CARDIOVASCULAR DISEASE IN CANADA

HEART AND STROKE FOUNDATION

CARDIOVASCULAR DISEASE IN CANADA

1993*

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1. INTRODUCTION

Cardiovascular disease (CVD) is the major cause of death, disability and illness in Canada. Although mortality rates have declined in recent decades, cardiovascular disease remains a great burden on the health of Canadians.

Cardiovascular disease is a broad group of conditions, the major components of which are ischemic heart disease and stroke (Figure 1).

In **ischemic heart disease** (IHD), the heart muscle function is impaired by reduced blood supply (ischemia) most often due to arteriosclerosis or "hardening" of the arteries that supply the heart muscle. Ischemic heart disease is most often manifested as **angina** (temporary chest pain due to transient ischemia precipitated by effort or excitement) or **acute myocardial infarction** (AMI; prolonged ischemia that produces muscle damage; a 'heart attack'). **Other ischemic heart disease** includes chronic ischemic heart disease and sudden death.

In **stroke**, an area of the brain is damaged by a sudden decrease in the blood supply or by hemorrhage.

Other cardiovascular diseases include arrhythmias (disturbance of heart rhythm); hypertension (high blood pressure); valvular heart disease (conditions of the heart valves); peripheral vascular disease (that affecting the arteries and veins); and myocardial disease (conditions affecting heart muscle).

In recent years, considerable progress has been made in identifying the multiple factors that place individuals at risk of developing cardiovascular disease. Successful programs of prevention have demonstrated that through the modification of these risk factors, death and illness from cardiovascular disease can be reduced.

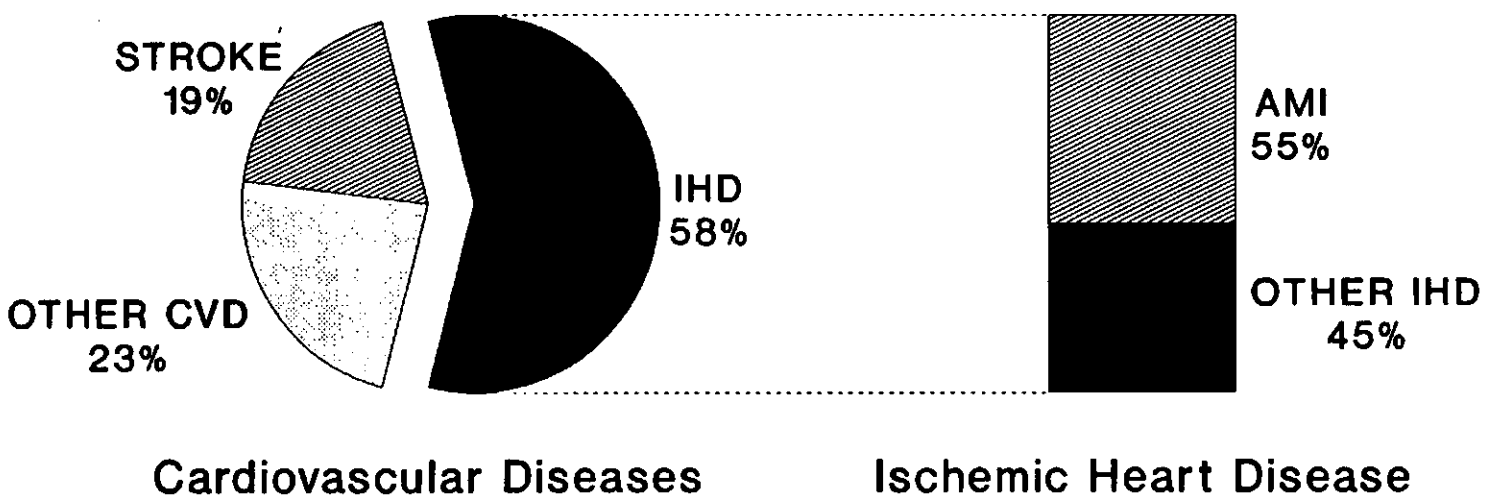
This booklet provides both the public and health professionals with an overview of the patterns of cardiovascular disease in Canada. It outlines the pattern of incidence, mortality, disability and the use of the health care system due to this disease, and will examine its economic impact. A discussion of risk factor distribution in Canada will illustrate the scope for cardiovascular disease prevention. This edition includes a focus on the pattern of cardiovascular disease in the Americas, which was authored by Eric Nicholls of the Pan American Health Organization.

This publication is sponsored by the Heart and Stroke Foundation of Canada and developed collaboratively by Health and Welfare Canada, Statistics Canada, and the Heart and Stroke Foundation of Saskatchewan Epidemiology Unit at the University of Saskatchewan. It is the second of a regular series that will examine trends of cardiovascular disease in Canada.

Age-standardization for international comparisons has been to the 1987 world population, whereas that for all Canadian comparisons has been to the population of Canada. A glossary of technical terms is included to facilitate use of this publication.

FIGURE 1

The Major Components of Cardiovascular Disease Mortality, Canada, 1990



SOURCE: Canadian Centre for Health Information
Statistics Canada

2. DEATHS FROM CARDIOVASCULAR DISEASE

2.1 The Leading Causes of Death

Thirty-nine percent of deaths in Canada in 1990 were due to cardiovascular disease (Figure 2).[1] Ischemic heart disease accounts for 23% of deaths, of which more than half are attributable to acute myocardial infarction. Stroke and other cardiovascular disease account for 7% and 9% of deaths respectively in Canada.

One-quarter of individuals suffering an acute myocardial infarction die suddenly before admission to hospital.[2] Of those admitted to hospital during the 1980's, it has been estimated that more than 8.5% and 18.3% of men and women respectively, died before discharge and an additional 8.2% and 11.4% died within one year.[3] Although improved treatment services, including thrombolytic therapy, may produce reductions in the number of deaths from cardiovascular disease, a great impact can be expected from reducing the initial incidence of the disease.[4]

2.2 International Comparisons

Cardiovascular disease is the leading cause of death worldwide, but rates vary considerably between countries. In the late 1980's, age-standardized mortality rates for all cardiovascular disease in males ranged from 493 deaths per 100,000 population in Romania, to a low of 165 deaths per 100,000 in Japan (Figure 3).[1] Canada's rate (1988) for men was 245 per 100,000 and for women was 134 per 100,000. If Canada were to attain the 1988 cardiovascular disease death rate of France (males: 177 per 100,000; females: 98 per 100,000), an estimated 11,000 deaths among males and 8,100 deaths among females might be avoided annually.[5] Among the 15 selected countries, Canada's mortality rates from ischemic heart disease are relatively high, whereas those from stroke are among the lowest (Figure 4).

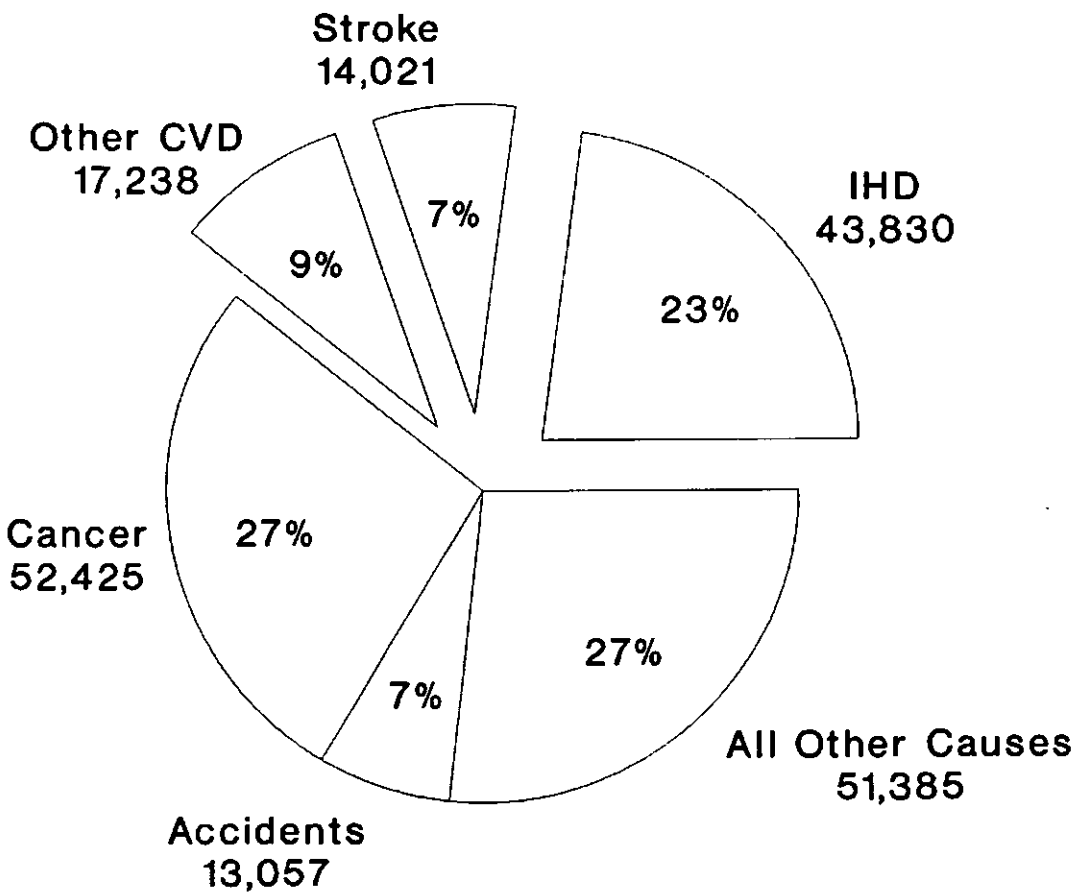
Many factors may account for international differences in death rates: genetic predisposition, the amount and type of fat in the diet, the amount of fish and fibre in the diet, smoking habits and the prevalence of high blood pressure in the population. Much of the difference, however, remains unexplained.

2.3 Age - and Gender - Specific Death Rates

Gender differences in cardiovascular disease are well documented. Males experience almost twice the death rates of females in all categories of cardiovascular disease except stroke, for which the rates are approximately equal (Table 1; Figure 5). Research suggests that normal estrogen levels in pre-menopausal women confer protective benefit against the development of ischemic heart disease. In the decades following menopause, ischemic heart disease death rates of women approach those of men.

FIGURE 2

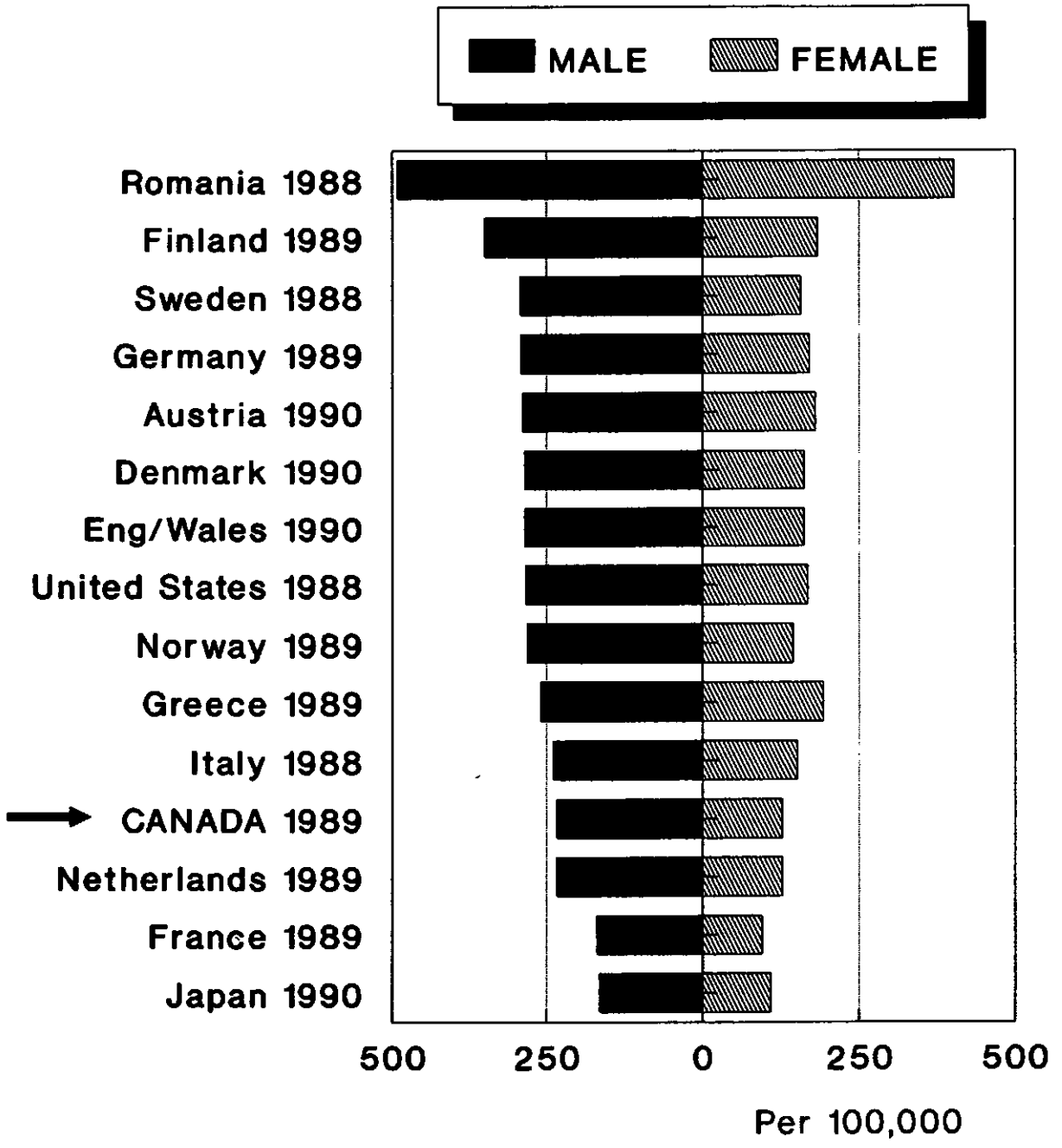
Leading Causes of Death, Percentage and Number of Deaths Canada, 1990



