ages 65 and 85. (Figure 2-18)

Figure 2-18 Crude rates of carotid endarterectomy by age group and sex, Canada, 1996/97.



Source: Hospital Morbidity Database, Canadian Institute for Health Information

Figure 2-19 Number of heart transplants, Canada, 1981-1995.



Source:Canadian Organ Replacement Registry, Canadian Institute for Health Information

The number of heart transplants has increased dramatically in the 1980s, largely due to improvements in technology and drugs. During the 1990s, the rate appears to have levelled off, perhaps due to limited availability of donor organs. In 1995, there were 180 heart transplants and 8 heart and lung transplants in all of Canada. (Figure 2-19) The most common primary diagnosis for heart transplants 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 transplants, respectively.

Visits to Physicians

It is estimated that in 1998, 26.4 million (9%) of visits made by Canadians to physicians were for cardiovascular diseases.[6] Of these cardiovascular disease-related visits, one-half were for the management of high blood pressure. Breakdowns by other cardiovascular diagnoses are not available.

Therapeutic Interventions

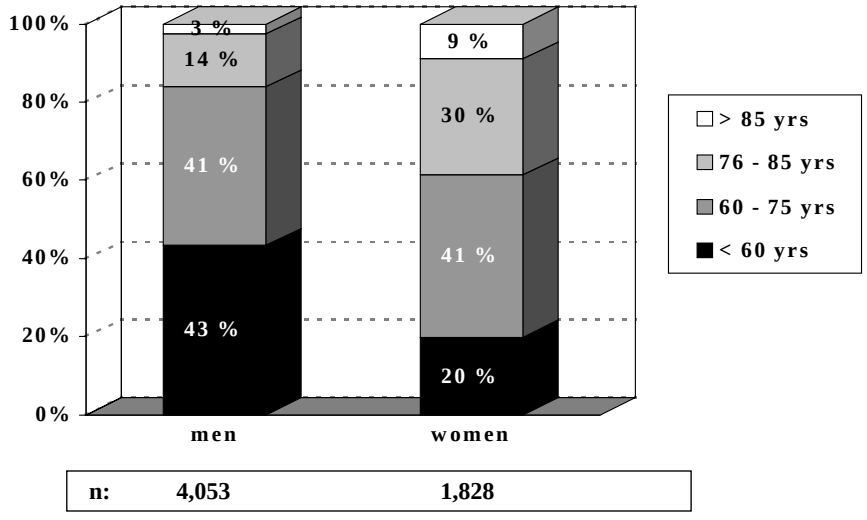
Although mortality for ischemic heart disease continues to decline, there is no evidence that the incidence of acute ischemic syndromes, including acute myocardial infarction and unstable angina, is declining. With the increase in elderly adults, it can be expected that the number of cases of acute ischemic syndrome will increase.

Adequate medical and surgical management of such patients is crucial to improve survival and quality of life. Numerous studies reveal a disturbing gap between evidence-based recommendations for patient management and actual practice. While a variety of local quality assurance measures are being implemented, these do not provide surveillance data on any larger scale.

FASTRAK II® is a standardized quality assurance program that has been implemented in over 100 hospitals across all regions in Canada. Begun in 1996*, this program continues to accrue new hospitals documenting relevant clinical and demographic information on cases with acute ischemic syndromes treated in the emergency department, the coronary care unit, and the ward.

Of the 5,881 individuals in the FASTRAK database in 1998 who had an acute myocardial infarction with ST elevation on the electrocardiogram, 68.9% were men and 31.1% were women. Over two-fifths of the men (43%) were under the age of 60 years, in contrast to one-fifth (20%) of the women. (Figure 2-20)

Figure 2-20 Age distribution in ST elevated AMI patients by sex, Canada, 1998.

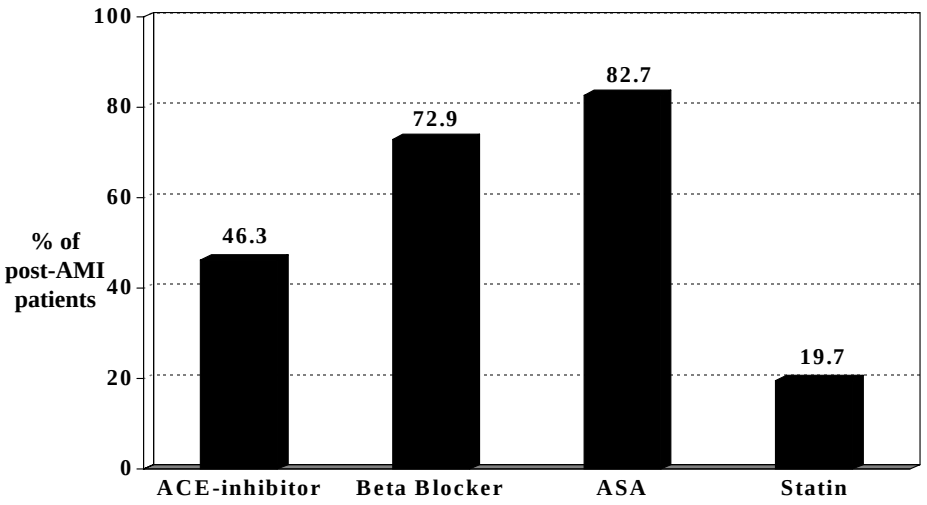


Source: FASTRAK II, Hoffmann-La Roche Ltd.

* FASTRAK II was preceded by FASTRAK I which was restricted to cases of acute myocardial infarction only.

A review of aggregate data on about 3,000 patients confirms the gap between optimal and actual care. In 1998, only 46.3% of patients were discharged on an ACE-inhibitor following their acute myocardial infarction. Beta-blockers, which are effective in decreasing mortality due to coronary artery disease, were prescribed more often (72.9%), and ASA fared even better (82.7%); however, statins were prescribed in only 19.7% of cases. (Figure 2-21)

Figure 2-21 Post-AMI discharge medications, Canada, 1998.



Source: FASTRAK II, Hoffmann-La Roche Ltd.

The utilization of thrombolytic therapy for an acute MI can also be improved. The overall average is 70%, with rates varying from 56% to 84% in hospitals across Canada. Based on the literature, it is expected that approximately 78% of individuals with an acute MI could benefit from thrombolytic therapy.

The FASTRAK registry has also been providing centre-specific data on time intervals that are critical to patient outcomes following an acute myocardial infarction. While the longest delay time from onset of symptoms to initiation of thrombolytic therapy derives from patient delay in deciding to seek help, there is a disturbingly long time from arrival in hospital to treatment (national average: 1 hour). In spite of minor fluctuations, there does not appear to be any trend towards improvement, the goal being 30 minutes. The availability of such data is providing a stimulus for a team-based review of local practice and implementation of requisite changes.

The FASTRAK registry, supported by Hoffmann-La Roche Ltd. and run by cardiovascular health care providers, promises to have a significant impact on the implementation of quality care in acute ischemic syndromes. Such an approach could be applied to other cardiovascular conditions as well.

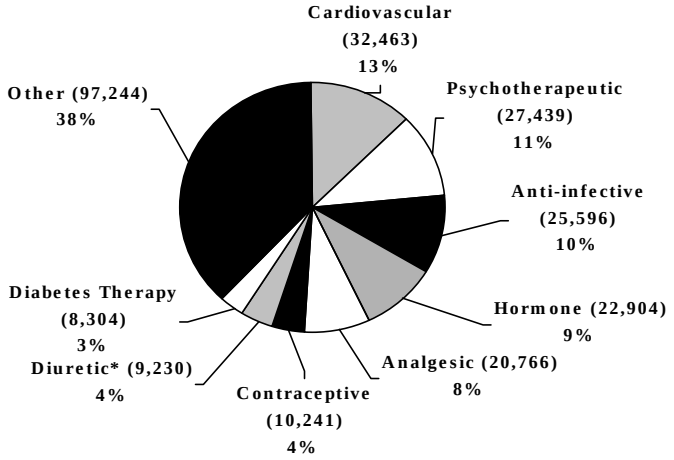
Thrombolytic therapy with rtPA has recently been approved in Canada for use in acute ischemic stroke under three hours. This approval was conditional upon the organization of a large post-marketing surveillance study on the use of rtPA for stroke in Canada. This study, the Canadian Activase for Stroke Effectiveness Study (CASES) is underway. The use of rtPA in acute stroke requires tremendous organization of emergency services because the time window is so short (3 hours from stroke onset). Centres around the country are participating with the Heart and Stroke Foundation, hospitals, EMS, and governments to construct systems for treating acute stroke. The

Heart and Stroke Foundation has taken an active role in helping hospitals develop protocols for acute stroke management with the STEPS program.

The benefits of treating acute stroke patients are seen in the reduction of morbidity after stroke with approximately a 12% absolute increase in the chance of leaving the hospital with no or little disability.[7] Furthermore, the focus upon acute stroke care will encourage the development of stroke units, long known to reduce both morbidity and mortality in acute stroke.[8]

The number of prescriptions for cardiovascular conditions increased 6.4% from 1997 to 1998, based on a sample of 2,000 pharmacies. This represents the largest single increase in the last 55 years. An estimated 32.5 million prescriptions were dispensed for the treatment of cardiovascular disease, accounting for 12.8% of the total 254.2 million prescriptions dispensed in Canada in 1998 (Figure 2-22). 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 3.6% (9.2 million) of prescription drugs dispensed in Canada. Not accounted for in these tabulations are homeopathic and herbal treatments, which continue to increase in popularity. The total annual amount spent by Canadians on alternative medicine is about 3.8 billion dollars.

Figure 2-22 Estimated number and percent of prescriptions dispensed in a sample of retail pharmacies, Canada, 1998.



* Diuretics are most often used in the treatment of cardiovascular disease.

Source: Intercontinental Medical Statistics (IMS) Canada, Compuscript, 1998

Unfortunately, prescriptions and sales do not indicate adherence with treatment. Failed adherence contributes to the burden of disease with an estimated annual cost of 7 to 9 billion dollars. Among the elderly, 25% of hospital admissions are related to failed adherence.

Cost of Cardiovascular Disease

Cardiovascular diseases (CVD) have a significant economic impact in Canada. CVD accounted for a total cost of $19.7 billion (15.3% of total cost of all illnesses) in Canada in 1993, which included a direct cost of $7.3 billion (16.7% of total direct cost of all illnesses) and an indirect cost of $12.4 billion (14.5% of total indirect cost of all illnesses).[9] Most of the data in this chapter are based on a study by the Laboratory Centre for Disease Control using the prevalence-based human capital approach with a discount rate of 6%, completed in 1996 using 1993 data for.[10] More recent cost data are undergoing analysis and will be available in the year 2000.

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

CVD is the largest cost category, in terms of total cost, direct cost, and indirect cost, among all diagnostic categories.[11] In terms of the direct cost of CVD in Canada in 1993, the major cost components were hospital care (66.1%), drugs (21.3%), physician care expenditures (11.8%), and research (0.8%). Hospital care ($4.9 billion) was the largest direct cost; research was minimal ($60 million).

In terms of the indirect cost of CVD in 1993, the major cost components were mortality (60.2%), long-term disability (36.4%), and short-term disability (3.4%). Premature mortality ($7.4 billion), the largest indirect cost, was followed by long-term disability costs ($4.5 billion). Short-term disability represented only $425 million of the indirect costs of CVD.

Direct and Indirect Costs of Cardiovascular Disease by Disease Subcategory

Coronary heart disease (CHD) and stroke accounted for $7.8 billion and $2.8 billion, respectively (Table 2-2).[12] These two illnesses together represented more than half (53.6%) of the cost of CVD. Table 2-2 also illustrates the distributions of direct and indirect costs for CHD and CVD. Indirect costs represented two-thirds (68.0%) the cost of CHD. Direct costs represented over half (51.9%) the cost of stroke. These two illnesses together represent 58.2% of the total hospital expenditure for CVD. Mortality costs had an enormous impact on both CHD ($4.6 billion, 59.0% of the total cost of CHD) and stroke ($1.2 billion, 44.0% of the total cost of stroke).

Table 2-2 Cardiovascular diseases, coronary heart disease, and stroke by cost component, Canada, 1993 ($million).