SOURCE: Canadian Centre for Health Information
Statistics Canada

FIGURE 3

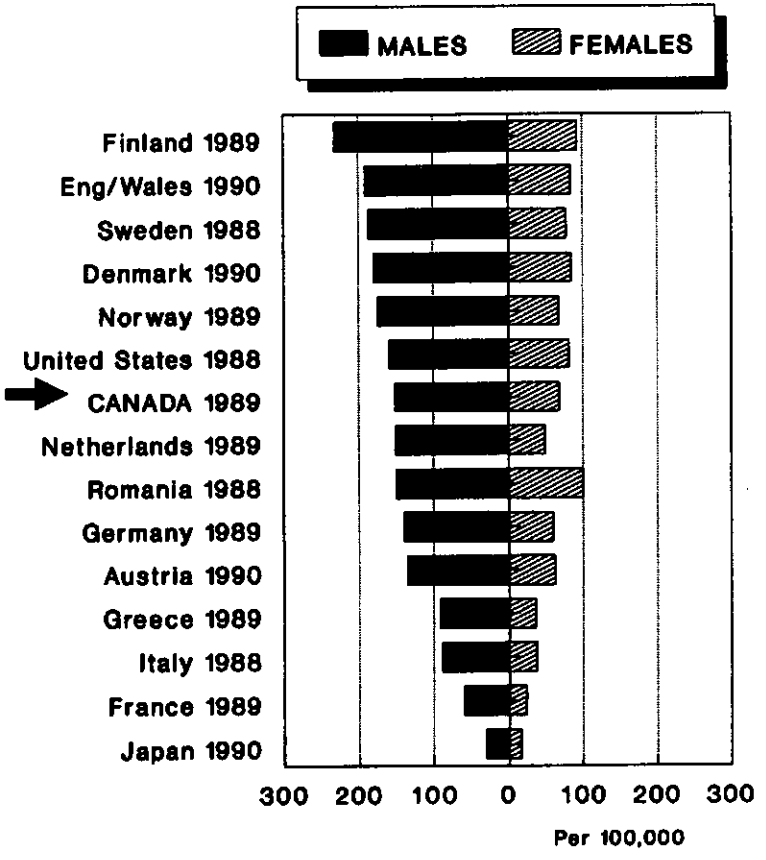
Age-Standardized Mortality Rates, Cardiovascular Disease, World, Late-1980's



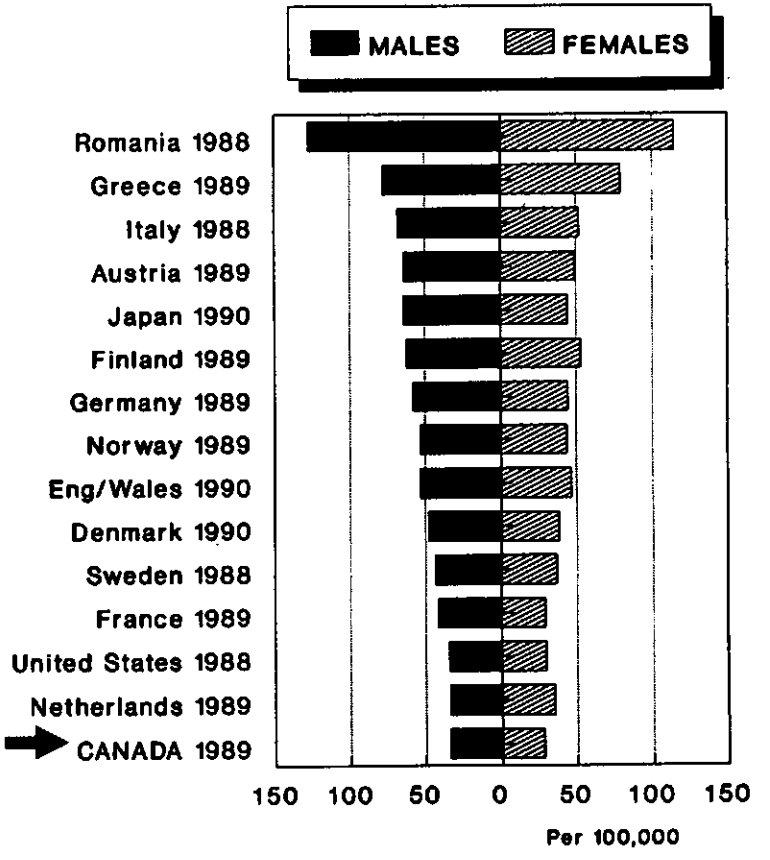
SOURCE: Canadian Centre for Health Information
Statistics Canada

FIGURE 4

Age-Standardized Mortality Rates
Ischemic Heart Disease, World, Late-1980's



Age-Standardized Mortality Rates
Stroke, World, Late-1980's



SOURCE: Canadian Centre for Health Information
Statistics Canada

TABLE 1

Age-Standardized Mortality Rates, per 100,000
All Cardiovascular Disease, Males and Females
Canada, 1990

	35-54		55-64		65-74		75+		All ages	
	M	F	M	F	M	F	M	F	M	F
IHD	57.2	11.5	339.4	101.7	891.3	366.7	2600.5	1751.2	211	109
AMI*	36.8	7.6	218.8	66.1	538.2	234.0	1319.0	830.9	119	58
Stroke	9.2	7.2	48.6	28.2	169.2	109.5	885.4	768.1	55	44
Other CVD	13.8	6.7	82.8	36.4	257.1	129.8	1088.7	857.2	74	49
Total CVD	80.2	25.4	470.7	166.2	1317.5	606.6	4574.5	3376.5	340	202

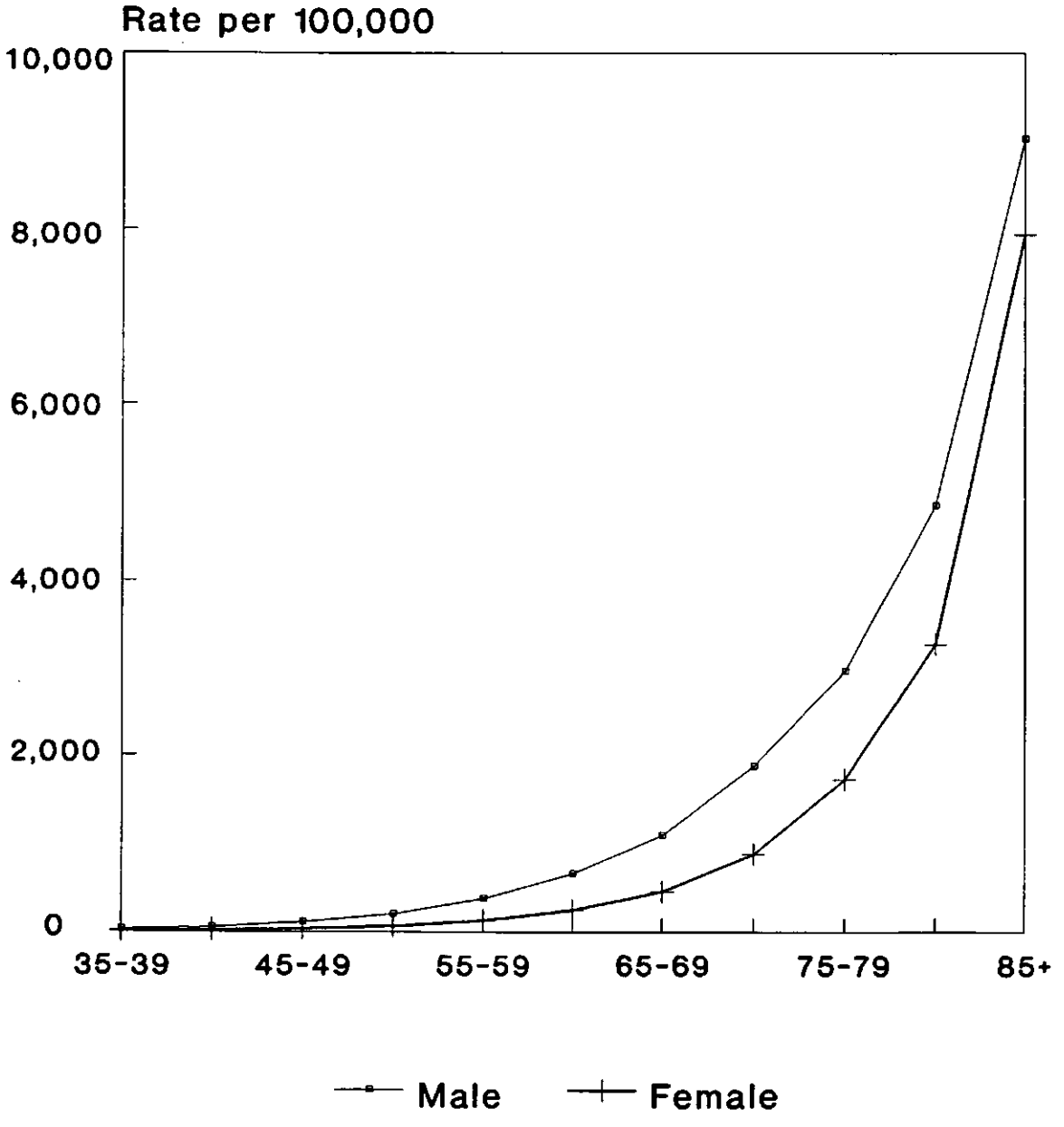
* AMI is a sub-category of IHD

IHD = Ischemic Heart Disease
AMI = Acute Myocardial Infarction (Heart Attack)
CVD = Cardiovascular Disease

SOURCE: Laboratory Centre for Disease Control, Health and Welfare Canada
Canadian Centre for Health Information, Statistics Canada

FIGURE 5

Age-Standardized Cardiovascular Disease Mortality Rates, Canada, 1989



SOURCE: Canadian Centre for Health Information
Statistics Canada

Although the age-standardized cardiovascular disease rates for men are more than double those of women, in the final analysis, almost as many women die from cardiovascular disease as men. In 1990 for example, 38,823 men and 36,266 women died from cardiovascular disease.[1] This apparent paradox is the result of the older average age of death of women and the high cardiovascular disease mortality rates in the oldest age groups.[6]

Forty-one percent of all deaths in women are due to cardiovascular disease compared to 37% in men. In women, the proportion increases sharply after menopause while for men, the percentage increases steadily from age 35 to age 75 (Figure 6).

For both sexes, rates increase dramatically in the older age groups. During the coming decades as the proportion of elderly (over 65 years) within the population increases, the prevalence of, and the absolute number of, deaths due to cardiovascular disease may increase. The lower death rate for the 35-64 age group does not diminish the importance of cardiovascular disease as a health problem; it is still the leading cause of death for this age group.

2.4 Regional Comparisons

Within Canada there is an East-West gradient in cardiovascular disease death rates (Figures 7, 8, 9; Table 2). Atlantic Canada has consistently higher rates than those of Western Canada. Cardiovascular disease death rates in 1990 were highest for men and women in Newfoundland, 418 and 248 per 100,000 population, respectively. The rates were lowest for men in British Columbia (308 per 100,000 population) and for women in Alberta (185 per 100,000 population).[5] Regional differences are more notable with respect to death rates from acute myocardial infarction than those due to stroke. Mortality atlases (Figures 8 and 9) show overall disease patterns in Canada; however the death rates given for specific census divisions should be interpreted cautiously due to the relatively small number of deaths from which they are derived.

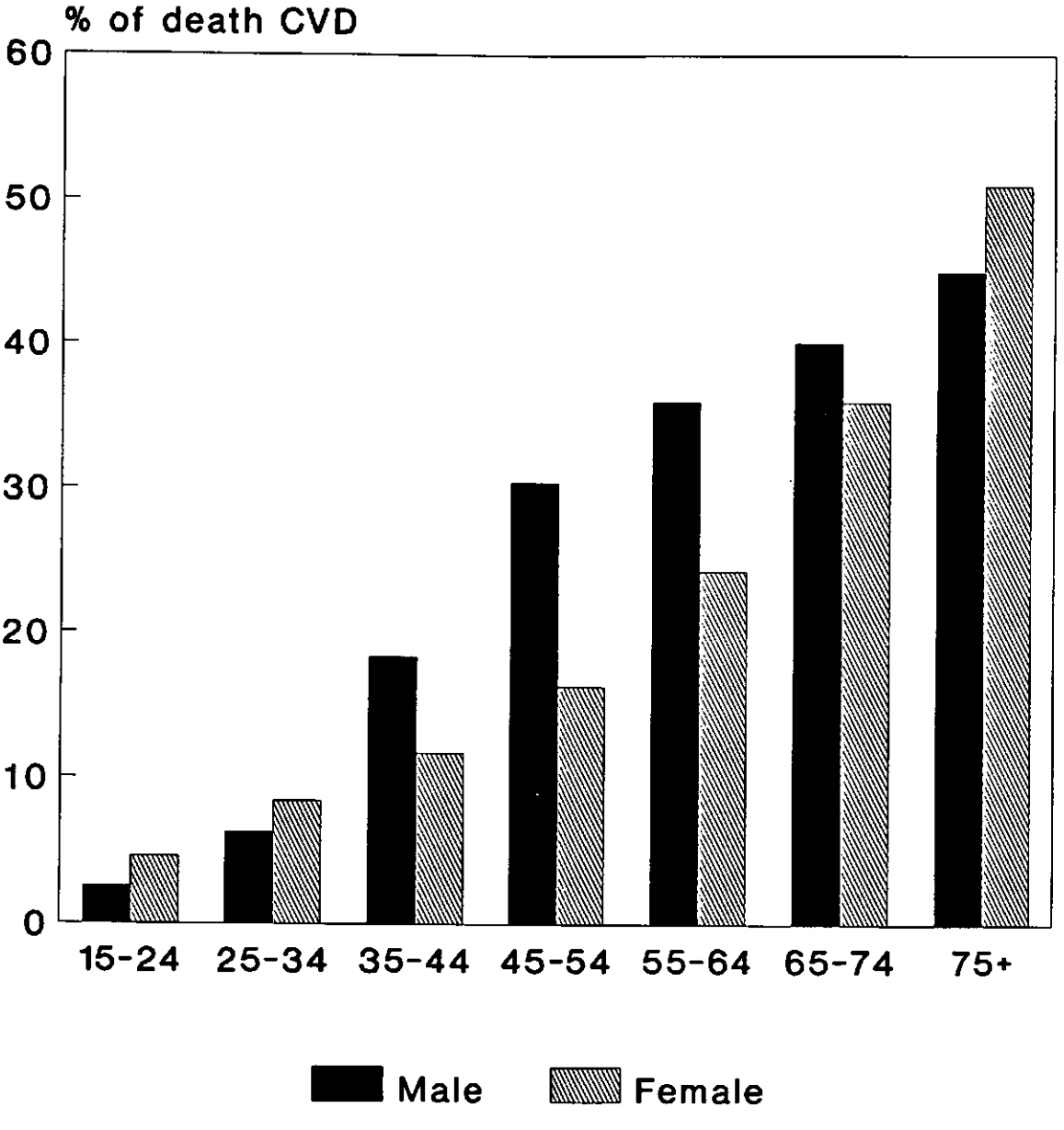
Provincial prevalence rates of smoking, high blood pressure and obesity parallel the CVD mortality gradient. This would suggest that the variation in cardiovascular disease death rates in Canada is partly explained by differences in the prevalence of risk factors.

2.5 Aboriginal Populations

Aboriginal populations (both Inuit and Indian) in Canada have, until recent decades, experienced much lower cardiovascular disease death rates than the non-native population. Yet, during the past decade, aboriginal men have experienced a death rate for ischemic heart disease similar to that of the Canadian male population and also have experienced a comparable decline over time (Table 3).[7,8] Their death rate from stroke, although decreased during the interval, has remained 40% above the Canadian average. Aboriginal women experience higher death rates than the general Canadian female population for both ischemic heart disease and stroke. During the past decade, the difference between aboriginal women and the general female population with respect to stroke has decreased noticeably, whereas that for ischemic heart disease has increased. 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.[9,10,11]

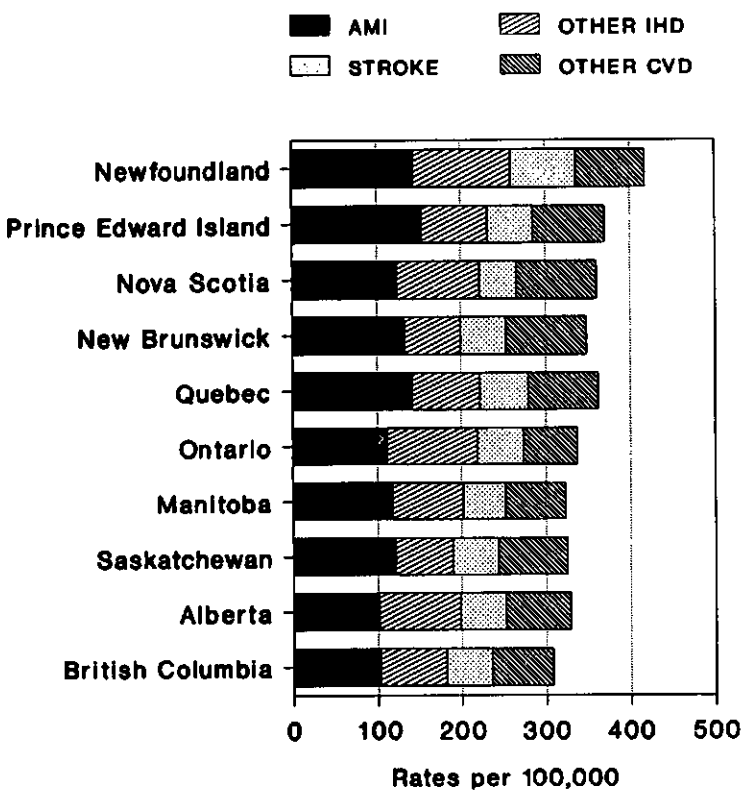
FIGURE 6

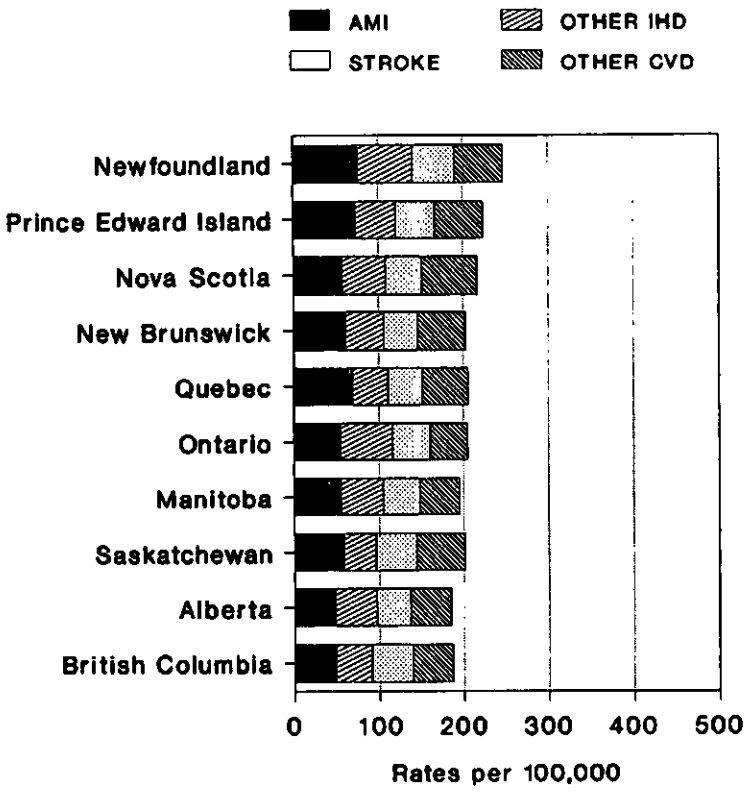
Percentage of Deaths due to Cardiovascular Disease, by Age Group and Sex, Canada, 1990



SOURCE: Canadian Centre for Health Information
Statistics Canada

FIGURE 7





SOURCE: Canadian Centre for Health Information
Statistics Canada

FIGURE 8

Ischemic Heart Disease, Males
Ages 35-74, 1983-1989

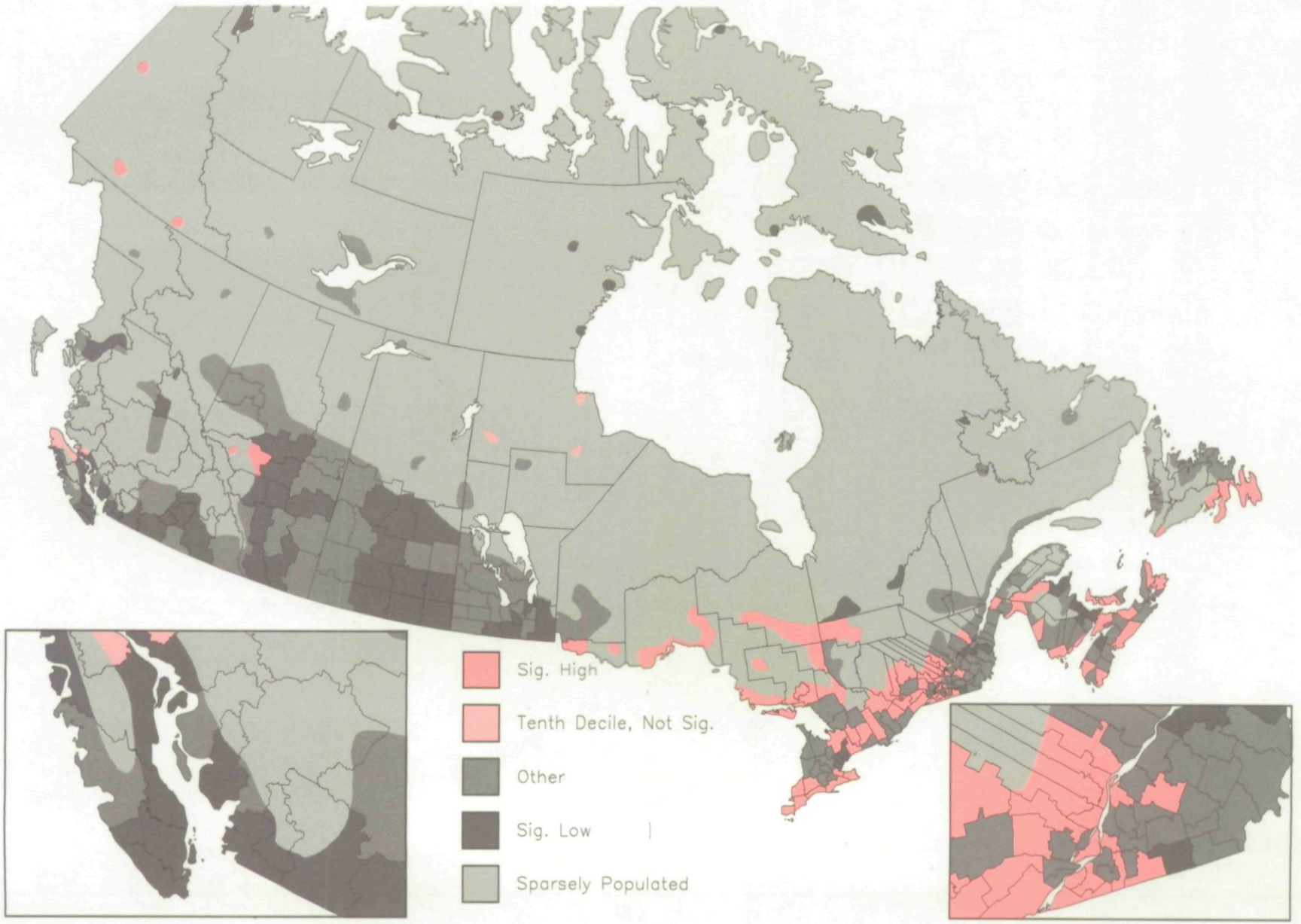


FIGURE 9

Ischemic Heart Disease, Females
Ages 35-74, 1983-1989

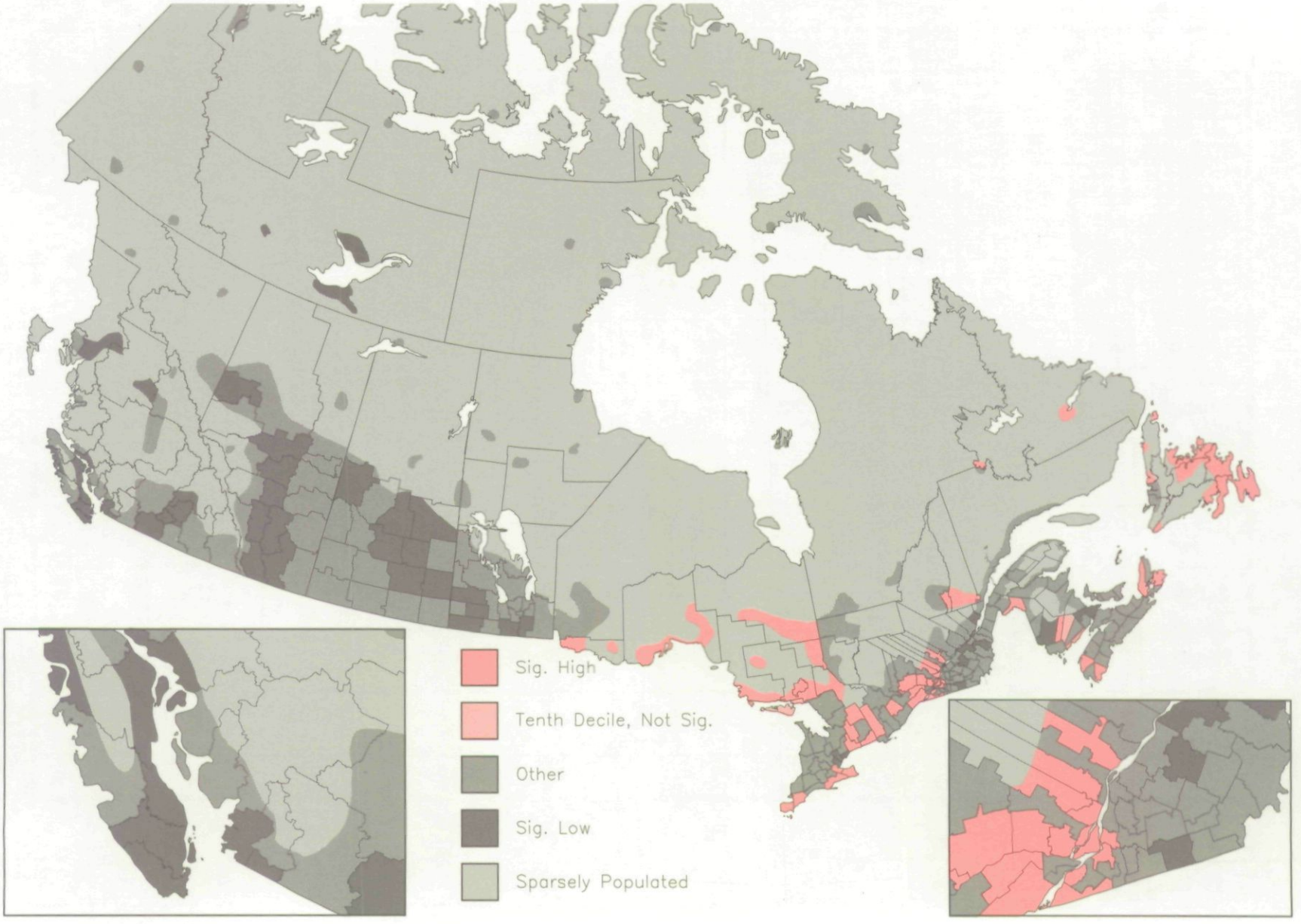


TABLE 2

Age-Standardized Mortality Rates, per 100,000
All Cardiovascular Disease, Males and Females
Provincial Comparisons, 1990