Cost Component	Cardiovascular Diseases Cost (% of Total)	Coronary Heart Disease Cost (% of Total)	Stroke Cost (% of Total)
Direct Costs			
Hospitals	4,862 (66.1)	1,572 (75.7)	1,258 (87.0)
Physicians	867 (11.8)	263 (12.7)	75 (5.2)
Drugs	1,565 (21.3)	239 (11.5)	112 (7.7)
Research	60 (0.8)	2 (0.1)	1 (0.1)
Total Direct Costs	7,354 (100.0)	2,076 (100.0)	1,446 (100.0)
Indirect Costs			
Short-term Disability*	425 (3.4)	NA#	NA#
Long-term Disability	4,502 (36.4)	696 (13.2)	NA#
Mortality (6% discount rate)	7,440 (60.2)	4,595 (86.8)	1,226 (100.0)
Total Indirect Costs	12,368 (100.0)	5,291 (100.0)	1,226 (100.0)
Total Costs	**19,722**	**7,784**	**2,788**

*Long-term and Short-term Disability costs are mutually exclusive.
#NA, not available. Some disability costs are not available for CHD and Stroke due to data restriction

Conclusions

Cardiovascular disease (heart disease and stroke) is the leading cause of hospitalization for men and women (excluding childbirth). Based on the rates of hospitalization by age group, acute myocardial infarction and ischemic heart disease become important health problems starting at age 45 for men and 55 for women. Congestive heart failure and stroke affect older individuals with much higher admission rates over age 75 for both men and women. Marked differences exist in the rate of hospitalization and procedures for men and women that are still unexplained.

Clinical practice guidelines based on the latest research evidence provide direction for the appropriate use of the wide range of therapeutic interventions by health professionals. Gaps exist between recommendations for practice and actual practice, not only for treatment but also for prevention. Greater adherence to these guidelines would improve the treatment of heart disease and stroke. Recent initiatives by the pharmaceutical industry to promote a more holistic approach to treatment are a welcome step toward achieving better health outcomes.

An increase in the number of elderly in the population who have high risk profiles will lead to an increased need for the full range of health services required to manage heart disease and stroke effectively – ambulatory care, acute and chronic care hospitals, rehabilitation, home care and support, pharmaceuticals, health education, and other interventions. Improved data at the community, provincial/territorial and national level on interventions and health services would assist health service providers and funders in planning for and evaluating these services more effectively.

Implications

Service providers and funders will have to provide the full range of health services for an increased number of elderly individuals, many of whom will have several illnesses.

More widespread use of clinical practice guidelines is required to improve evidence-based practice.

The expansion of hospital-based clinical databases with standardized indicators in all hospitals will promote continuous quality improvement and increase the ability to compare health services and interventions across the country.

Future surveillance that includes such indicators as length of hospital stay, access to surgical procedures and ambulatory care services, use of interventions according to clinical practice guidelines, and satisfaction with services will provide useful information to health service providers and funders.

The linkage of physician, hospital, home care, pharmaceutical, and mortality databases at the provincial/territorial levels would add to the knowledge base that could be used to improve clinical practice and health outcomes. This would be facilitated by a unique identifier that could track an individual over time.

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[9] Moore RS, Mao Y, Zhang J, Clarke K. Economic burden of illness in Canada, 1993. Ottawa: Health Canada, Laboratory Centre for Disease Control, 1997. Available from: URL: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/burden/index.html

[10] Moore RS, Mao Y, Zhang J, Clarke K. Economic burden of illness in Canada, 1993. Ottawa: Health Canada, Laboratory Centre for Disease Control, 1997. Available from: URL: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/burden/index.html

[11] Moore RS, Mao Y, Zhang J, Clarke K. Economic burden of illness in Canada, 1993. Ottawa: Health Canada, Laboratory Centre for Disease Control, 1997. Available from: URL: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/burden/index.html

[12] Moore RS, Mao Y, Zhang J, Clarke K. Economic burden of illness in Canada, 1993. Ottawa: Health Canada, Laboratory Centre for Disease Control, 1997. Available from: URL: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/burden/index.html

Chapter 3 HEALTH OUTCOMES

When considering health outcomes from cardiovascular disease (heart disease and stroke), there is a tendency to focus on mortality as the primary outcome. 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 quality of their lives and the nature of their disabilities.

Incidence and Prevalence

Although the mortality rate from cardiovascular diseases, particularly ischemic heart disease, is declining, it remains unclear whether the rate of new cases (incidence) is decreasing as well or the decline in mortality simply reflects increased survivorship.

Unfortunately, the existing surveillance system for cardiovascular diseases does not allow for an easy determination of disease incidence. The current methodology involves a costly and time-consuming record linkage approach. Even with the current state of databases that have to be matched through a probabilistic algorithm, in the absence of unique personal identifiers, it has been demonstrated that determination of incidence is feasible using the health insurance number.[1] The recent initiative to expand the Canadian Heart and Stroke Surveillance System (CHSSS) is addressing the need for incidence data in Canada.

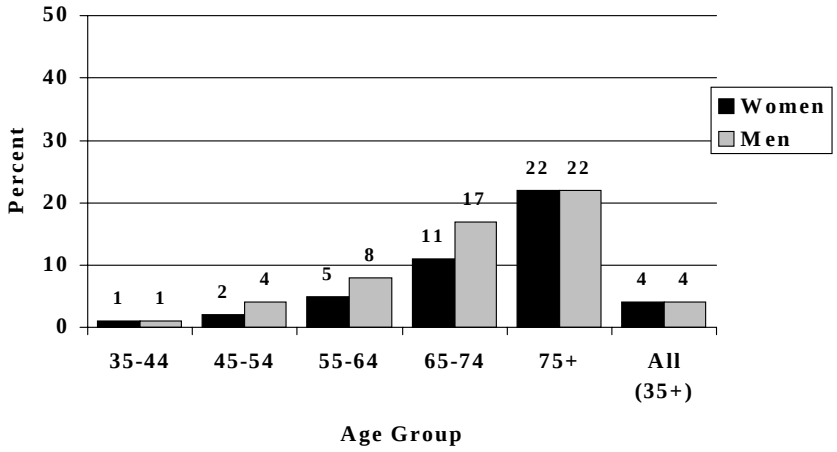
There are remarkably few reports on the incidence of cardiovascular diseases worldwide, largely because costly and complex surveillance systems are required. Recently the World Health Organization (WHO) MONICA Project reported its findings after a multinational, prospective assessment of incidence spanning 10 years.[2] Over the decade studied in 37 populations (371 population-years) there were 166,000 fatal and non-fatal myocardial infarctions registered. Contributions to changing CHD mortality varied, but in populations in which mortality decreased, coronary-event rates contributed two-thirds and case fatality one-third. The results show that in most western industrialized countries there has been a small but significant decline in incidence in all age groups and in both sexes. One well-defined Canadian population (Halifax County) participated in the project.

While the age-specific rates may be decreasing, with an aging population and with life expectancy for women greater than for men, it can be expected that the number of individuals with heart disease will increase in the future.

Some sense of the prevalence of heart disease (number of existing cases) can be obtained from surveys such as the National Population Health Survey (NPHS). The limitation of this approach is that it is self-reported and dependent on the individual having already been diagnosed with heart disease by a physician, and then reporting this correctly in the survey.

For the 1996/97 National Population Health Survey (NPHS), respondents were asked whether they had ever been diagnosed with a heart problem by a physician. Overall, 4% of Canadians answered "yes'". Men reported higher rates than women, and the rate increased with age. (Figure 3-1)

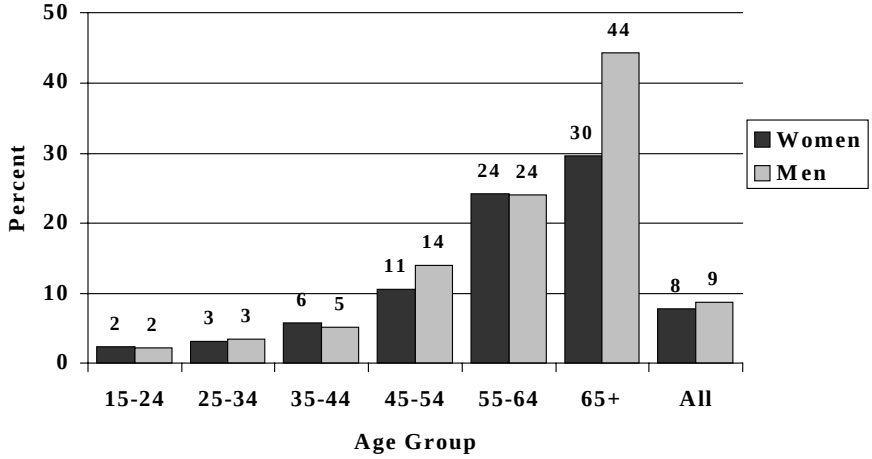
Figure 3-1 Proportion of adults who report having heart problems by age group and sex, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, 1996/97.

The First Nations and Inuit Regional Health Survey found higher rates of self-reported heart disease among Canada's native population in comparison to the non-Aboriginal. Even with age-standardization, the rates of heart disease among First Nations were higher than the non-Aboriginal Canadian population. (Ratio: 3.0 for men and 2.9 for women). This may reflect the increased prevalence of risk factors such as diabetes in the First Nations population. (Figure 3-2) These very general questions give a sense of just how common heart health problems are in Canada.

Figure 3-2 Proportion of First Nations and Inuit adults who report having heart problems by age group and sex, Canada, 1997.

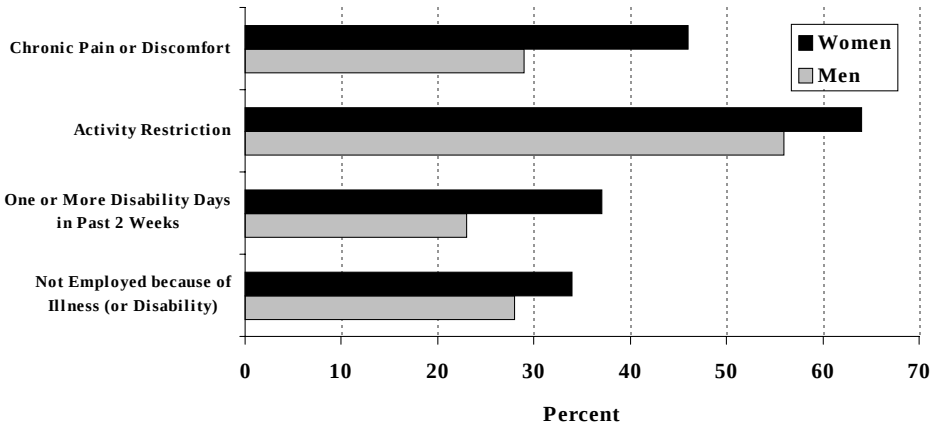


Source: Assembly of First Nations, National Steering Committee, First Nations and Inuit Regional Health Survey 1997.

Quality of Life

Heart disease has a major impact on quality of life. For example, in the 1996/97 NPHS, 36% of individuals with heart disease reported that they had chronic pain or discomfort, 59% were restricted in their activities, and 29% had had one or more disability days in the past two weeks. Furthermore, 30% were not employed because of illness or disability. (Figure 3-3)

Figure 3-3 Proportion of population aged 35 to 64 with self-reported heart disease who have chronic pain, activity restriction, disability, or unemployment, Canada, 1996/97.