	MALES				FEMALES			
	AMI	IHD	STROKE	TOTAL CVD	AMI	IHD	STROKE	TOTAL CVD
Newfoundland	143	260	76	418	76	140	51	248
Prince Edward Island	153	232	53	370	73	120	47	224
Nova Scotia	123	222	44	360	57	108	43	217
New Brunswick	132	200	53	348	61	106	40	203
Quebec	141	222	57	362	69	110	41	206
Ontario	111	219	55	337	54	116	44	205
Manitoba	117	202	50	323	55	104	43	195
Saskatchewan	121	189	54	325	58	96	47	198
Alberta	101	198	54	327	48	97	40	185
British Columbia	103	182	54	308	49	91	48	187
CANADA	119	211	55	340	58	109	44	202

SOURCE: Laboratory Centre for Disease Control
Health and Welfare Canada

TABLE 3

Age-Standardized Mortality Rates (ASMRs) and Standardized Mortality Ratios (SMRs) on Indian Reserves (IR) and in Canada, per 100,000 Ages 0-64, 1979-88

	ASMR				SMR	
	1979-83		1984-88		1979-83	1984-88
	IR	CANADA	IR	CANADA		
MALES						
IHD	80.9	82.6	60.9	64.6	0.99	0.94
STROKE	15.3	10.7	11.8	8.2	1.43	1.44
FEMALES						
IHD	25.4	20.7	26.6	16.4	1.25	1.61
STROKE	23.0	8.6	12.9	6.5	2.77	1.93

SOURCE: Mao *et al.* 1992

2.6 Socioeconomic Status and Cardiovascular Disease Death Rates

Canadian communities with lower average income and educational levels experience higher rates of death from cardiovascular disease than communities with higher levels of income and education (Figure 10). In this presentation, comparisons are made between average income levels and average cardiovascular disease death rates in given geographical areas, and not between individual income level and risk of death from cardiovascular disease.[12] The observed pattern may be due, in part, to a greater prevalence of risk factors such as smoking and obesity in the lower socioeconomic groups of Canadian society (Section 7).

Inequalities in ischemic heart disease and stroke mortality also exist in other developed countries such as Britain and appear to be becoming more apparent with time.[13,14] Reasons for such differences in mortality rates are only partially explained by risk factor profile.[14]

2.7 Time Trends

Cardiovascular disease death rates have been declining steadily in Canada since the mid-1960's. The 1990 death rates are almost half those of 1969; this applies to all major categories of cardiovascular disease, and to rates among both males and females.[1]

Ischemic heart disease rates peaked in Canada in the mid-1960's (Figure 11). Ontario's rates were the highest, reaching 447 deaths per 100,000 population (males) in 1970; whereas those in Saskatchewan were the lowest, reaching 318 deaths per 100,000 population (males) in 1969.[15] Since then, the decline has been steady at approximately 2% per year. The rate of decline has been greatest in Atlantic Canada and less in the Prairies, so that by 1990, considerably less regional variation is seen than two decades earlier. The decline may, like that in the United States, be partly explained by a reduction in the prevalence of smoking and consumption of dietary fat, improved identification and control of hypertension, and improved medical and surgical care of individuals who have developed cardiovascular disease.[4]

The decline in the death rate from acute myocardial infarction is similar to that seen for ischemic heart disease (Figure 11). Statistics specific to acute myocardial infarction were not collected until 1969 and therefore death rates are not available prior to this time.

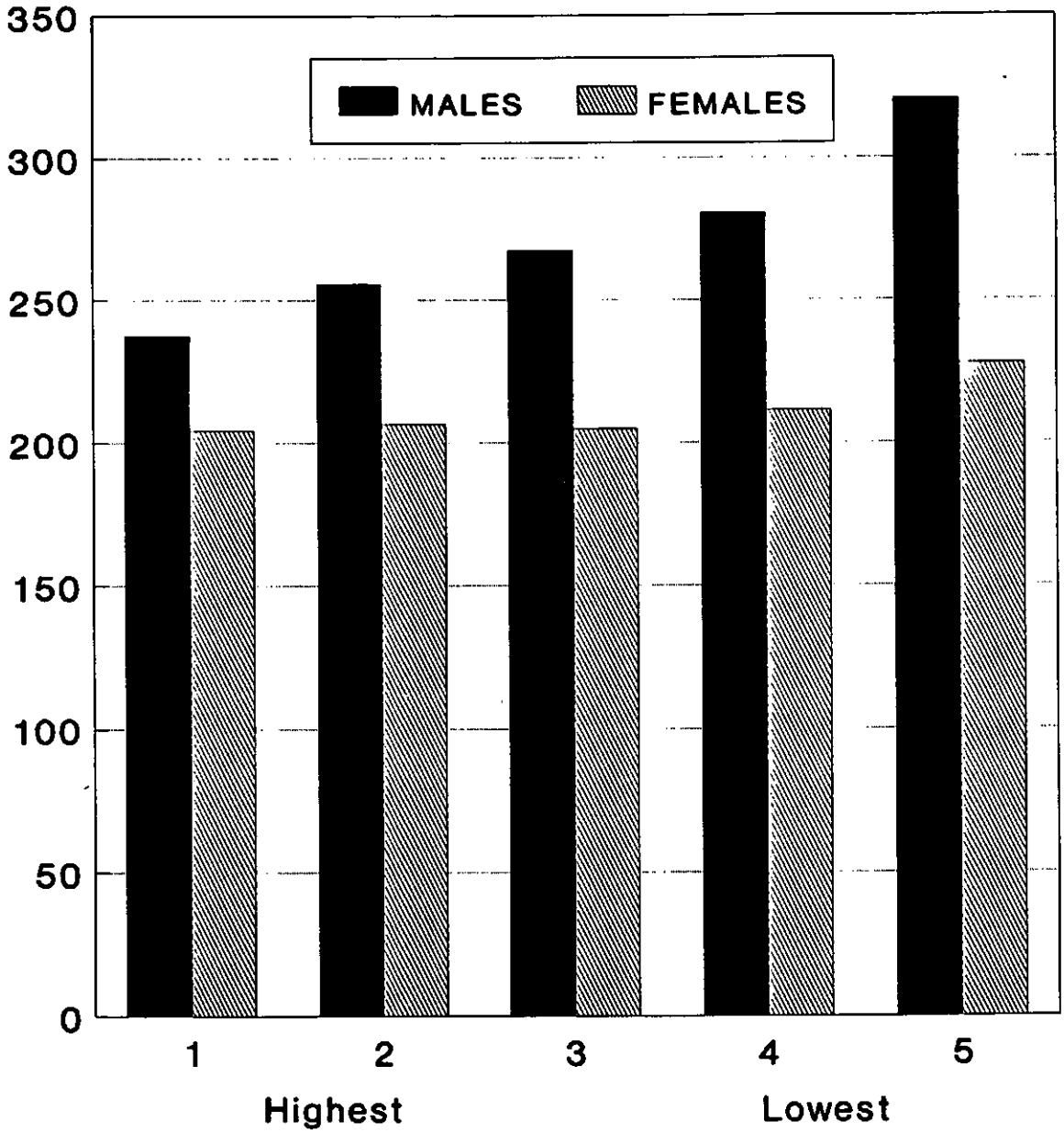
Although stroke in Canada is responsible for 7% of all deaths, the death rate from stroke is among the lowest in the world. Death rates from stroke have declined at approximately 2% per year since the 1950's. The death rate from stroke is closely related to the prevalence of high blood pressure and smoking in the population. The decline in death rate from stroke may be related to an improved public awareness of high blood pressure and its earlier detection and treatment, and to a reduced prevalence of smoking.

2.8 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 70).

FIGURE 10

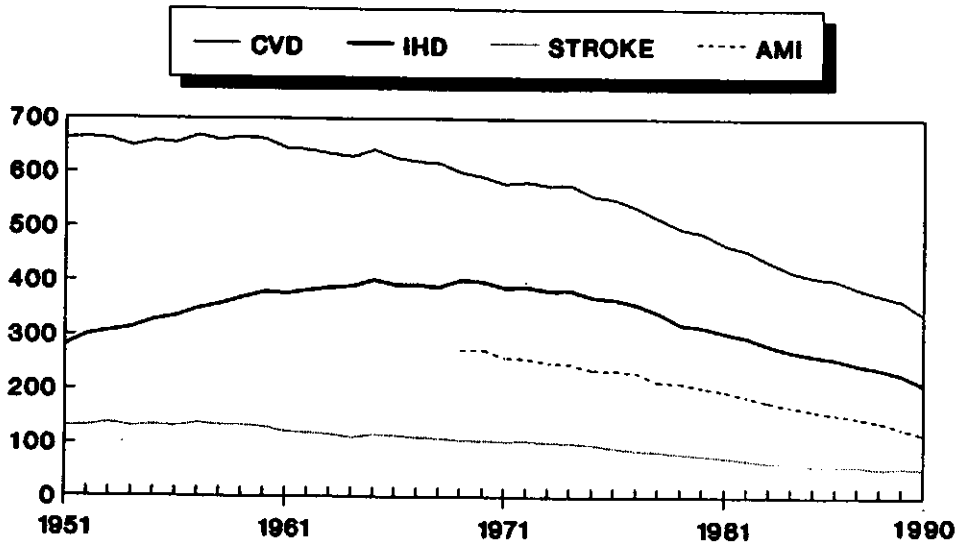
Age-Standardized Mortality Rates
Cardiovascular Disease, Income Quintile, 1986



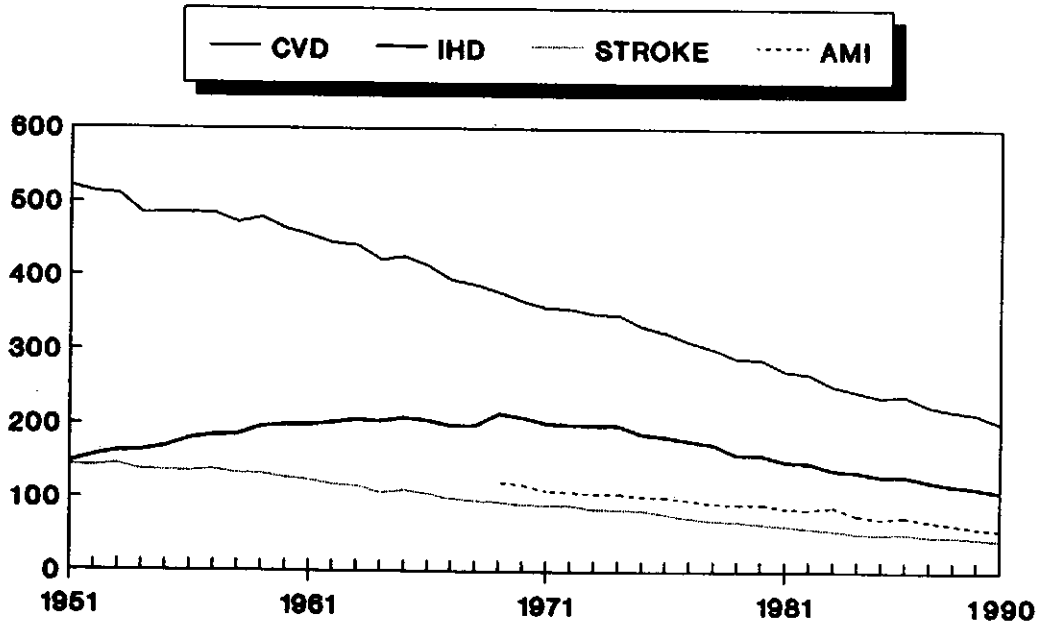
SOURCE: Canadian Centre for Health Information
Statistics Canada

FIGURE 11

Age-Standardized Mortality Rate, per 100,000 Males, 1951-90



Age-Standardized Mortality Rate, 1951-90 Females (Per 100,000)



SOURCE: Canadian Centre for Health Information
Statistics Canada

Premature death from cardiovascular disease is responsible for an estimated 188,000 years of life lost, and is third after that from injuries and cancer (Figure 12).[5] 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.

2.9 Probability of Death from Cardiovascular Disease

One can apply the 1990 Canadian age-specific death rates for cardiovascular disease to a life table analysis to estimate the probability of death from CVD. If these rates remain unchanged, a male at birth has a 42% probability of dying during his lifetime from cardiovascular disease, while a female has a 47% probability (Table 4). Males are more likely than females to die of ischemic heart disease and acute myocardial infarction, whereas females are more likely to die of stroke.[5]

A comparison of the probability of death between ages 0-75 with that of total lifetime probability demonstrates the dramatic increase in the risk of cardiovascular disease death that occurs after age 75, especially among females.