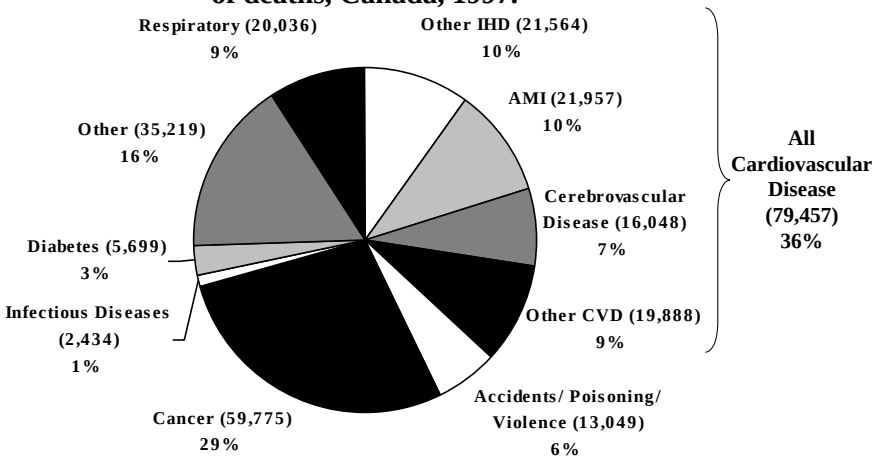
Source: Statistics Canada, NPHS, 1996/97

Mortality

Leading Cause of Death

Cardiovascular disease (heart disease and stroke) is the leading cause of death in Canada (36%). (Figure 3-4) Ischemic heart disease accounts for the greatest percentage of deaths at 20%, of which half are attributable to acute myocardial infarction. Cerebrovascular disease (mainly stroke) accounts for 7% of deaths.

Figure 3-4 Leading causes of death, number and percentage of deaths, Canada, 1997.

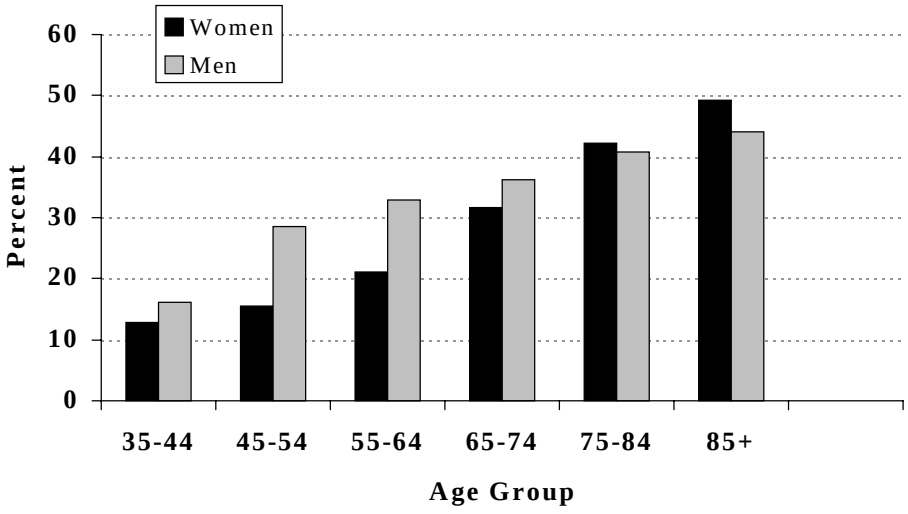


Total Number of Deaths: 215,669
Cardiovascular (ICD-9 390-459); Respiratory (ICD-9 460-519); Diabetes (ICD-9 250); Cancer (ICD-9 140-239); Infectious Diseases (ICD-9 001-139); Accidents/Poisonings/Violence (ICD-9 E800-E999)

Source: Statistics Canada, 1997

For men of all ages, 36% of deaths are attributable to cardiovascular disease, while in women the percentage is slightly higher, at 38%. (Table 3-1; Figure 3-5) In women, the proportion of all deaths due to cardiovascular disease increases after menopause. In men, the percentage of all deaths due to cardiovascular disease increases steadily from age 35 to 84.

Figure 3-5 Percentage of total deaths due to cardiovascular diseases by age group and sex, Canada, 1997.



Source: Statistics Canada, 1999

In 1997, there were 79,457 deaths attributed to cardiovascular disease (CVD)- 39,619 among women and 39,838 among men (Table 3-1). Ischemic heart disease (IHD) accounted for 59.8% of these deaths among men and 49.7% among women. Cerebrovascular disease (mainly stroke) caused 16,048 deaths - 9,375 (9.0%) among women and 6,673 (5.9%) among men.

Table 3-1 Number and percent of deaths due to cardiovascular diseases by sex, Canada, 1997.

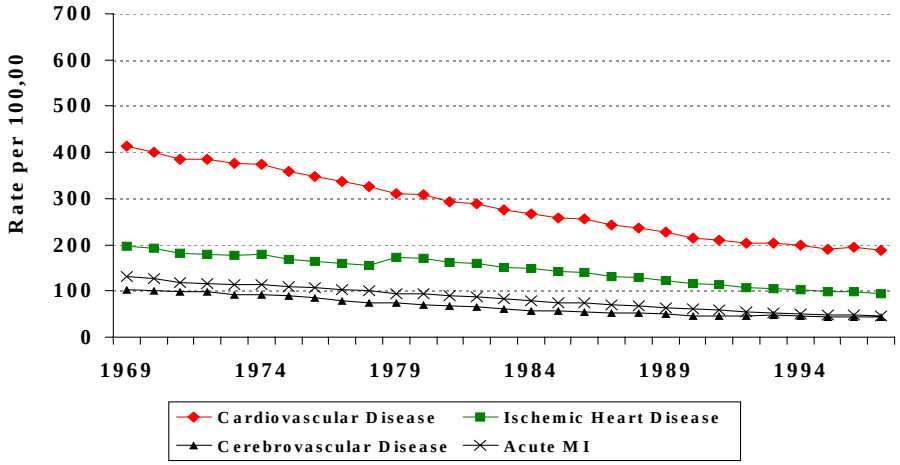
Age	All Deaths	All CVD[1]		IHD[2]		AMI[3]		CBVD[4]	
		Number	Percent of All Deaths	Number	Percent of All Deaths	Number	Percent of All Deaths	Number	Percent of All Deaths
Women									
<35	2982	150	5.0	13	0.9	9	0.3	37	1.2
35-44	2416	314	12.9	101	4.2	59	2.4	112	4.6
45-54	4563	712	15.6	325	7.1	208	4.6	198	4.3
55-64	8111	1708	21.1	903	11.1	518	6.4	345	4.3
65-74	18040	5711	31.7	3155	17.5	1791	10.0	1100	6.1
75-84	31989	13531	42.3	7030	22.0	3713	11.6	3185	10.0
85+	35567	17488	49.2	8172	23.0	3171	8.9	4398	12.4
All Ages	103668	39614	38.2	19699	19.0	9469	9.1	9375	9.0
Men									
<35	5947	226	3.8	50	1.0	33	0.6	38	0.6
35-44	4361	702	16.1	447	10.2	261	6.0	92	2.1
45-54	7384	2113	28.6	1439	19.5	895	12.1	241	3.3
55-64	13466	4419	32.8	3050	22.6	1808	13.4	503	3.7
65-74	27560	9999	36.3	6380	23.1	3473	12.6	1428	5.2
75-84	33915	13846	40.8	8094	23.9	4197	12.4	2585	7.6
85+	19338	8529	44.1	4362	22.6	1821	9.4	1786	9.2
All Ages	111971	39834	35.6	23822	21.3	12488	11.2	6673	5.9

Table does not include cases with a missing age.
1. All CVD = All Cardiovascular diseases (ICD code 9th revision 390-459).
2. IHD = Ischemic heart disease (ICD-9 410-414)
3. AMI = Acute myocardial infarction (heart attack); (ICD-9 410), AMI is a sub-category of IHD
4. CBVD = (ICD-9 430-438)
Source: Statistics Canada.

Cardiovascular disease death rates have been declining steadily in Canada since the mid-1960s. The 1997 death rates are almost half those of 1969; this applies to all major categories of cardiovascular disease, and to rates among both men and women (Figures 3-6 & 3-7).

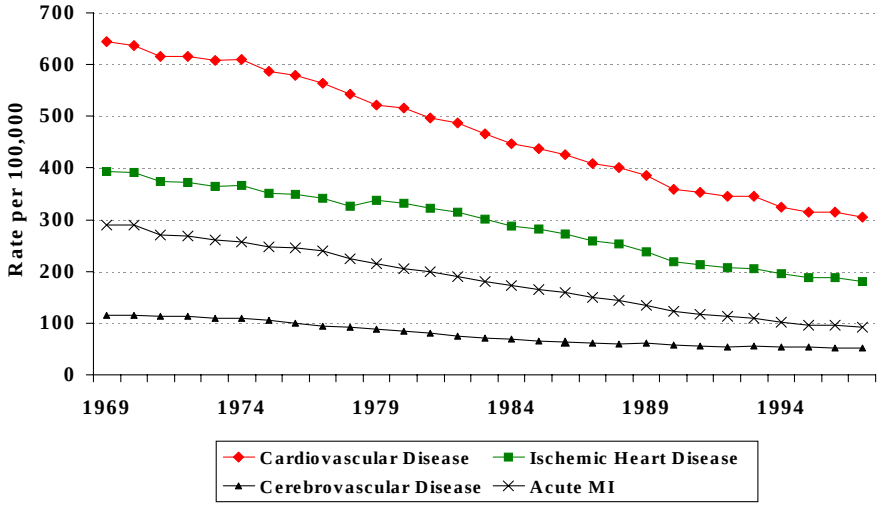
The decline may be explained in part by a reduction in the prevalence of smoking, by other lifestyle changes, and by improved medical and surgical care of individuals who have developed cardiovascular disease.

Figure 3-6 Age-standardized mortality rate per 100,000 women, Canada, 1969-1997.



Age-standardized to 1991 Canadian Population
Source: Laboratory Centre for Disease Control; Statistics Canada

Figure 3-7 Age-standardized mortality rate per 100,000 men, Canada, 1969-1997.

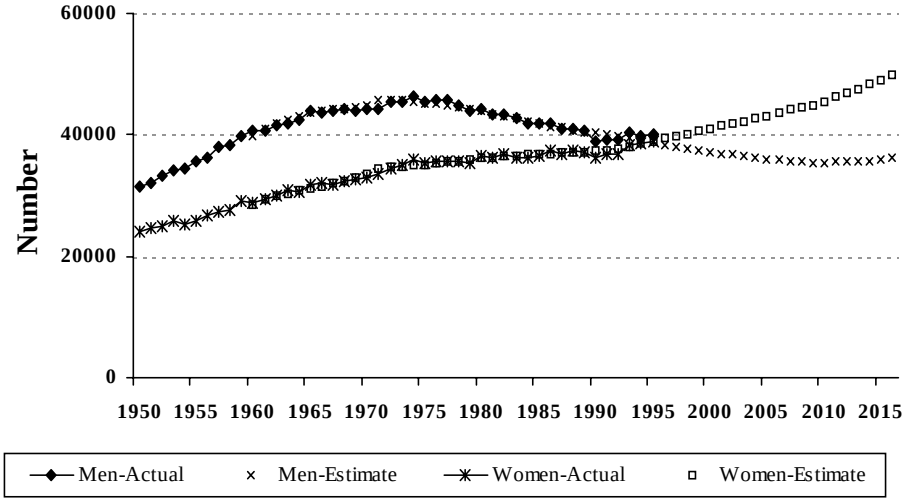


Age-standardized to 1991 Canadian population
Source: Laboratory Centre for Disease Control; Statistics Canada

Although mortality rates have been declining for all cardiovascular disease for both men and women, the actual number of cases has increased. In 1990, there were 75,089 deaths (38,823 men and 36,266 women). The number has increased to 79,457 in 1997 (39,838 men and 39,619 women). This phenomenon reflects increased survivorship and an increase in the size of the population over age 65.

Based on Statistics Canada population projections and current trends in age-specific mortality rates, projections to 2016 suggest that while the number of CVD deaths for men will not increase, the numbers for women will increase by 28% between 1995 and 2016. (Figure 3-8) The number of deaths among women will likely surpass deaths among men in the near future. This is because women tend to live longer than men, and there are high cardiovascular disease rates among older people increased with age.

Figure 3-8 Number of cardiovascular disease deaths by sex, actual and projected, Canada, 1950-2016.