3. INCIDENCE OF CARDIOVASCULAR DISEASE

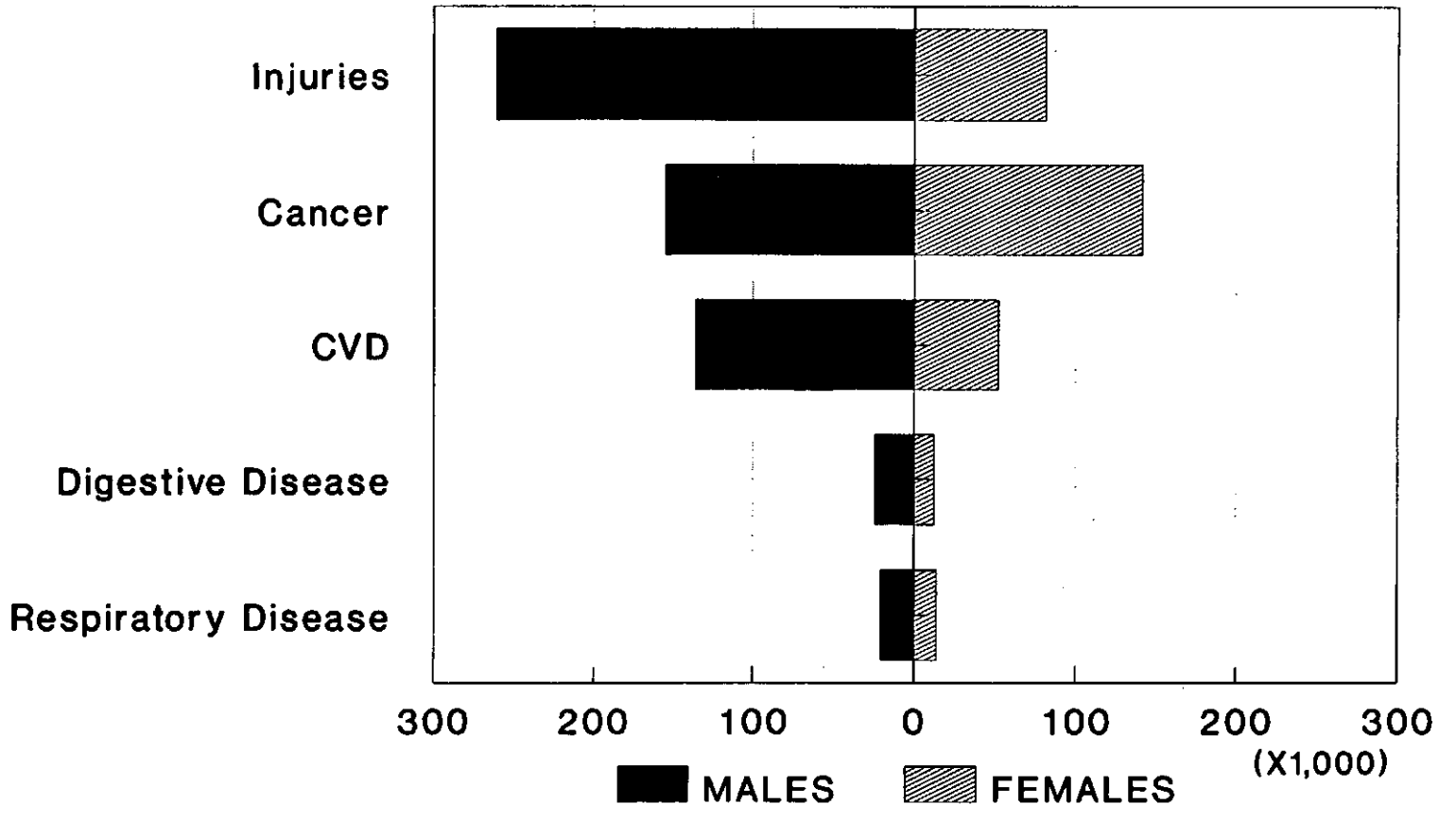
Declines in cardiovascular disease mortality may be attributable to decreased incidence, improved survival or a combination of the two.[16,17] Through the determination of incidence rates, the impact of lifestyle changes and improvements in treatment may be identified. Furthermore, estimation of cardiovascular disease incidence is of central importance to effective health care planning.[17]

To explain regional and time trends in death from cardiovascular disease in Canada, the Nova Scotia - Saskatchewan Cardiovascular Disease Epidemiology Group examined the incidence of acute myocardial infarction in these two provinces.[16] Nova Scotia experiences one of the highest rates of ischemic heart disease death in Canada while Saskatchewan has one of the lowest. The incidence of fatal and non-fatal cases of acute myocardial infarction was estimated by linking hospital discharge records with the Canadian Mortality Database.[18] The study demonstrates a higher incidence rate and lower survival rate of acute myocardial infarction in Nova Scotia, which appears to account for the higher death rate in that province when compared with Saskatchewan (Figure 13; Table 5).[16] Incidence and mortality rates have decreased and survival rates increased in both provinces between 1977-85.[19] To further explain changing mortality rates, data regarding cardiovascular incidence is needed from other provinces.

The World Health Organization's *Monitoring the Trends and Determinants of Cardiovascular Disease* (MONICA) project is an international cardiovascular disease surveillance study covering a total population of more than 15 million people in 41 centres.[20] To explain international cardiovascular disease trends, data regarding death and incidence rates, risk factor profiles and medical care are being collected in each centre using a standardized methodology. The population of Halifax County, Nova Scotia is one of the population groups being studied.[21] Every fatal and non-fatal case of acute myocardial infarction is validated and documented in a registry. Preliminary results are soon to be reported.

FIGURE 12

Potential Years of Life Lost Prior to Age 70, by Disease Category, Canada, 1990



SOURCE: Laboratory Centre for Disease Control
Health and Welfare Canada

TABLE 4

Probability of Death From Cardiovascular Disease, Males and Females, Canada, 1990

MALES

AGES	IHD	AMI	STROKE	ALL CVD
0-75	11%	7%	2%	16%
Life time	26%	14%	7%	42%

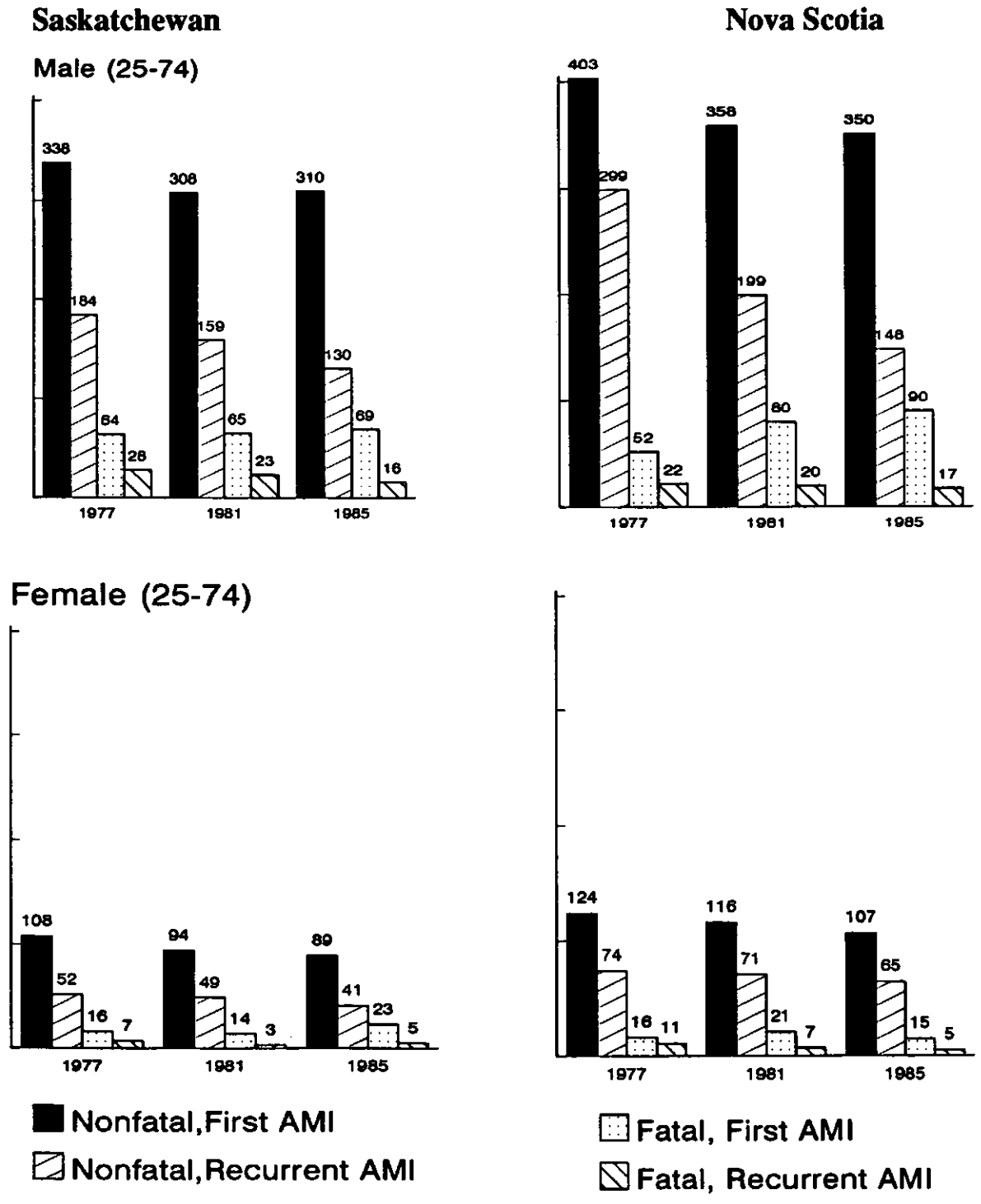
FEMALES

AGES	IHD	AMI	STROKE	ALL CVD
0-75	5%	3%	2%	8%
Life time	25%	12%	11%	47%

SOURCE: Laboratory Centre for Disease Control
Health and Welfare Canada

FIGURE 13

Age-Standardized Rates of Fatal and Nonfatal First and Recurrent Acute Myocardial Infarction, per 100,000*



SOURCE: The Nova Scotia-Saskatchewan Cardiovascular Epidemiology Group

* **Standardized to 1971 Canadian Population**

TABLE 5

Survival Rates (Percentage) for Hospitalized Patients Experiencing an Acute Myocardial Infarction (AMI) in 1981

	AGE Group	n	Day(s) after AMI episode 1	Day(s) after AMI episode 14	Year(s) after AMI episode 1	Year(s) after AMI episode 5
Nova Scotia						
Males	25-54	341	96.5	90.3	87.4	86.2
	55-74	805	97.0	86.0	78.6	74.3
Females	25-54	64	98.4	87.5	84.4	81.3
	55-74	370	96.3	82.4	74.3	71.9
Saskatchewan						
Males	25-54	295	94.9	89.8	92.9	89.8
	55-74	864	94.6	85.5	80.9	75.6
Females	25-54	57	91.2	84.2	84.2	84.2
	55-74	353	93.8	87.3	75.6	70.5

n: Number of participants

SOURCE: The Nova Scotia-Saskatchewan Cardiovascular Disease Epidemiology Group
Can J Cardiol 1992;8:253-8

4. DISABILITY FROM CARDIOVASCULAR DISEASE

About 20% of disability pensions paid by the Canada Pension Plan in 1992 to individuals up to age 65 were for cardiovascular disease, second only to payments for musculoskeletal disability (34%).[1] This proportion has been decreasing by approximately 1% per year in recent years. Sixty percent (60%) of the cardiovascular disease pensions are related to ischemic heart disease, of which heart attack is only a small proportion (2.4%) while 20% of cardiovascular disease pensions are related to stroke.[22]

5. UTILIZATION OF HEALTH SERVICES

5.1 Hospitalization

Cardiovascular disease has a significant impact on Canada's health care system. In year 1989-90, it accounted for 12% or 426,000 of all hospital admissions, unchanged from that in 1986-87, but increased from 414,000 admissions in 1983-84 (Figure 14).[1] Of the admissions, 37% were for ischemic heart disease (13% for acute myocardial infarction), 15% for stroke and 48% for other cardiovascular diseases.[1]

Almost 20% of all patient days in hospital, a total of 8 million in 1990, were for the treatment of cardiovascular disease.[5] For men and women respectively, 40% and 45% of these cardiovascular disease patient days are a result of stroke, 26% and 19% for ischemic heart disease and 11% and 7% for heart attack. Thus, although stroke is responsible for only 19% of cardiovascular disease mortality, it accounts for nearly half of the patient days in hospital for cardiovascular disease.

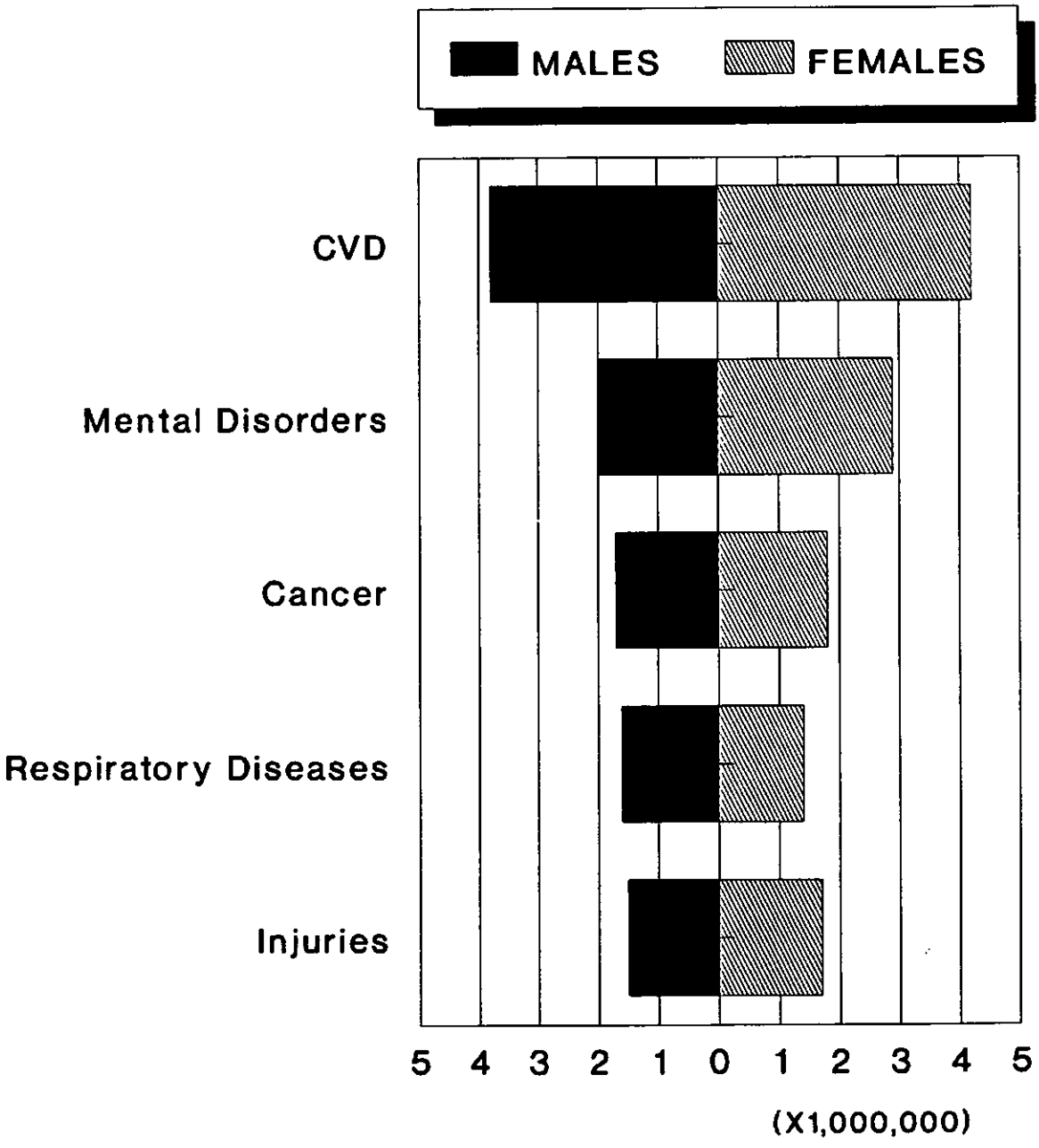
Patients with cardiovascular disease have a longer length of stay (19 days) than the average for all causes (11 days) with striking differences between the young (35-64 years) and older (65+ years) age groups (11 days versus 24 days, respectively). The average length of hospital stay is 17.1 days for males and 26 days for females. This difference may reflect the older age of women and the greater percentage of patients suffering from stroke.[1]