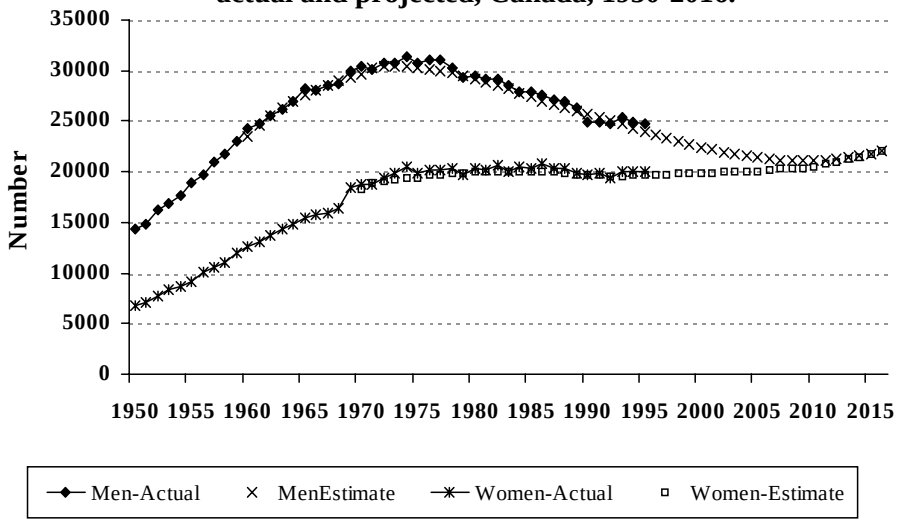


Source: LCDC, Health Canada, unpublished work

The increase in deaths from cardiovascular disease among women is due primarily to an increase in deaths from ischemic heart disease (Figure 3-9) and cerebrovascular disease. (Figure 3-10) The number of deaths from cerebrovascular disease is expected to increase for both men and women by 15% between 1995 and 2016.

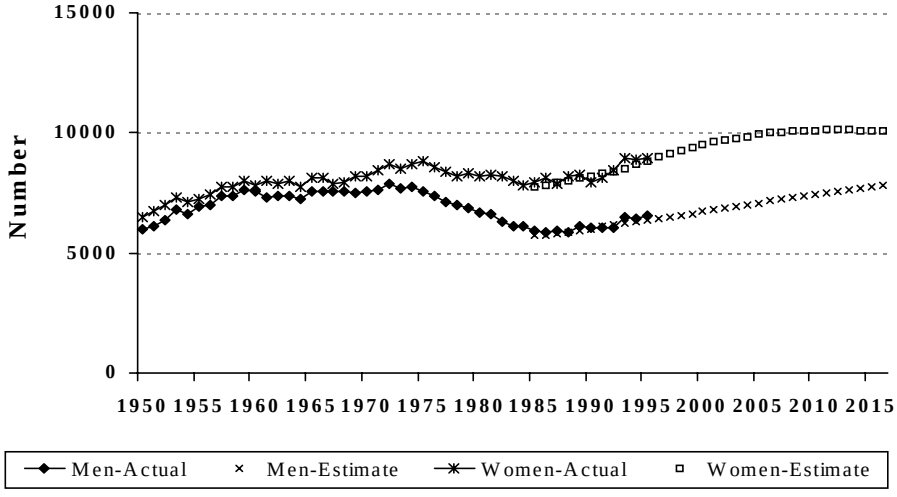
The number of deaths from cerebrovascular disease is higher for women than men and this trend will likely continue in the future.

Figure 3-9 Number of ischemic heart disease deaths by sex, actual and projected, Canada, 1950-2016.



Source: LCDC, Health Canada, unpublished work

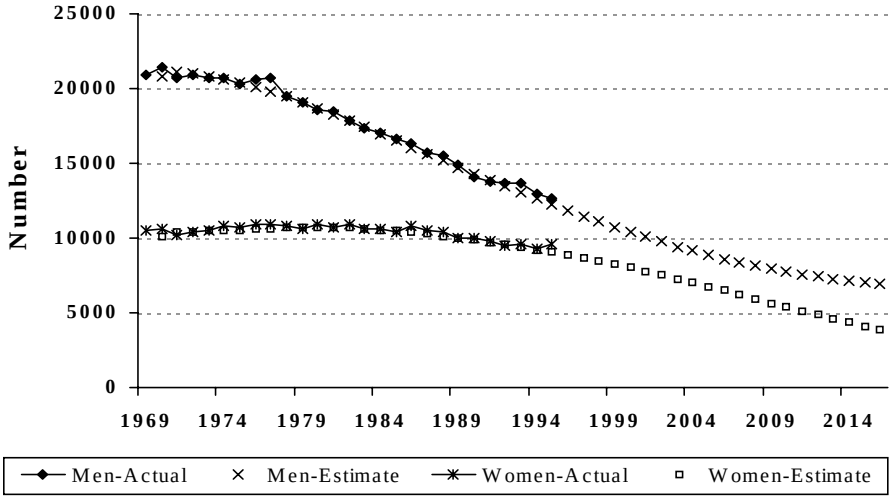
Figure 3-10 Number of cerebrovascular disease deaths by sex, actual and projected, Canada, 1950-2016.



Source: LCDC, Health Canada, unpublished work

The number of deaths from acute myocardial infarction will likely continue its downward trend into the next century for both men and women. (Figure 3-11)

Figure 3-11 Number of acute myocardial infarction deaths by sex, actual and projected, Canada, 1969-2016.

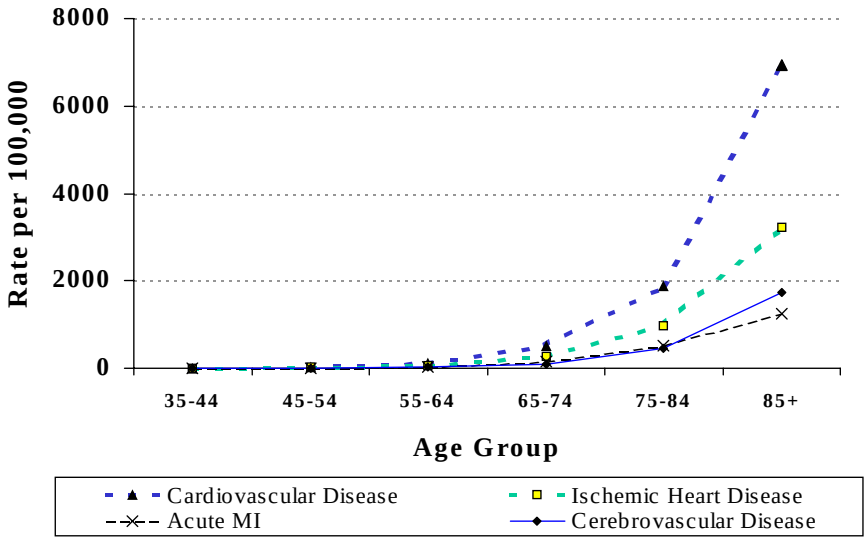


Source: LCDC, Health Canada, unpublished work

Age- and Sex-Specific Death Rates

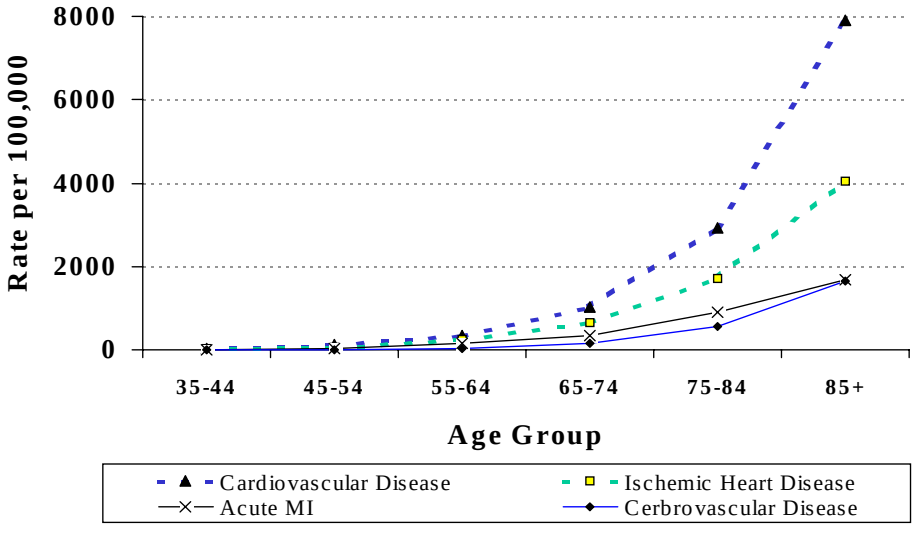
Mortality rates for cardiovascular disease increase rapidly after age 65 and are higher for men than women at all ages. (Figures 3-12 & 3-13) Up to the age of 74, men experience two- to five-fold greater death rates for AMI and IHD compared to women. Research suggests that normal estrogen levels in pre-menopausal women confer a protective benefit against the development of ischemic heart disease.[3] The rate for cerebrovascular disease is very similar among men and women until age 55 at which point men have an increased death rate. This differential continues until the age of 85 at which point the rate among women is slightly higher.

Figure 3-12 Age-specific cardiovascular disease mortality rates, women, Canada, 1997.



Source: Statistics Canada, 1999

Figure 3-13 Age-specific cardiovascular disease mortality rates, men, Canada, 1997.



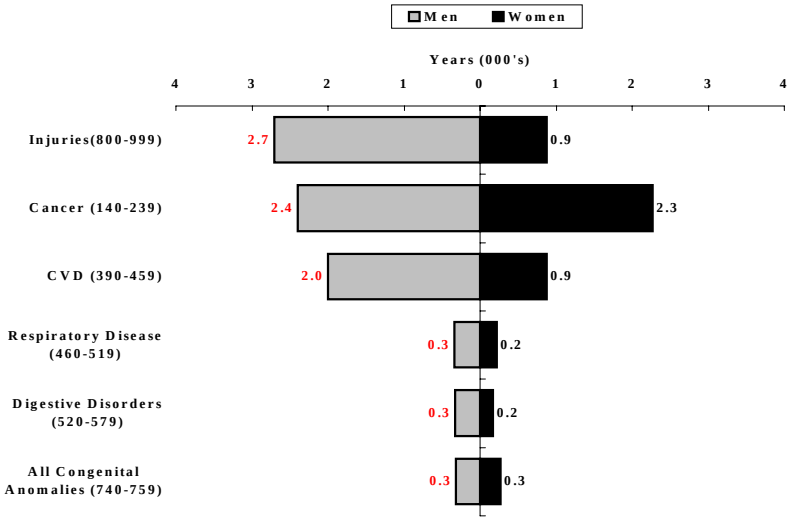
Source: Statistics Canada, 1999

Potential Years of Life Lost

An indication of the impact of premature death on society can be obtained from the calculation of potential years of life lost. This is 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 that prior to age 75).

Premature death from cardiovascular disease is responsible for an estimated 289,000 years of life lost, and is third after injuries and cancer. (Figure 3-14) This represents a significant social and economic loss to the nation and stresses the importance of preventive health programs to decrease the number of premature deaths from cardiovascular disease.

Figure 3-14 Number of potential years of life lost (PYLL) prior to age 75 by disease category, 1997.

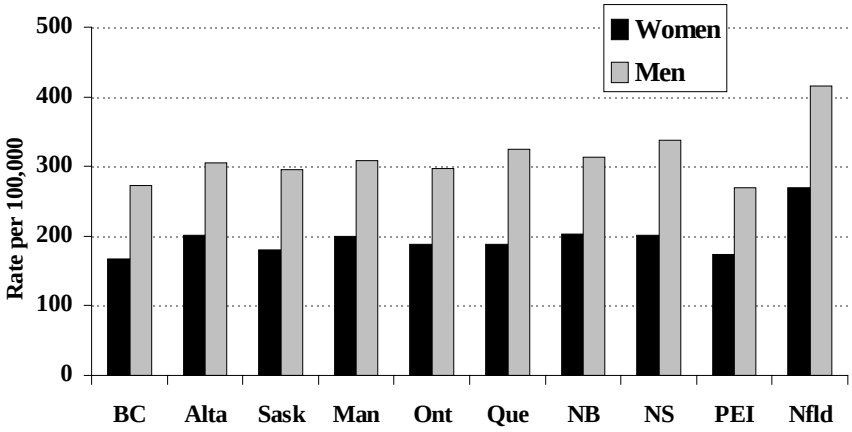


Source: Laboratory Centre for Disease Control,1999

Regional Comparisons

Regional differences are more notable with respect to death rates from acute myocardial infarction and ischemic heart disease than to those from cerebrovascular disease. Cardiovascular disease mortality rates in 1997 were highest for both men and women in Newfoundland; the rates were lowest for men in Prince Edward Island and for women in British Columbia. (Figures 3-15 to 3-18)

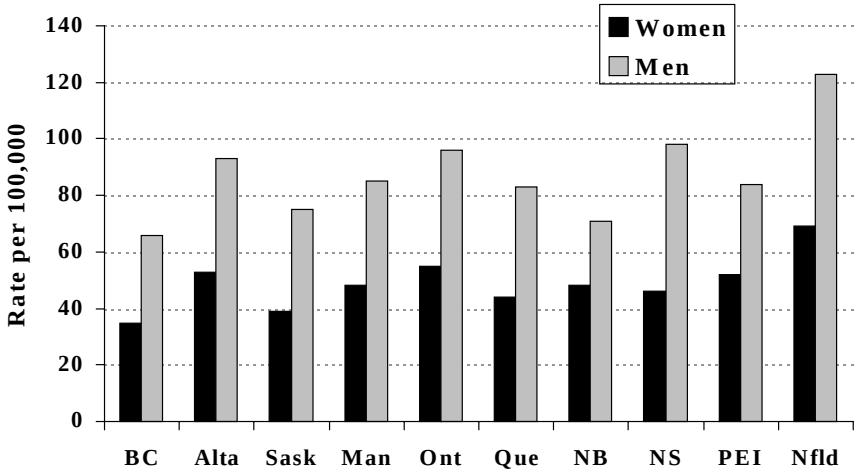
Figure 3-15 Age-standardized cardiovascular disease mortality rates per 100,000 by sex and province, Canada, 1997.



Age-standardized to 1991 Canadian population

Source: Statistics Canada, LCDC

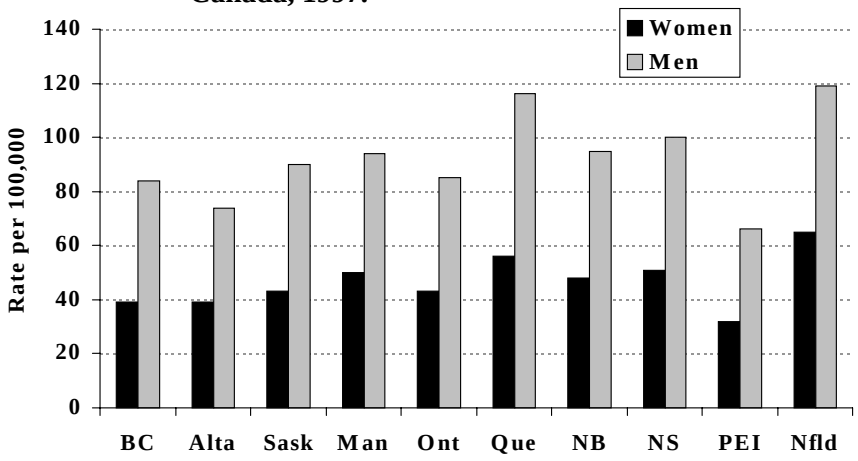
Figure 3-16 Age-standardized ischemic heart disease mortality rates per 100,000 by sex and province, Canada, 1997.



Age-standardized to 1991 Canadian population

Source: Statistics Canada, LCDC

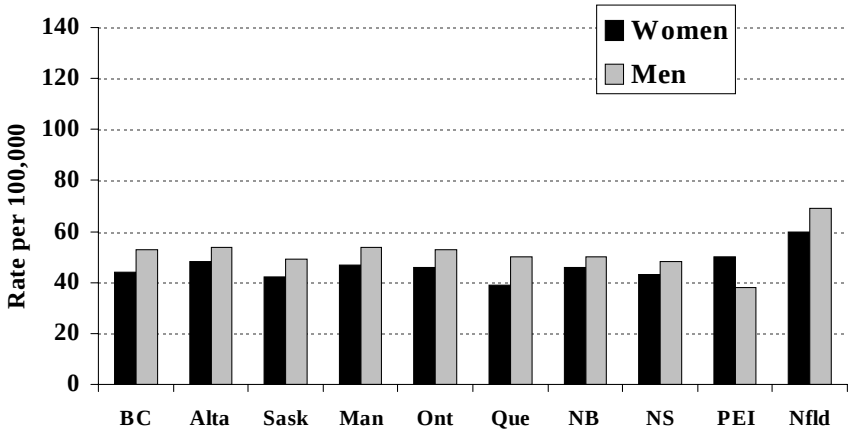
Figure 3-17 Age-standardized acute myocardial infarction mortality rates per 100,000 by sex and province, Canada, 1997.



Age-standardized to 1991 Canadian population

Source: Statistics Canada, LCDC

Figure 3-18 Age-standardized cerebrovascular disease mortality rates by sex and province, Canada, 1997.



Age-standardized to 1991 Canadian population

Source: Statistics Canada, LCDC

Aboriginal Populations

Mortality data do not identify Aboriginal or First Nations status, therefore no current data are available for mortality from cardiovascular disease for this population. Special studies conducted in the past suggest that Aboriginal populations in Canada formerly experienced a much lower cardiovascular disease mortality rate than the non-native population, but this has been reversed in recent years. During the 1980s the death rates due to ischemic heart disease for Aboriginal men were similar to that of non-Aboriginal men.[4, 5] Aboriginal women experience higher mortality rates than the general non-Aboriginal female population for both ischemic heart disease and stroke. The higher prevalence of risk factors for cardiovascular disease such as high blood pressure, diabetes, obesity, and smoking may account in part for this trend.[6,7,8]

Migrant Studies

Approximately one in five Canadians is a first generation immigrant. Immigrants tend to bring with them their cultural and lifestyle habits, such as food choices, smoking behaviour and other lifestyle choices that will influence their risk of developing heart disease and stroke. Over time, they tend to acquire the habits and customs of their adopted country.

In Canada, the largest non-European migrant groups are from China and South Asia. Using a unique methodology to identify these two populations in the Canadian Mortality Database, mortality rates were calculated for persons who were Chinese-, South Asian-, and Canadian-born.[9]

Cardiovascular disease mortality rates differ for the various first generation ethnic groups in Canada. (Table 3-2) South Asian-born and Chinese-born groups have lower all-cause mortality rates among both men and women. However for ischemic heart disease, the rates for men are significantly lower among those men of Chinese origin. South Asian women have the highest rate of ischemic heart disease among women - almost three times the rate of women of Chinese background.

For stroke, the rates among men are similar in all three groups, but women of Chinese origin have the highest rate among women.

Table 3-2 Age-standardized mortality rates by ethnicity by sex, aged 35-74 years, 1979-93.

Cause Men	Canadian-born	95%CI	South Asian-born	95%CI	Chinese-born	95%CI	Other Immigrants	95%CI
All Causes	1093	(1091, 1096)	758	(735, 782)	599	(584, 615)	1068	(1063,1073)
CVD	449	(447,451)	418	(400,436)	190	(181,199)	440	(437,443)
IHD	320	(318,321)	320	(304, 336)	107	(100, 114)	314	(311,316)
CBVD	50	(49,50)	47	(41, 54)	46	(41, 50)	52	(51,53)
Women								
All Causes	567	(566,569)	494	(475, 513)	360	(349, 371)	576	(573,560)
CVD	184	(183,185)	223	(209,236)	104	(98,110)	187	(185,189)
IHD	110	(109,111)	145	(134, 155)	40	(36, 44)	108	(107,110)
CVBD	35	(34,35)	39	(33, 45)	42	(38, 46)	38	(37,39)

Mortality rates in deaths/100,000 Population.
95%CI = 95% Confidence Intervals,
CVD = Cardiovascular Disease IHD= Ischemic Heart Disease, CBVD= Cerebrovascular Disease

Source: Tej Sheth, Cyril Nair, Mukund Nargundkar, Sonia Anand, Aslim Yusuf. Cardiovascular and cancer mortality among Canadians of European, south Asian and Chinese origin from 1979 to 1993: an analysis of 1.2 million deaths. CMAJ 1999;161:132-138.

Death In and Out of Hospital

Death from ischemic heart disease may occur suddenly in the absence of or within one hour of the onset of symptoms. Such 'sudden death' may be the only manifestation in approximately 15% of individuals suffering a first heart attack.[10,11] In individuals with known ischemic heart disease experiencing a second heart attack, the risk of sudden death may be increased four- to five-fold.[12,13]

Results from the Quebec Cardiovascular Study among 4,371 men found that 60% of the mortality from ischemic heart disease occurred outside the hospital as a first event and that 42% of all ischemic heart disease deaths were observed dying within one hour of the onset of their symptoms or found dead in bed.[14]

Women are more likely than men to die in hospital. Approximately 31% of male deaths and 40% of female deaths from AMI occur in hospital.[15]

Recent results from Quebec show a decreased case fatality rate for acute myocardial infarction among those admitted to hospital from 18.4% to 12.7% between 1986 and 1996.[16] As improved case fatality rates were most evident from 1991 to 1996 in women and the elderly, the data suggest that part of the decline in mortality may be due to increased penetration of proven treatment strategies in these two groups.

Studies worldwide continue to assess the efficacy of one regimen of thrombolysis versus another. Regardless of the specific preparation used, a thrombolytic agent, when given within 12 hours of the onset of symptoms, reduces mortality from myocardial infarction. The reduction in mortality may be as high as 30-50% for those receiving the thrombolytic agent within 6 hours of the onset of their chest pain to 7.5% for patients consulting between 6 and 12

hours after the onset of symptoms.[17,18] Unfortunately, thrombolytic therapy is not used in all eligible patients.[19] There are still delays in patients seeking treatment after the onset of symptoms, and delays in receiving treatment once in hospital, even for those meeting inclusion criteria for thrombolytic trials.[20] Therefore strategies are needed to improve diagnosis, reduce "door-to-needle" time, and increase the availability of thrombolytic agents.[21,22,23,24]

International Comparisons

Cardiovascular disease is the leading cause of death world wide, but rates vary considerably among countries. In the mid-1990s, age standardized mortality rates for all cardiovascular disease in men ranged from a high of 1051.7 deaths per 100,000 population in the Russian Federation, to a low of 232.7 deaths per 100,000 in Japan. (Figure 3-19) In women, the mortality rates ranged from 633 deaths per 100,000 in the Russian Federation, to a low of 139.9 deaths per 100,000 in France. (Figure 3-20) Canada's rates (1996) for men were 307 deaths per 100,000; for women, the rates were 185 deaths per 100,000. These international rates, while providing an overview of the world-wide situation, are derived from the different countries in different years, using different methods, depending on when statistics were collated. Caution must be used, therefore, in comparisons between countries.