5.2 Physician Consultation

Canadians make more than 182 million visits to physicians each year[1], it is estimated that more than ten percent (10.2%) of these visits are due to cardiovascular disease (Table 6). Of these cardiovascular disease-related visits, nearly half (44%) are for the management of high blood pressure, 13% for ischemic heart disease, 7% for angina pectoris, and 36% for other cardiovascular disease.[23]

FIGURE 14

Hospital Days for Major Causes by Sex, Canada, 1989/1990



SOURCE: Laboratory Centre for Disease Control
Health and Welfare Canada

5.3 Ischemic Heart Disease-Related Procedures

The rates of performance of both coronary artery bypass (CAB) surgery and angioplasty have increased substantially during the past decade (Figure 15). A total of 11,322 CAB surgical procedures (42.6 per 100,000 population) and 8,791 angioplasties (33.1 per 100,000 population) were performed in Canada in the 1989-90 year.[1] In Canada in January, 1990, 4,495 patients were awaiting CAB surgery and 852 awaiting angioplasty. The average waiting time was 22.6 and 11.0 weeks respectively for these procedures.[24]

Women undergoing coronary balloon angioplasty[25] have been found to have a lower success rate and a higher hospital mortality than men.[26] However, if the angioplasty is successful, the long-term outlook for women appears better than for men. In Canada, men are three times more likely than women to be referred for angioplasty.[18]

CAB surgical rates are highest in the age groups 55-64 and 65-74 and are considerably higher in males than females (Table 7).[27] Women have a higher post-operative death rate than men following coronary artery bypass surgery. Studies suggest that women experience a 60 to 400% greater in-hospital death rate, but a rate following discharge that is no different from that of men.[28] A smaller body size and greater average age have been suggested as reasons for the higher death rate in women. In Canada, a man is five times more likely than a woman to be treated with bypass surgery. This difference most likely reflects the higher incidence of coronary artery disease in men at younger ages, but may represent a bias in the selection of surgical candidates.[18,29] CAB surgical rates have particularly increased in the elderly population.[30] As greater numbers of Canadians enter the 55-74 year age group during the coming decades, the number of these surgical procedures performed annually is expected to rise.

There is considerable variation in the cost for CAB surgery. For example, at the Vancouver General Hospital in 1989, total inpatient costs for CAB surgery were found to vary from $10,982 to $33,676 per case (mean $14,328). Cost tends to increase with the patient's age and the number of vessels grafted. The change in the mean age of CAB patients from 52.2 to 61.1 years between 1975 and 1985 may account, in part, for the cost increase observed in that decade.[31]

5.4 Utilization of Pharmaceuticals

Prescription drugs for the treatment of cardiovascular disease are estimated to account for 12.5% of the total 211,779,000 prescriptions dispensed in Canada in 1991 (Table 8).[23] Beta-blocking agents are the most frequently prescribed, comprising 24.5% of the estimated 26.4 million prescriptions dispensed for the treatment of cardiovascular disease. This is followed by calcium channel blocking agents (23.3%), angiotensin converting enzyme inhibitors (16.7%), vasodilators (14.3%), digitalis preparations (10.9%) and other agents (10.4%). Diuretics, most of which are utilized in the treatment of cardiovascular disease, account for a further small percentage (4.6%) of prescription drugs dispensed in Canada. During the past five years, the use of calcium channel blocking agents and angiotensin converting enzyme inhibitors has increased, whereas that of beta-blocking agents, vasodilators, digitalis preparations and diuretics has decreased.[23,32]

TABLE 6

Numbers and Percentage of Physician Visits per Diagnostic Category* Canada, 1991

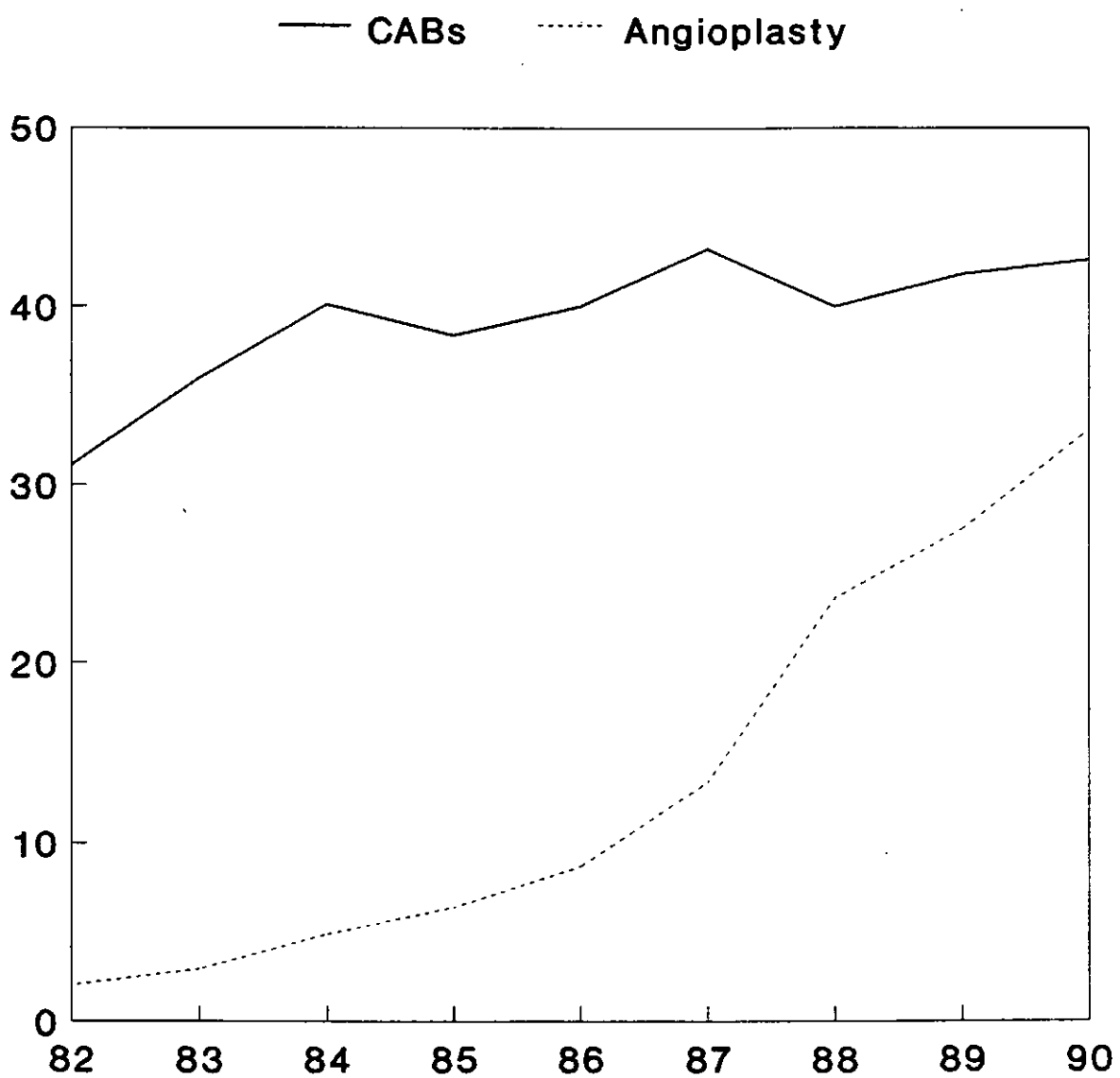
Diagnostic Category (ICD-9)	Estimated Number (Millions)	Percentage
Respiratory Diseases(460-519)	25.0	13.7
Cardiovascular Diseases(390-459)	18.6	10.2
Central Nervous System Disorders(320-389)	15.7	8.6
Mental Disorders(290-319)	13.7	7.5
Musculoskeletal Disorders(710-39)	14.0	7.7
Injury & poisoning(800-999)	10.8	5.9
Genito-Urinary Diseases(580-629)	11.1	6.1
Skin Diseases(680-709)	8.9	4.9
Digestive Diseases(520-79)	9.7	5.3
Endocrine/Immune Disorders(240-79)	9.5	5.2
Infective/Parasitic Diseases(001-139)	6.9	3.8
Neoplasms(140-239)	5.8	3.2
Other Categories	32.6	17.9
TOTAL	182.4	100

SOURCE: Intercontinental Medical Statistics (IMS)
Canadian Centre for Health Information
Statistics Canada

* **Percentage drawn from the Canadian Disease and Therapeutic Index of IMS, Montreal, Quebec. The database is comprised of self-reported practice patterns of a representative sample of 652 office-based family physicians and specialists throughout Canada surveyed four times per year. Estimated number of physician visits calculated from the physician claims data of Statistics Canada.**

FIGURE 15

Coronary Artery Bypass Surgery (CABS) and Angioplasty, Age-Standardized Rates, per 100,000 Canada, 1982-90*



SOURCE: Canadian Centre for Health Information
Statistics Canada

* **1982 refers to fiscal year 1981/1982, etc.**

TABLE 7

Age-Specific Coronary Artery Bypass Surgery Rate, per 100,000, Six Year Average Annual Rate, Canada, 1981-87

	AGE GROUP			
	35-54	55-64	65-74	75+
MALES	86	289	238	51
FEMALES	11	64	78	15

SOURCE: Canadian Centre for Health Information
Statistics Canada

6. ECONOMIC IMPACT OF CARDIOVASCULAR DISEASE

6.1 Direct and Indirect Costs

Cardiovascular disease has significant economic impact in Canada as measured by direct and indirect costs. Direct costs refer to the value of resources actually expended that could have been allocated elsewhere. Indirect costs are those equalling the value of lost productivity due to illness or disability, and the loss of future earnings by people who die prematurely.

Cardiovascular disease is responsible for 21% of the total costs of illness in Canada in 1986. Of the $16.8 billion attributable to cardiovascular disease, direct cost comprise $5.2 billion, whereas indirect costs comprise $11.6 billion (Figure 16).[33]

The sources of the direct and indirect costs of cardiovascular disease are illustrated in Figure 17. Direct costs comprise those for hospital expenditures, medical care, pensions and benefits, research and drugs. Indirect costs comprise those due to premature mortality and chronic and short-term disability. The loss of future earnings of people who die prematurely is a major component of indirect costs. Cardiovascular disease is responsible for the greatest proportion (32%) of total future earnings lost due to premature death, followed by cancer (27%). Cardiovascular disease accounts for 17% of lost productivity due to disability, while musculoskeletal injuries account for 32%. Twenty-one percent of hospital operating expenditures and 9% of medical care expenditures are spent on the care of cardiovascular disease patients.

7. RISK FACTORS FOR CARDIOVASCULAR DISEASE

Considerable research has identified major risk factors for cardiovascular disease.[34] Some factors such as family history of cardiovascular disease, age and male sex are "non-modifiable". Others such as smoking, high blood pressure, elevated blood cholesterol, diabetes, physical inactivity and obesity are considered "modifiable" through individual behaviour change or treatment.