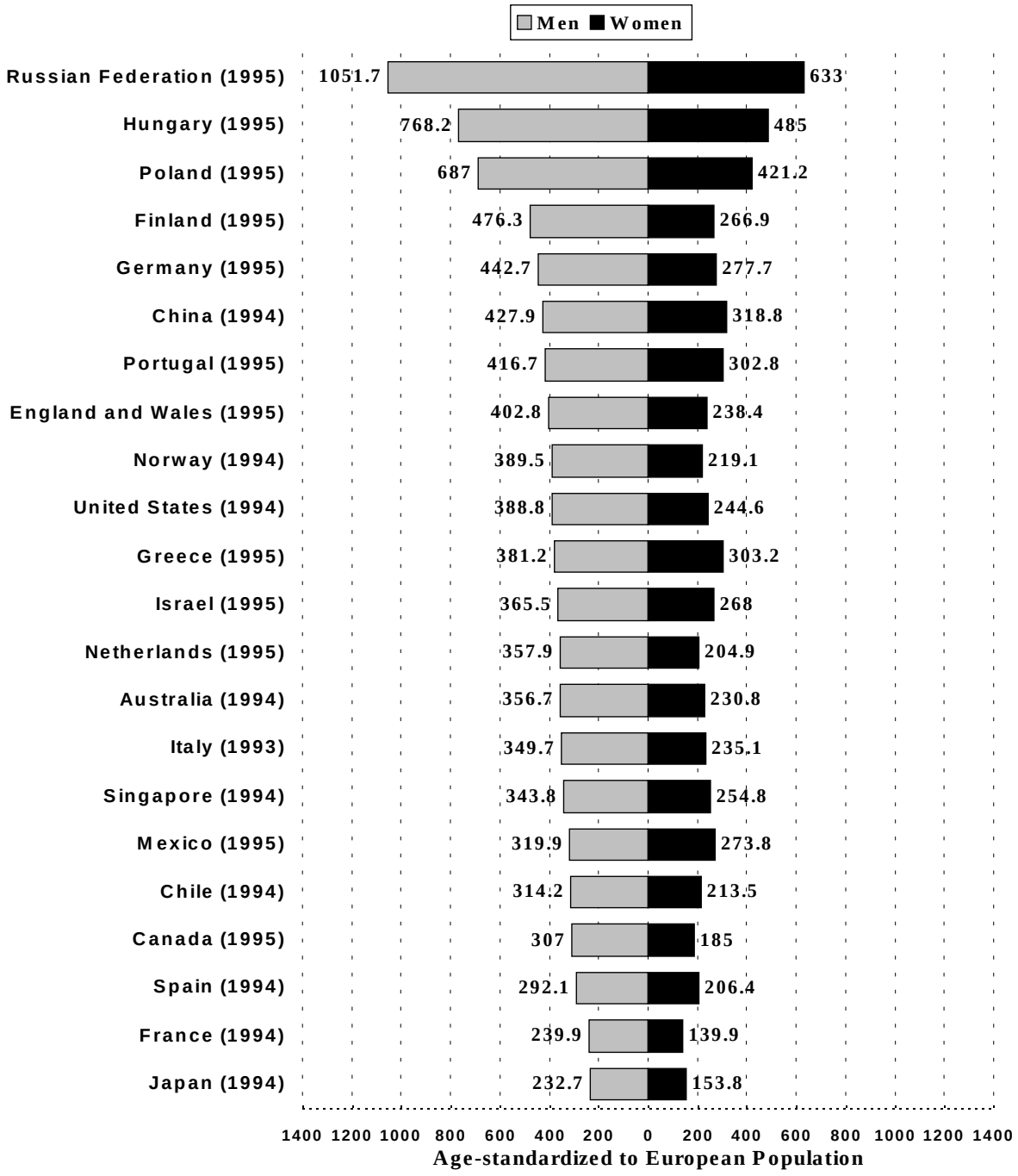
Among the 22 selected countries, Canada ranks 11th in mortality from ischemic heart disease, at a rate of 186.1 deaths per 100,000 for men; the mortality rate for women is 94.5 deaths per 100,000 population. (Figure 3-20) In comparison, France (a comparable society to Canada's) has much lower rates; 81.3 deaths per 100,000 for men and 33.8 deaths per 100,000 for women. Canada's relative position has remained essentially unchanged since the mid-1980s.

Canada maintains its enviable position among the selected countries in mortality rates from stroke. For males the rate is 50.5 deaths per 100,000 population, which is the lowest among the selected countries. (Figure 3-21) For women, the rate is 41.7 deaths per 100,000 population, the second lowest, behind France. World rates for men range from 50.5 deaths per 100,000 in Canada to 340.3 deaths per 100,000 in the Russian Federation. World rates for women range from 39.4 deaths per 100,000 population in France to 257.3 per 100,000 in the Russian Federation

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 Eastern Europe, the Russian Federation, and in a number of countries in the developing world.

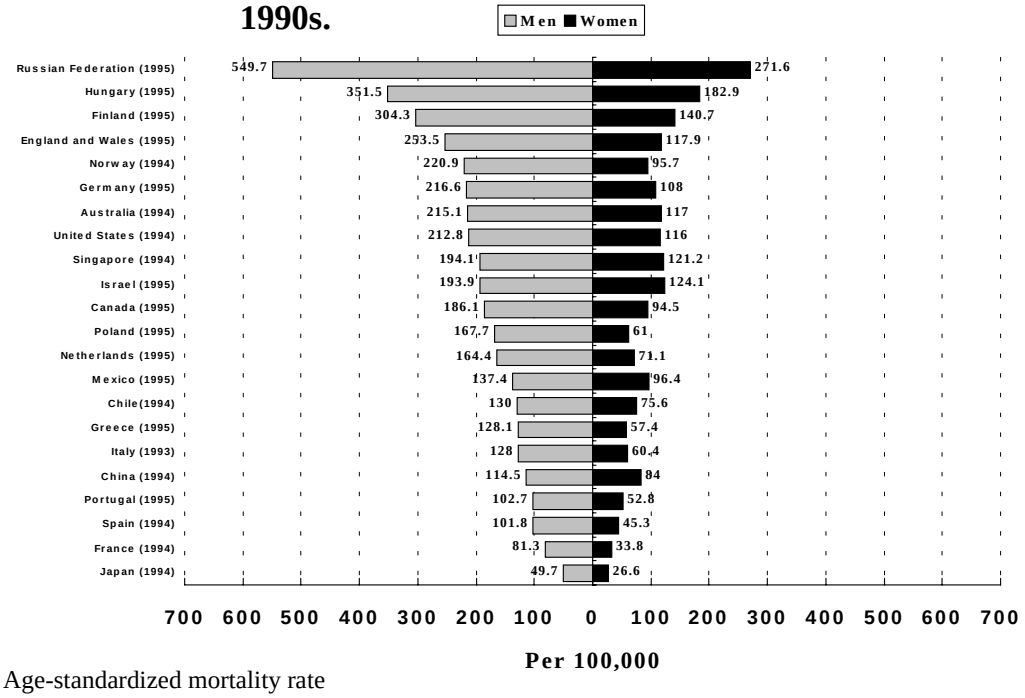
Although differences in risk factors and quality of treatment may account for international differences in mortality rates, much of the difference remains unexplained. The expectation is that given the change to a western diet and increase in smoking rates, the rate of cardiovascular disease in less-developed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

Figure 3-19 Age-standardized mortality rates, cardiovascular disease, World, mid-1990s.



Source: 1996 World Health Statistics Annual, WHO

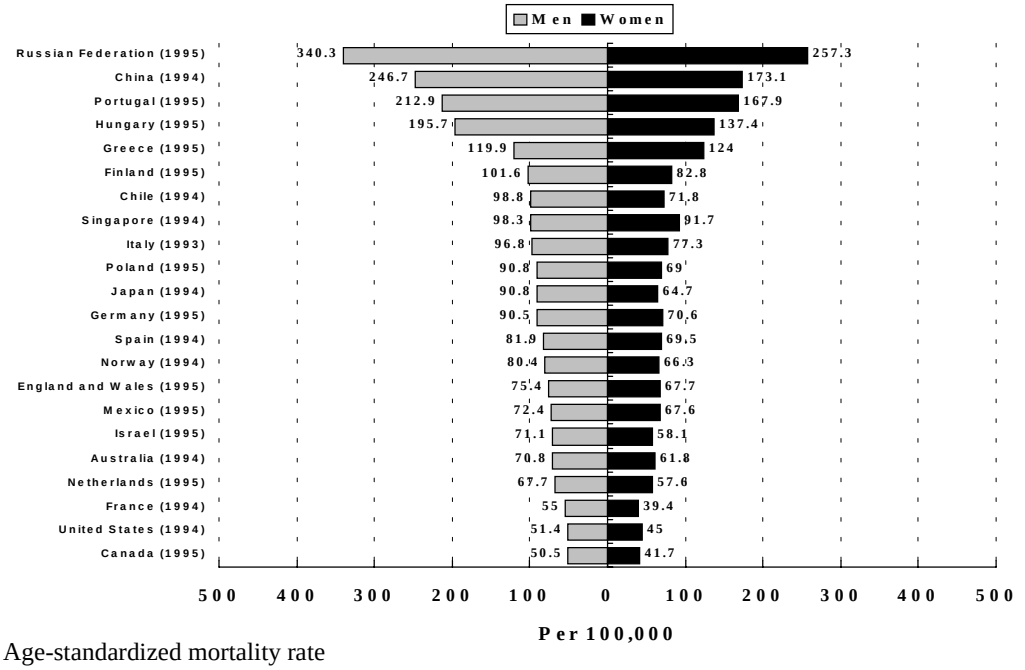
Figure 3-20 Age-standardized mortality rates, IHD, World, mid-1990s.



Age-standardized mortality rate

Source: 1996 World Health Statistics Annual, WHO

Figure 3-21 Age-standardized mortality rates, cerebrovascular disease, World, mid-1990s.



Age-standardized mortality rate

Source: 1996 World Health Statistics Annual, WHO

Conclusions

Cardiovascular disease (heart disease and stroke) is the leading cause of death in over one-third of Canadians. It not only affects the elderly but is also the third leading cause of premature death under age 75. Mortality rates for ischemic heart disease and acute myocardial infarction continue to decrease, but mortality rates for stroke have not changed significantly during the past ten years.

The number of elderly in the Canadian population has been increasing in recent years. As a result of this trend, there has been an increase in the number of deaths due to stroke and ischemic heart disease. This trend is expected to continue for the next fifteen years.

Heart disease has a major impact on an individual's quality of life, including chronic pain or discomfort, activity restriction, disability, and unemployment.

While there are detailed data on deaths from heart disease and stroke, there is a lack of data on other critical health outcomes, such as incidence, prevalence and quality of life, needed to plan and evaluate prevention and management interventions.

Implications

Both primary and secondary prevention efforts must attain priority to decrease the incidence of fatal and non-fatal heart disease and stroke in the population.

Collaborative efforts are required by health service providers to provide a wide range of services that will enhance the quality of life of individuals living with heart disease and stroke as well as their families.

The Canadian Heart and Stroke Surveillance System (CHSSS) needs to be enhanced to provide more useful information to decision-makers on

- ⇒ quality of life – activity restriction, side-effects of drugs, psychological reaction, sexuality,impact on family dynamics, social life, personal and economic;
- ⇒ incidence of heart disease and stroke and linked to morbidity and mortality for longitudinal follow-up; and
- ⇒ mortality rates for Aboriginal people and by ethnic background.

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Chapter 4 YOUTH

Heart disease and stroke, with the exception of congenital heart disease and neonatal stroke, have traditionally been associated with adults rather than children and youth. Behavioural risk factors for heart disease and stroke, however, begin in childhood and adolescence. The atherosclerotic process leading to ischemic heart disease and stroke in adults also begins early in life, and is associated with the same risk factors as for adults. An increased focus on children and youth can make a significant contribution toward preventing heart disease and stroke in the adult population.

This chapter discusses and behavioural risk factors for heart disease and stroke among youth, and high blood pressure. It also provides an overview of the population burden of congenital heart disease in Canada.

Heart Disease Begins in Childhood

Autopsy studies of Korean and Vietnam War casualties showed that 44% to 77% of young male soldiers (mean age 22 years) had evidence of coronary atherosclerosis. Five to 15% had severe lesions, suggesting that atherosclerosis began years earlier.[1,2] Similarly, autopsy studies have demonstrated the presence of fatty streaks and of fibrous-plaque lesions in the aortas and in the coronary arteries of young children.[3,4,5]

In the Bogalusa study, statistically significant correlations were found between the extent of fibrous plaques in the coronary arteries of children and young adults, and several risk factors including: body mass index, systolic, and diastolic blood pressure, cholesterol, and triglycerides.[6] The extent of fatty streaks and fibrous plaques in the coronary arteries was more pronounced among current smokers, as well as among those with multiple risk factors.[7]

The Pathobiological Determinants of Atherosclerosis in the Young (PDAY) study also reported significant positive associations between the extent of coronary arterial atherosclerotic lesions and cholesterol, high density lipoproteins, and serum thiocyanate concentration (a marker for exposure to cigarette smoke)[8,9,10] among 400 adults aged 15 to 34 years from eight communities in the United States who had died of violent causes.

The prenatal environment may also influence the risk of heart disease and stroke through exposure of the mother to passive smoke and other factors that influence the development of the cardiovascular system.[11]

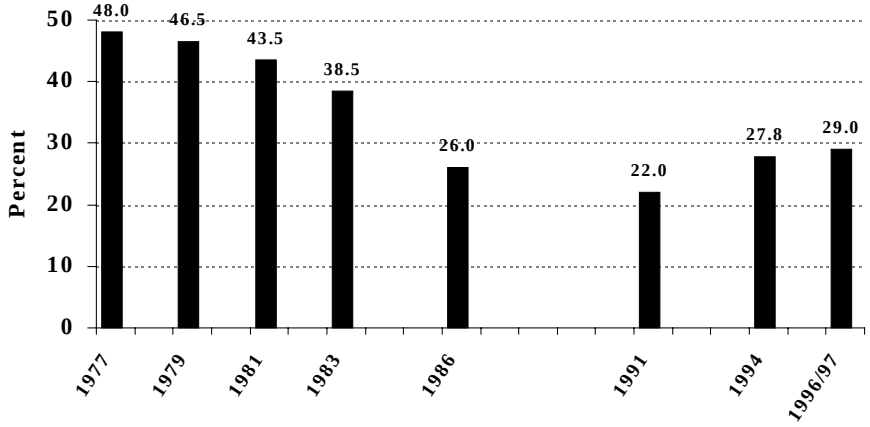
Risk Factors for Heart Disease and Stroke

Smoking

Smoking is the most important preventable cause of death and disease, including cardiovascular disease, in Canada. It is critical, therefore, to understand the process leading to smoking experimentation and regular smoking, and to monitor smoking prevalence among Canadian youth. This information can be used to develop effective prevention and cessation programs for this population.

The proportion of youth aged 15 to 19 years who are current smokers (daily and occasional) increased to 29% in 1996-1997,[12,13] an increase of almost 40% over the prevalence found in 1991 (22%). (Figure 4-1) The increase in current smoking is higher among teenaged girls than boys. From 1994 to 1996-1997 the prevalence of current smoking increased from 23% to 27% (a 17% increase) among boys and from 24% to 31% (a 30% increase) among girls.[14]

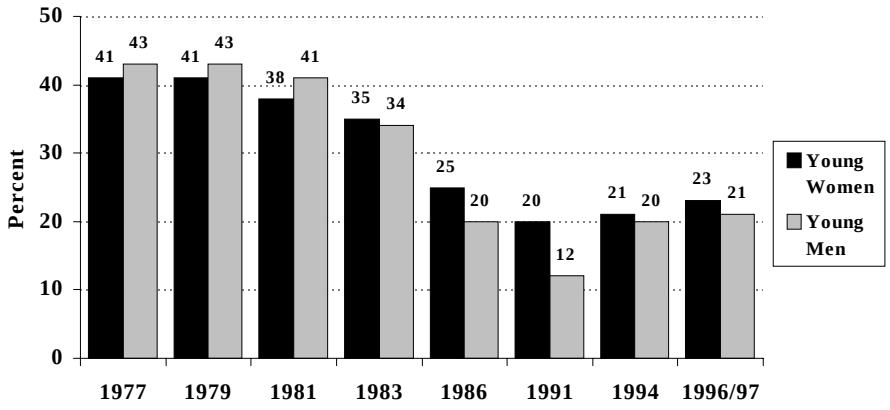
Figure 4-1 Proportion of youth aged 15-19 years who smoke cigarettes currently, Canada, 1977-1996/97.



Source: Statistics Canada, catalogues 91-002, vol 7, no. 3; 91-512;91-213. Canadians and smoking: An update. Health and Welfare Canada, 1991. General Social Survey, Statistics Canada, 1991. Survey on Smoking in Canada, Cycle 3, 1994. National Population Health Survey, Statistics Canada, 1996/97.

The proportion of young men and young women aged 15 to 19 years who are daily smokers increased from 16% in 1991 to 22% in 1996/97. At the same time, the rate of smoking among young women (23%) was higher than that among young men (21%). (Figure 4-2)

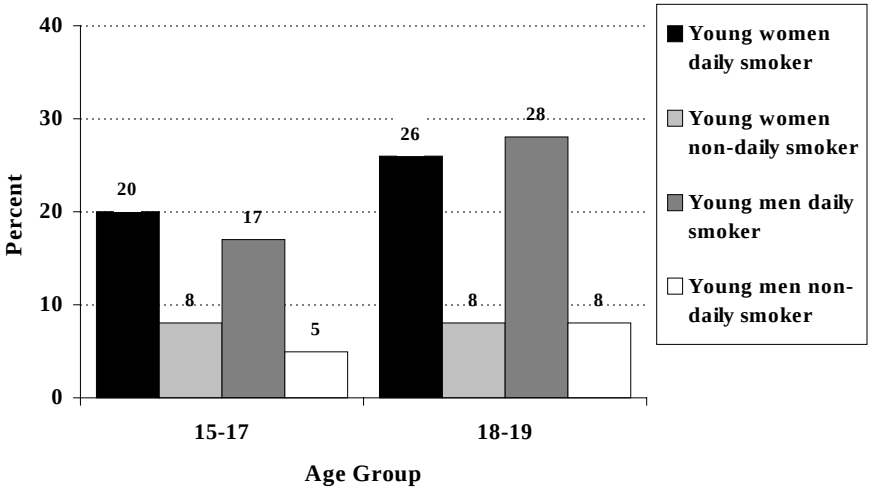
Figure 4-2 Proportion of youth aged 15-19 years who smoke cigarettes daily by sex, Canada, 1977-1996/97.



Source: Statistics Canada, catalogues 91-002, vol 7, no. 3; 91-512;91-213. Canadians and smoking: An update. Health and Welfare Canada, 1991. General Social Survey, Statistics Canada, 1991. Survey on Smoking in Canada, Cycle 3, 1994. National Population Health Survey, Statistics Canada, 1996/97.

Smoking increases with age. Only 2% of 10 to 14 year-olds smoked daily in 1994 compared to 18% of 15-19 year-olds.[15] In 1996-97, 17% of young men aged 15 to 17 were daily smokers compared to 28% of those aged 18 to 19. There was a similar increase with age among young women. (Figure 4-3)

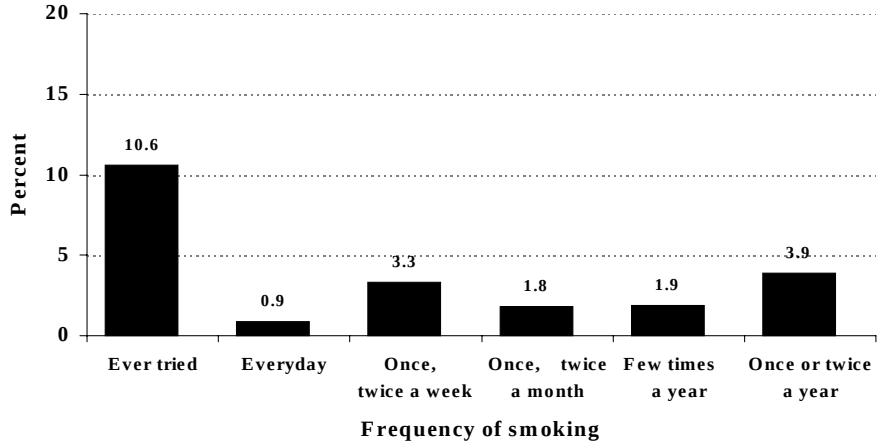
Figure 4-3 Proportion of youth aged 15-19 years who report smoking cigarettes by age group, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

Experimentation with smoking begins before adolescence. Among children aged 10 and 11 years 10.6% had tried smoking (Figure 4-4).

Figure 4-4 Proportion of children aged 10 and 11 years who smoke cigarettes, Canada, 1994/95.

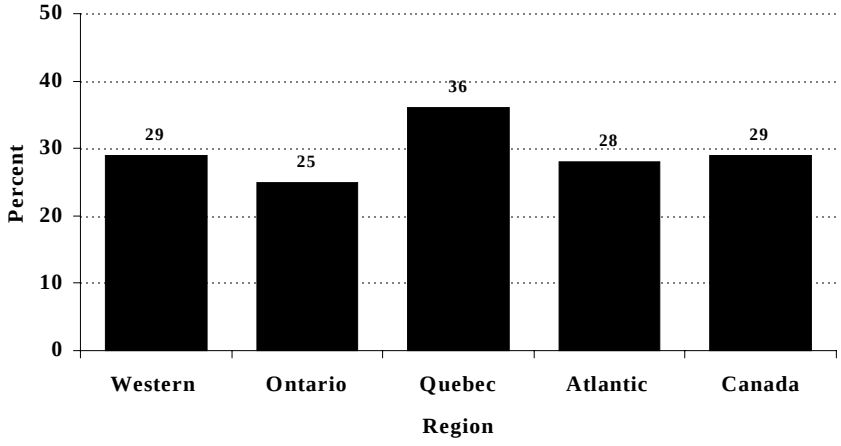


Source: Statistics Canada, National Longitudinal Survey of Children 1994/95

Up to a quarter of children smoked their first cigarette by age 12, and among those who continued to smoke, daily cigarette use usually began by age 16.[16] In the 1994 Youth Smoking Survey (YSS) the average age at which youth aged 10-19 had smoked an entire cigarette was 12.8 years. Early smokers were less likely to quit and were at higher risk of smoking attributable death.[17,18]

In 1996/97, the highest proportion of smokers among youth aged 12 to 19 was in Quebec (36%). (Figure 4-5)

Figure 4-5 Proportion of youth aged 12-19 years who report smoking cigarettes daily by region, Canada, 1996/97.



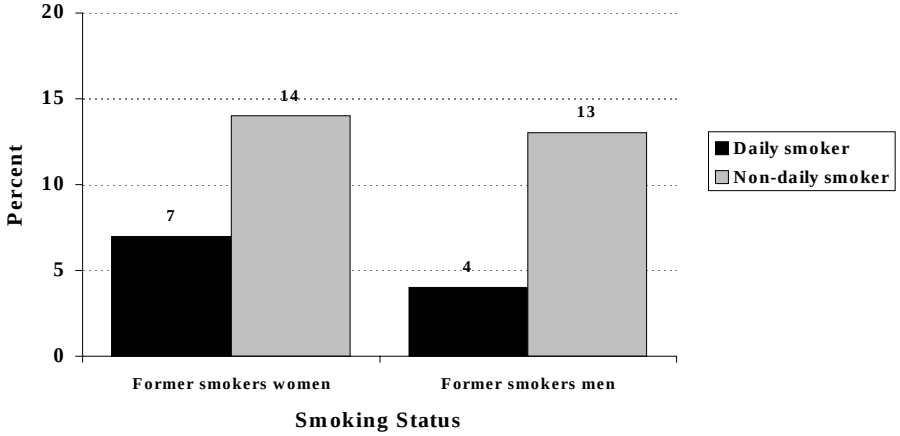
Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

The YSS reported that a high percentage of adolescent smokers had seriously thought about or attempted to quit, but with a low success rate.[19] Over 80% of current smokers aged 10 to 19 years had seriously thought about quitting. Of these, over 80% had made at least one attempt to quit.

Most young smokers attempted to quit within two years of smoking their first cigarette and 19% of current smokers who tried to quit made at least five attempts. Only one-third of young men and young women who are current smokers, aged 10 to 19 years, who tried to quit, remained abstinent for at least one month, suggesting that even at that young age nicotine dependence prevents a substantial proportion of smokers from quitting. Less-established smokers were more likely to try to quit and remain abstinent longer. Forty-five percent of current, non-daily smokers were able to quit for one month or more, compared to 26% of daily smokers.[20]

In 1996/97, 7% of young men and 4% of young women were former smokers. Former smokers were more likely to have been occasional smokers. (Figure 4-6)

Figure 4-6 Proportion of youth aged 15-19 years who were former smokers by sex and amount previously smoked, Canada, 1996/97.