As part of the Canadian Heart Health Initiative[35], the prevalence of cardiovascular disease risk factors in Canadian adults has been determined using a standardized methodology.[36] Nearly 30,000 Canadian adults between the ages of 18 and 74 were surveyed and the results from nine provinces have been reported.[37]

TABLE 8

Pharmaceutical Prescriptions Dispensed by Type of Drug*, Number and Percentage, Canada, 1991

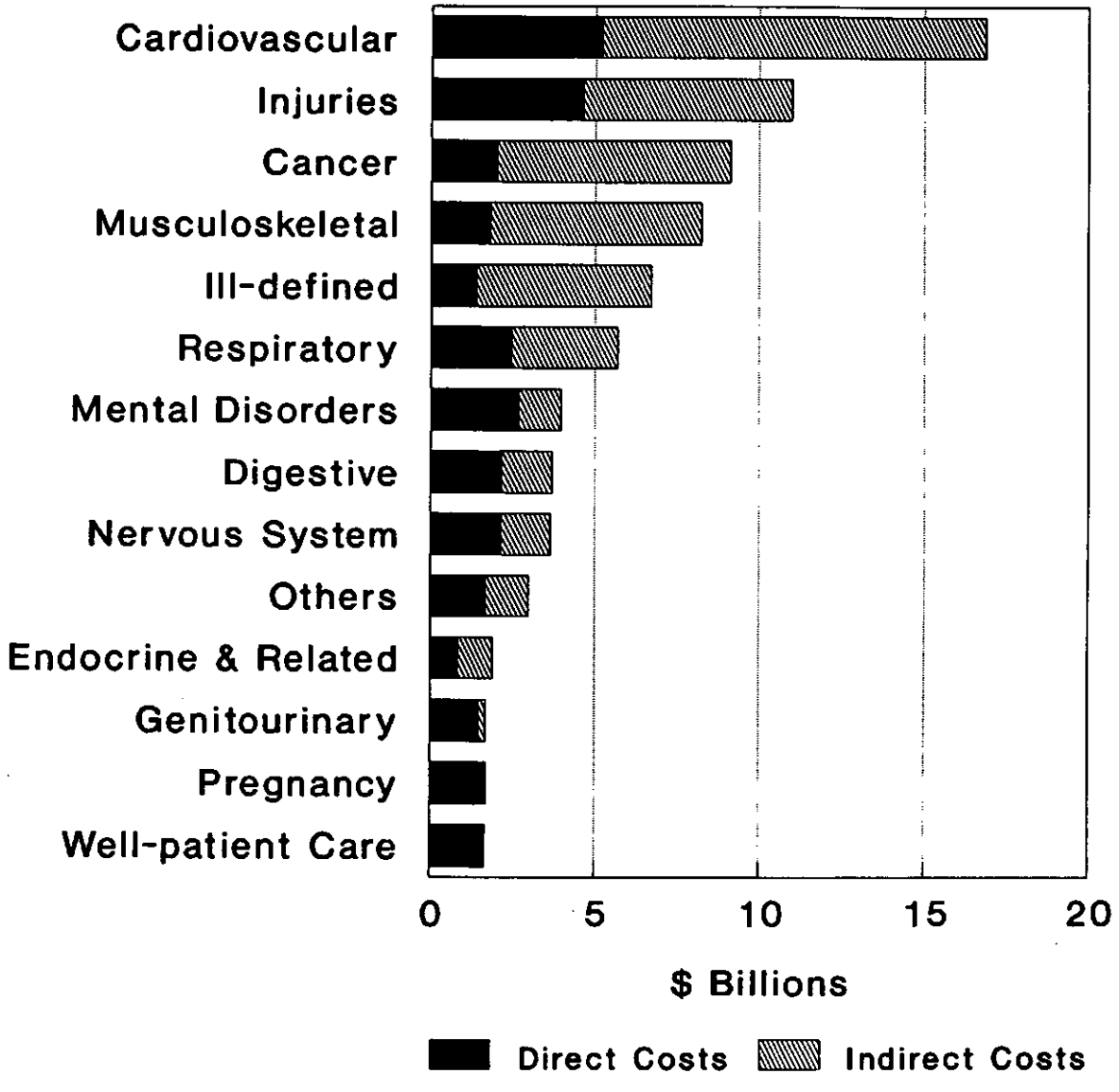
Type of Drug	Estimated Number (Millions)	Percentage
Cardiovascular	26.4	12.5
Anti-infectives	24.6	11.6
Psychotherapeutics	20.3	9.6
Analgesics	18.6	8.8
Hormones	14.1	6.7
Contraceptives	9.5	4.5
Diuretics	9.8	4.6
Antiarthritics	10.4	4.9
Others	78.1	36.8
TOTAL	**211.8**	**100.0**

SOURCE: Intercontinental Medical Statistics (IMS)

* **Data drawn from the Canadian Compuscript Audit of IMS, Montreal. The database is comprised of the dispensing patterns of a representative sample of 1500 retail pharmacies throughout Canada collected on a continual basis.**

FIGURE 16

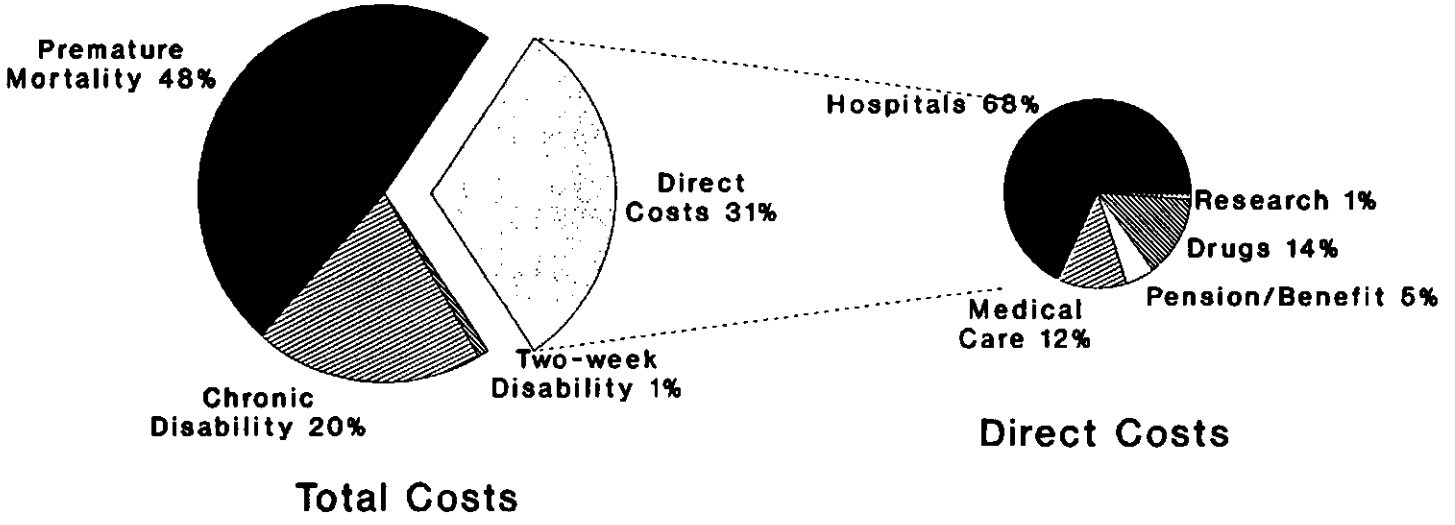
Cost of Illness by Disease Category, Canada, 1986



SOURCE: Laboratory Centre for Disease Control
Health and Welfare Canada

FIGURE 17

Economic Impact of Cardiovascular Disease, Canada, 1986



SOURCE: Laboratory Centre for Disease Control
Health and Welfare Canada

7.1 Blood Pressure

High blood pressure is an independent risk factor for cardiovascular disease.[38,34] Sixteen percent (16%) of Canadian men and 13% of women are considered to have high blood pressure (diastolic blood pressure of 90 mm Hg or greater and/or undergoing treatment) (Table 9).[39]

At age 18, 2% of men and 1% of women have high blood pressure. From that age on among men, there is a steady increase in the prevalence of high blood pressure until age 64 after which a decrease is observed. In women, the increase in prevalence is steady to age 74. After the age of 55, the prevalence of high blood pressure is greater in women than men.

Twenty-six percent (26%) of individuals with high blood pressure are unaware of their condition. Of those aware, only 57% are treated and controlled (diastolic blood pressure <90 mm Hg). Women are generally more likely than men to be aware that they have high blood pressure, and more likely to have their blood pressure under control if it is treated.[39]

7.2 Blood Cholesterol

A 2% decrease in ischemic heart disease has been associated with a 1% lowering of blood cholesterol in middle aged men.[40] Forty-eight and forty-three percent (48% and 43%) of men and women respectively, have elevated total plasma cholesterol ($\geq$ 5.2 mmol/L) (Table 9) and 18% and 16% of men and women respectively, are in a high risk category ($\geq$ 6.2 mmol/L).[41] In men, there is a rapid increase in prevalence of elevated total cholesterol from age 18 to 44, whereas in women, the rise is more gradual until age 44 when it dramatically increases to exceed the men's rate at age 55.

Elevated low density lipoprotein cholesterol (LDL-C) and decreased high density lipoprotein cholesterol (HDL-C) are more precise indicators of ischemic heart disease risk than total blood cholesterol.[42] Measurement of these lipid fractions may identify additional people at risk and at the same time prevent the entry into treatment of individuals who have elevated total cholesterol but low LDL-cholesterol and high HDL-cholesterol. Forty percent (40%) of men and 32% of women have elevated LDL-C ($\geq$ 3.4 mmol/L) and 13% and 4% of men and women respectively, have depressed HDL-C levels (<0.9 mmol/L).[41] While elevated LDL-C cholesterol and low HDL-C are risk factors for ischemic heart disease in both men and women, a consistent association between high triglyceride levels and IHD has been found only in women. In general, when HDL-C is taken into account, triglyceride levels do not improve the prediction of CVD, however in women with low levels of HDL-C, high triglyceride levels have been associated with increased risk of ischemic heart disease.[43,44,45]

TABLE 9

Prevalence of Cardiovascular Disease Risk Factors [a] (Percentage of Individuals)*

MALES

Risk Factor	18-24	25-34	35-44	45-54	55-64	65-74	TOTAL
Smoking[b]	33	35	32	31	22	16	30
High Blood Pressure[c]	2	9	15	25	33	27	16
Elevated Blood Cholesterol[d]	14	34	58	65	61	65	48
Obesity[e]	18	27	37	45	47	39	35
One or More Risk Factors[f]	39	57	72	80	79	80	64
Two or More Risk Factors[f]	5	17	28	34	30	24	22

FEMALES

Risk Factor	18-24	25-34	35-44	45-54	55-64	65-74	TOTAL
Smoking[b]	32	34	33	26	18	12	28
High Blood Pressure[c]	1	3	6	19	32	38	13
Elevated Blood Cholesterol[d]	18	23	31	60	81	80	43
Obesity[e]	13	19	27	32	42	45	27
One or More Risk Factors[f]	41	49	56	74	89	89	63
Two or More Risk Factors[f]	6	9	14	28	36	37	19

a. Prevalence in all Canadian provinces excluding Ontario

b. Regular cigarette smoker: one or more cigarettes per day

c. Diastolic blood pressure $\geq$ 90mmHg and/or pharmacologic or non-pharmacologic treatment

d. Total plasma cholesterol $\geq$ 5.2mmol/L

e. Body Mass Index $\geq$ 27; Body Mass Index = Weight in kg/(Height in meters)^2

f. Major risk factors: regular smoker, high blood pressure, elevated total plasma cholesterol

SOURCE: Canadian Heart Survey Group. Can Med Assoc J 1992;146:1969-2029

* **Age standardized to 1986 Canadian population.**

7.3 Smoking

Smoking is believed to account for up to 17% of deaths from cardiovascular disease.[46] Twenty-nine percent (29%) of Canadian adults are regular cigarette smokers (one or more cigarettes per day) (Table 9).[47] Although there is little difference in the overall smoking rates between sexes, there are more male smokers over the age of 45. Men are also heavier smokers with an average of 21.1 cigarettes smoked per day compared to 18.6 smoked by women.

The percentage of smokers with a sedentary lifestyle is higher than non-smokers. Fewer smokers than non-smokers are overweight. Among smokers, the percentage who are overweight rises with the number of cigarettes smoked per day.[47] The U.S. Nurses Health Study[48] found that women who were heavy smokers (25 and more cigarettes per day) compared to non-smokers had a relative risk of 5.5 of dying from ischemic heart disease and a relative risk of 5.8 of suffering a nonfatal heart attack. Women who were heavy smokers and using oral contraceptives were more than 20 times as likely to have a heart attack.

7.4 Obesity

Obesity, especially abdominal obesity, is associated with increased risk of cardiovascular disease.[49,50] Thirty-one percent of Canadian adults are obese (Body Mass Index - BMI- > 27) with the prevalence being greater among men than women (Table 9).[51] With age, the prevalence of obesity increases in both males and females. Yet, for men a decrease is observed following age 65 so that in the 65-74 age group there are more obese women than men.

With obesity there is a rise in the prevalence of an abdominal distribution of fat as measured by waist-hip circumference ratio. A waist-hip ratio of 0.9 for men and 0.8 for women is an indication of abdominal obesity. More men (50%) than women (34%) have abdominal obesity with the prevalence also increasing with age.[51]

Obesity and an abdominal fat distribution are associated with an increased prevalence of diabetes, high blood pressure and elevated plasma cholesterol. The prevalence of high blood pressure is more than doubled among individuals with abdominal obesity.[51]

7.5 Physical Inactivity

Physical inactivity is recognized as a major cardiovascular disease risk factor.[52] The *1988 Campbell's Survey of the Well-Being of Canadians* is part of a longitudinal study examining physical activity and health patterns of Canadians.[53] According to total energy expenditure, 43% of Canadians are regarded as inactive in their leisure time with females being more likely to be inactive. There is a general decline in activity with age except Canadians over 65 are more active than those in the 45-64 age group. During the past 20 years, however, the Canadian population has become generally more active.[53]

Health benefits of exercise are believed to result from 30 minutes or more of exercise every other day, at moderate intensity [54], yet only 11% of Canadians report this level of physical activity.[53]

7.6 Diabetes Mellitus

Overall, 5% of Canadian men and women report having diabetes mellitus. This prevalence ranges from 1% in the youngest (15-34 years) to 12% in the oldest (55-74 years) age groups among men and from 3% to 9% among women respectively.[51] The relative impact of diabetes on death from ischemic heart disease and acute myocardial infarction is greater in women than in men.[55] Diabetic women suffer from ischemic heart disease at rates similar to non-diabetic men. In studies of the prognosis following myocardial infarction, diabetic women have been observed to have a consistently worse outcome than diabetic men.[56]

7.7 Hormonal Risk Factors

Oral contraceptive and estrogen replacement therapy are of special concern for women. Oral contraceptives result in a three - to four - fold increase in risk of both fatal and non-fatal myocardial infarction.[57] Since young healthy women have a low risk of myocardial infarction, the absolute increase in risk is not great. However the risk increases with age and the simultaneous presence of other risk factors. Concurrent smoking and oral contraceptive use, for example, substantially elevates the risk of myocardial infarction.[28]

In contrast to oral contraceptives, postmenopausal estrogen replacement therapy (ERT) seems to have a protective effect. Women who used estrogen for menopausal symptoms had one-third to one-half the risk of fatal and non-fatal heart attacks of those who did not.[58] However, since it is found that estrogen taken alone increases the risk of endometrial cancer, it has been recommended that estrogen be combined with low dose progestin in this setting.[59]

7.8 Multiple Risk Factors

The hallmark of CVD risk is that the presence of more than one cardiovascular disease risk factor acts synergistically on overall cardiovascular disease risk. Even moderate elevations in more than one risk factor may increase cardiovascular disease risk.[60]

Sixty-four percent (64%) of Canadian adults have one or more of the cardiovascular disease risk factors (high blood pressure, elevated blood cholesterol and regular smoking) and 21% have at least two (Table 9).[61] The prevalence of at least one risk factor increases substantially with age until it plateaus in men at age 45 and in women at age 55. Men, aged 45-54 and women, aged 65-74 years of age had the highest occurrence of two or more risk factors (34% and 37% respectively).