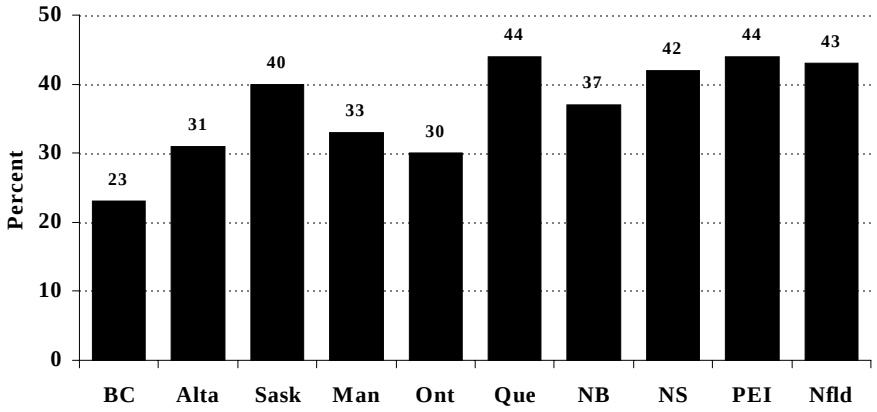


Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

Exposure of children to environmental tobacco smoke (ETS) affects their lung function and overall health. It also exposes them to role models that influence their own smoking behaviour. In 1996/97, 32% of children aged 5 and under and 35 % of children aged 6 to 11 were regularly exposed to tobacco smoke. This was a decrease from levels of 37% and 39% in 1994/95. Children in the lowest income level had the highest exposure to ETS (48%) compared to children in the lower middle (37%,), upper middle (29%), and highest income groups (18%).

Children living in Quebec and the eastern provinces were more likely to be exposed to ETS than children in Ontario or B.C. (Figure 4-7)

Figure 4-7 Proportion of children under age 12 years regularly exposed to environmental tobacco smoke in the home by province, Canada, 1996/97.



Source: Statistics Canada, National Population Health Survey, Cycle 2, 1996/97

Factors Influencing Smoking

Many biologic, psychosocial and environmental factors have been associated with smoking experimentation and onset among youth, including

low income;

low academic achievement and problem behaviours;

low self-esteem and self-efficacy, stress, low social support and depression;[21,22,23]

smoking by parents, siblings and peers;

accessibility to cigarettes, and advertising by tobacco companies;[24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40] and

concerns over weight among adolescent girls.[41,42,43]

In a recent study of children aged 9 to 12 years, overweight girls who tried smoking were 3.5 times more likely to continue smoking than normal weight girls who had tried smoking. This suggests that the association between body weight and smoking begins even before adolescence.[44]

Nicotine dependence appears to be one of the most important determinants of continued smoking among youth. It is well established that children inhale and absorb as much nicotine per cigarette as adults, even with their first few cigarettes.[45,46] Young smokers frequently report symptoms of nicotine dependence, which were once thought to be associated only with regular smoking among adults.[47,48,49,50,51]

Excess Weight and Obesity

Obesity in adults is a strong risk factor for many chronic diseases including heart disease and stroke, type II diabetes, hypertension, dyslipidemia, and certain cancers. Elevated body weight in children is associated with increases in low density (LDL) and very low density (VLDL) lipoprotein, decreases in high density (HDL) lipoprotein, increases in blood pressure, and other risk factors for ischemic heart disease.[52,53,54,55,56]

Excessive weight during late childhood and adolescence is associated with higher morbidity and mortality in adulthood.[57,58,59,60] Compared to thin children, obese children have a two-fold increase in the risk of becoming overweight adults.[61,62] The risk of an obese child becoming an obese adult increases with the child's age. Between 26% and 41% of obese pre-school children and 42% and 63% of obese school children become obese adults.[63]

There is a lack of recent data in Canada on the prevalence of obesity among children. A comparison of the 1981 Canada Fitness Survey and the 1988 Campbell Survey on Well Being showed that, based on the sum of five skinfold thicknesses, the prevalence of obesity increased from 16 to 22% among boys and from 15 to 26% among girls from 1981 to 1988.[64,65]

Determinants of Excess Weight and Obesity

Both genetic and environmental factors are important in the development of obesity.[66,67] Some of these factors are

parental obesity either through family eating patterns, physical activity levels or shared genes;[68,69,70,71,72,73]

high-caloric, high-fat diet; and

physical inactivity.

Physical Inactivity

Physically active children have higher HDL levels, and lower blood pressure, BMI and triglyceride levels.[74,75,76,77] These factors are associated with a reduced risk for heart disease and stroke. Those who are physically active in childhood are more likely to be active in adolescence and adulthood.[78,79,80]

Recent national data on the level of physical activity among children and adolescents do not exist in Canada. Older surveys that have been conducted must be interpreted cautiously because concepts of fitness and activity and the measurements of physical activity have changed over time.[81,82]

Methodological problems include:

Surveys that rely on self-reports of physical activity by children are often unreliable.

Proxy reporting by parents may under or overestimate physical activity once children start school, because a substantial amount of their physically active time is not under direct parental supervision.

Parents and children may report time spent outdoors as physically active time, but the amount of time the children are actually active at play may be quite variable.

According to the 1988 Campbell Fitness Survey,[83] a higher proportion of boys (72%) compared to girls (49%) aged 10-14 years were physically active (expending 3 or more kilocalories per kilogram of body weight per day). Among adolescents aged 15-19 years, the proportion of boys who were physically active was similar to the younger children (69%), but a lower proportion of girls (39%) were physically active.

A 1996 survey in Quebec[84] found that 63% of boys and 39% of girls aged 15-19 engaged in moderate or vigorous physical activity three times per week for at least 20 minutes.

In the 1995 Canadian Physical Activity Monitor Survey (PAMS)[85], parents reported that

their children aged from 1 to 4 years spend 22 hours each week in physically active play;

pre-school boys spend nearly four more hours per week in physically active play than pre-school girls;

boys and girls aged 5-12 years were physically active about 14 hours per week, including time spent in physical education classes and activities outside the school;

by adolescence, boys were again more active than girls, spending about 5 more hours per week than girls being physically active; and

boys and girls aged 13-17 spend 16 and 11 hours per week, respectively, being physically active.

Determinants of Physical Activity

Many physiological, psychological, social, and environmental factors influence physical activity by youth:[86,87,88,89,90,91,92,93,94]

enjoyment of physical activity;

a safe and challenging environment that encourages the development of motor skills;

parental encouragement and social support;

self-efficacy or a sense of being able to do the physical activity;

younger age groups; and

gender - boys tend to be more active than girls.

Nutrition

Several nutritional factors that may have their origin in childhood - a high caloric intake, high fat diet, and hyperlipidemia - influence the risk of heart disease and stroke. Both genetic and environmental influences affect blood lipoprotein concentrations. High levels of total cholesterol among children are associated with higher levels as adults.[95] Studies of apolipoproteins show strong correlations between parental or grandparental atherosclerosis and apolipoprotein B, lipoprotein (a) and apolipoprotein A-1 in children.[96,97,98]

Unfortunately there are no recent national population surveys that provide data on the prevalence of nutritional factors among children and youth.

High Blood Pressure

Although high blood pressure tends to be a condition of adulthood, it can became evident during very early childhood or adolescence. Persistently elevated systolic blood pressure has been reported from about six months of age.[99] The probability that elevated blood pressure will continue is greater among older children and for higher levels of blood pressure.[100,101] Children who are overweight have an increased risk of high blood pressure.[102,103]

There are no recent national data on the prevalence of high blood pressure among children. A health and social survey in a representative sample of children aged 9, 13 and 16 years was conducted from January to May 1999 in Quebec. This survey will provide data on CVD risk factors and behaviours including diet, blood lipoproteins, and blood pressure. The results of this survey should be available by the end of the year 2000.

Congenital Heart Disease in Canada

No systematic collection of information on congenital heart disease on a province-by-province basis has ever taken place. Therefore, the prevalence of congenital disease and thus the burden of congenital heart disease in the population can only be estimated.[104]

The number of adults with congenital heart disease living in Canada may be between 70,000 and 105,000.

Approximately 12,000 adults currently receive follow-up cardiac care.

By the year 2006, the number of complex cases requiring follow-up is expected to double.

There are approximately 4,600 new cases per year of congenital heart disease in Canada, based on a prevalence of 10 to 12 cases per 1000 live births, a total population of over 29 million at the last census, and a birthrate of 0.016. This is likely an underestimate of total cases as it does not take into consideration other familial or heritable cardiac conditions that are diagnosed after the first year of life.

Approximately 10% of new cases will require some form of treatment in the first year of life.

There are approximately 82,800 cases of congenital heart disease in the Canadian population aged 18 years and less, based on an estimated 4,600 new cases per year x 18 years.

Studies of the incidence of congenital heart disease from other countries have provided an overall estimate of approximately 6 per 1000 live births within the population.[105,106,107,108,109] About one-half are diagnosed in the first year of life (2.2 to 3.7 per 1000 live births).

Surgical Interventions

Approximately 3,000 pediatric and 300 or more adult cardiac surgeries are performed per year in Canada for congenital heart disease. These numbers are expected to increase in the future as the cohort of children with congenital heart disease reaches adulthood.

Conclusions

Behaviours that increase the risk of heart disease and stroke and the underlying pathophysiologic changes begin early in life. Therefore, it is essential that prevention begin in early childhood.

Greater effort must be made to prevent children and youth from starting to smoke cigarettes. The rates of smoking among youth aged 15 to 19 continue to increase with the greatest increase evident among young women. The factors that influence smoking include personal factors such as low self-esteem but also include smoking patterns in the family and the accessibility of cigarettes.

Young children are physically active but physical activity decreases during the teenage years, particularly among young women.

Obesity is a problem for a significant proportion of children aged 7 to 12. Programs to promote healthy weights must also address the concern young women have about the need to be thin, as this contributes to the decision to smoke.

There is a lack of data on congenital heart disease in Canada. This limits the ability to track this important health problem and plan effectively for health services for this population group.

Implications

A greater effort is needed to address smoking among youth. This includes programs and policies specifically for youth. Programs, policies and legislation are also needed to decrease smoking in the population as a whole, which will in turn have a positive effect on the incidence of youth smoking.

More attention to the promotion of healthy nutrition and weight and regular physical activity throughout childhood and adolescence will help to promote lifelong healthy behaviour.

Ongoing collection of data on physical activity, nutrition, weight, height, and skin-fold measures among children and youth will enable effective planning and evaluation of health promotion programs, policies and legislation.

The development of a national surveillance system on congenital heart disease with data on incidence, prevalence, quality of life, use of health services, costs, and mortality will facilitate planning for health services for individuals living with this disease.

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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 that section of cardiac muscle.

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 BMI of 25 to 27 as excess weight, and a level of BMI >27 as obesity.

CARDIOVASCULAR DISEASE
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)
Sudden development of a focal neurologic deficit due to disease of one or more blood vessels of the brain.

CONGESTIVE HEART FAILURE
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 an illness associated with a disturbance of blood glucose control. In the provincial heart health surveys, individuals were considered to have diabetes if they reported ever having been so diagnosed by a physician.

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 household income and the size of the household.

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

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.

OBESITY

Individuals are considered obese if they have a Body Mass Index [weight in kilograms/(height in metres)^2] greater than or equal to 27.

PACEMAKER IMPLANT

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 Code 49.71 to 49.74

PERSON-ORIENTED DATA

Information derived by Statistics Canada by linking the diagnosis of acute myocardial infarction with hospital discharge records from the National Hospital Morbidity File and using a personal identifier.

PHYSICAL INACTIVITY
In the National Population Health Survey 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 the risk among the unexposed.

SMOKING
Individuals are considered to be smokers if they regularly smoke at least one cigarette per day.

ST ELEVATED AMI
ST elevation is the criterion for determining thrombolysis by diagnosis.

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 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 agents used are streptokinase and tissue-plasminogen activator, in combination with other adjunctive therapy, such as heparin and aspirin.

TRANSIENT ISCHEMIC ATTACK
Reversible neurological or retinal deficits secondary to a decrease 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 Code 47.01 to 47.29

WAIST-HIP RATIO
The ratio of waist circumference (cm) to hip circumference (cm).

The Changing Face of Heart Disease and Stroke in Canada
Evaluation For

1. How would you rate the information presented in terms of usefulness in the following areas? (Where Poor =1, Excellent =5)

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