7.9 Public Knowledge on Causes of Cardiovascular Disease

More than 90% of Canadians recognize that heart disease is preventable. However, the majority do not recognize the specific risk factors (Table 10).[47,61] Smoking was one of the most commonly reported risk factors associated with cardiovascular disease and was reported more often by smokers than by non-smokers.[47]

7.10 Socioeconomic Status and Risk Factors

Prevalence and awareness of risk factors varies with socioeconomic status. Canadians with a lower level of education (a proxy measure of socioeconomic status) are more likely to have risk factors for cardiovascular disease (Table 11)[61] yet are less likely to identify these as risk factors (Table 10). Lower and upper socioeconomic groups differ most noticeably in their awareness of high blood pressure and high blood cholesterol as CVD risk factors.

8. PREVENTION OF CARDIOVASCULAR DISEASE

8.1 Opportunities for Prevention

It has been estimated that 54% of the decline in ischemic heart disease mortality observed in North America in recent decades may be due to changes in lifestyle, 39.5% may be the result of medical intervention and the remainder (6.5%) unexplained.[4,46] Studies in Canada and the United States estimate that as much as 30% of cardiovascular disease mortality is attributable to elevated blood pressure, 19% to diabetes, 17% to smoking and 15% to elevated serum cholesterol.[46]

Optimal prevention requires the use of primary, secondary and tertiary prevention strategies. "Primary" prevention, by risk factor modification, can reduce disease incidence; "secondary" prevention, through early identification and management of the disease states, can increase survival; whereas "tertiary" prevention, through the rehabilitation from established disease, can further reduce disability and suffering, and so enhance individual quality of life.

Primary prevention of cardiovascular disease involves a three-pronged strategy that includes: a general population approach; targeting those at high risk; and managing the psychosocial determinants of cardiovascular disease.[35,62] Within Canada, the differences in incidence and mortality rates that are observed between provinces leads one to believe that opportunities exist for enhanced prevention.[63] Internationally, the Stanford Five City, the North Karelia, Heartbeat Wales and other projects have convincingly demonstrated that effective CVD prevention can result from programs that are community-based and are targeted at both the general population and to individuals at 'high risk' of cardiovascular disease.[64,65,66]

8.2 The Role of Research

Although cardiovascular disease constitutes one of the major health problems in Canada, funding allocation for research ($53 million, 1986-87 year) does not reflect this, and lags behind that for endocrine disorders ($72 million) and cancer ($54 million).[33]

Death rates for cardiovascular disease are declining, while the economic costs of cardiovascular disease are increasing. The challenge is not only to improve the quality of care and quality of life of diseased individuals but also to reduce the incidence of the disease so as to minimize its social and economic costs.

TABLE 10

Percentage of Individuals Mentioning Selected Risk Factors as Causes of Heart Disease by Years of Education*†

	YEARS OF EDUCATION						
	MEN			WOMEN			TOTAL
Risk factor	≤ 6	7-12	≥13	≤ 6	7-12	≥ 13	
Smoking	34	48	48	32	46	49	47
High Blood Pressure	7	18	20	11	21	24	20
Elevate Blood Cholesterol	12	25	28	12	24	29	25
Obesity	20	28	31	18	35	36	31
Lack of Exercise	20	38	56	16	35	52	40
Stress	28	37	46	30	44	54	44

SOURCE: MacDonald, *et al.* Can Med Assoc J 1992;146:2021-9

* **Data from all Canadian provinces excluding Ontario.**

† **Age standardized to 1986 Canadian population.**

TABLE 11

Percentage of Individuals with One or More Major Risk Factors by Years of Education*

	YEARS OF EDUCATION					
	MEN			WOMEN		
Age (years)	≤ 6	7-12	≥13	≤ 6	7-12	≥ 13
18-24	69	50	28	48	48	35
25-34	79	67	48	55	56	42
35-44	75	76	68	84	59	48
45-54	78	84	77	92	75	67
55-64	76	79	82	90	89	89
65-74	78	80	82	86	89	92
TOTAL	77	72	58	86	67	53

SOURCE: MacDonald, *et al.* Can Med Assoc J 1992;146:2021-9

*** Data from all Canadian provinces excluding Ontario**

8.3 The Canadian Heart Health Initiative

A national approach to heart health developed from the broad consultations carried out by the Federal-Provincial Working Group on Cardiovascular Disease during the mid 1980's is known as the Canadian Heart Health Initiative. With the collaboration of numerous interested health and non-health sectors, a consensus was developed on strategies for cardiovascular disease prevention in Canada. The report of the working group, *Promoting Heart Health In Canada*[67] recommended an integrated multi-factorial approach toward preventable or controllable risk factors by achieving environmental changes favourable to positive lifestyles for heart health.

Promoting Heart Health in Canada serves as the policy blueprint for The Canadian Heart Health Initiative (CHHI). The report's strategic options - public health system leadership; community programs; intersectoral coordination; access to health services; public education and information; and monitoring, evaluation and research - have been adopted as CHHI strategies. This Initiative is a partnership between Health and Welfare Canada and the provincial ministries of health, in collaboration with the Heart and Stroke Foundation of Canada.[35] The CHHI accommodates the fundamental principles of health promotion as described in *Achieving Health for All: A Framework for Health Promotion.*[68]

The main agents of the CHHI are coalitions at national, provincial and community levels. Four phases of the Initiative have been planned.

The first phase, a cardiovascular disease risk factor survey in all 10 provinces, has been completed.

The second phase, currently in progress, involves the development of a national database and the implementation of demonstration heart health programs in each province. The national database documents the Canadian and provincial risk factor profiles as well as the levels of knowledge and awareness of cardiovascular disease. This data base is proving to be instrumental in planning appropriate interventions that will meet the specific needs of Canadian communities. Programs underway include: public and professional education, worksite programs, school health and public policy development.

Evaluation of these programs and the Initiative as a whole comprises the third phase. This will determine the effectiveness of these efforts and demonstrate health promotion opportunities to other Canadian communities.

Diffusion of interventions to communities across Canada is the fourth phase which is envisaged to start in a systematic manner after 1995.

The Heart and Stroke Foundation of Canada and its affiliated provincial foundations play a major role in the prevention of cardiovascular disease in Canada through their substantial support for research, professional education and such public education programs as *Jump Rope for Heart, Know Your Blood Pressure by Heart* and the *Heart Smart* restaurant and cooking program.

8.4 International Heart Health

The Victoria Declaration on Heart Health, issued in May 1992 by the Advisory Board of the International Heart Health Conference, Victoria, B.C., calls upon all professionals, organizations, governmental agencies, communities and individuals to join in a partnership of policy development and program implementation towards heart health promotion and cardiovascular disease prevention.[62]

Using a public health approach to eliminate or reduce risk factors, the Declaration proposes a "four cornerstone approach" to heart health that would extend the benefits of prevention and treatment to all individuals and populations: the promotion of healthy dietary habits; a tobacco-free lifestyle; regular physical activity; and a supportive psychosocial environment.

The Declaration states: "Cardiovascular disease is largely preventable. We have the scientific knowledge to create a world in which heart disease and stroke would be virtually eliminated. We know, from studying the downward trends in cardiovascular disease in many countries, how to reduce its toll". This will necessitate achieving international support for heart health policies that create environments supportive of a healthy lifestyle. It will require education of the public, the involvement of communities in health promotion activities, the encouragement of employers to create healthy work environments and the creation of cardiovascular disease monitoring systems. The development and nurturing of partnerships will be essential to the achievement of these common goals.

9. CARDIOVASCULAR DISEASE IN THE AMERICAS

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9.1 Changes in Profiles

During the last three decades there have been profound changes in the demographic, socioeconomic and epidemiologic profiles of most of the countries in the American continents (the Americas).

In effect, total fertility, infant and total death rates attributable to communicable and deficiency diseases have been declining in practically all the countries, while life expectancy, the size and the average age of the population continues to increase.[69] The population is migrating to urban areas in increasing proportions and experiencing dramatic changes in its lifestyle. As a result, a higher prevalence of risk factors for cardiovascular and other noncommunicable diseases is being documented everywhere.

9.2 The Epidemic

The proportion of deaths attributable to CVD has been steadily increasing in the Americas.[70] Between 1975 and 1985, this proportion increased from 27.2% to 33.0% and currently, in 31 out of 35 countries that report mortality statistics in the Americas, CVD is the leading cause of death.

It is regarded as the most important cause of disability, utilization of health care services, loss of productivity and particularly of deterioration of the quality of life.

The magnitude and severity of the public health problem posed by CVD has exceeded all expectations, particularly in Latin America and the Caribbean where it has emerged at a faster rate than in North America and Western Europe. Thus, cardiovascular disease in a number of American countries can be regarded as a true epidemic.

Nevertheless, the CVD epidemic has not been fully documented and further information is needed in most countries regarding morbidity, disability, costs, prevalence of risk factors, perceptions, attitudes and knowledge of the population about the problem. However, in spite of the limitations affecting the validity of mortality statistics in some countries[69] they have been useful to show the marked differences among the various countries and subregions in respect to onset, pace and some characteristics of the CVD epidemic.

9.3 Mortality Trends

On the basis of the completeness and reliability of their mortality statistics, 15 countries have been selected to illustrate the CVD mortality trends of the various sub-regions of the Americas for the period 1968 to 1987.

Data on the number of deaths by age, sex, country, year and ICD codes (8th and 9th Revisions) collated by the Pan American Health Organization[71] and population data provided by the "Centro Latinoamericano de Demograffa"[72] were used to calculate age adjusted mortality rates per 100,000 population (direct method, using the 1960 continental population as a standard). Among all cardiovascular deaths (ICD-9 390-459), those attributable to ischemic heart disease (ICD-9 410-414) and cerebrovascular disease (ICD-9 430-438) are by far the most important and they are described separately.

To summarize the trends of the 15 countries selected, three-year average rates were compared between two periods: Period 1 (centered around 1968) and period 2 (centered around 1985). While the proportional mortality attributable to CVD is still increasing (because other causes of death are declining), age-adjusted mortality rates are almost invariably on the decline, with very few exceptions.

With the exception of some countries in Central America (Table 12), a decreasing trend is seen for all cardiovascular diseases. Female mortality rates have been lower than those of males in both periods, yet they have experienced a greater decline.

Higher mortality rates in both periods were found in the English-speaking Caribbean, North America and in the Southern Cone subregion, while lower rates were found in the Latin Caribbean and Central America. Two of the countries reporting from Central America, however, are still experiencing an increase in their mortality rates for both men and women.

For ischemic heart disease (Table 13), again the rates for males are higher than those of females, yet the latter have experienced greater declines. High rates in both periods were found in North

America, the English-speaking Caribbean and in the Southern Cone subregion, in that order. It should be pointed out that in Central America, Colombia, Barbados and the Dominican Republic, even though the rates are relatively low, they continue to increase for both men and women. For cerebrovascular disease (Table 14), the highest rates were found in the English-speaking Caribbean and in the Southern Cone subregion, while North American countries exhibited comparatively lower rates. The difference between both sexes were not as marked, and in some instances female rates are not only higher but also declining at a lower rate.

The differences of timing in the occurrence of the epidemic "waves" are illustrated in Figures 18 and 19, depicting the 20-year mortality trend of ischemic heart disease among males, for five countries located in different subregions. It shows that the decline in mortality began in Canada prior to 1968, while in Chile it began in the early 1970's and in Cuba in the late 1970's. In Cost Rica, the decline began in the mid-1980's while in Mexico the mortality rate was still increasing until 1987.

The data described above indicate that there are significant differences among the various countries and subregions regarding the relative importance of the CVD mortality components and also in their age, sex and time distribution. Ischemic heart disease is quite preponderant among males and females in North America and carries an important weight in male mortality in Argentina, Colombia, Costa Rica, Cuba, Uruguay and Venezuela. In contrast, cerebrovascular disease is comparatively more important among females and even among males, in the English-speaking Caribbean and in some countries of the Southern Cone subregion. This may explain why the male to female mortality ratios are not as large in these countries. The data also suggest, that countries that originally had a higher mortality for CVD began to experience a reduction in their rates earlier, and these are currently declining at a faster rate. Comparatively, countries with lower CVD rates began their decline at a later date, or are still experiencing an increase (such is the case of El Salvador and Guatemala).

Although there seems to be a relationship between the trends of CVD, of other non-communicable disease mortality and the levels of the so-called "demographic transition"[69], it is obvious that a myriad of different factors are determining the diversity of these trends. At the moment, there is insufficient information to elucidate whether the differences are due to genetic factors, the prevalence of precursor risk factors, particularly diet, or the effectiveness of prevention and treatment programs. One may attribute at least a proportion of cerebrovascular disease mortality to the burden of untreated hypertensive disease in various countries.

The declining mortality trends indicate that the problem can be abated, and since sufficient scientific knowledge and experience are available, the prospects for prevention and control are encouraging.

TABLE 12

Age-Adjusted Mortality Rates Attributable to All Cardiovascular Disease, per 100,000 Males and Females, by Country and Subregion*[71,72]

COUNTRY	MALES Period 1	MALES Period 2	MALES %	FEMALES Period 1	FEMALES Period 2	FEMALES %
Andean Area						
Colombia	167.8	165.9	-1.1	158.3	135.1	-14.8
Venezuela	190.3	146.6	-23.0	146.4	115.3	-21.2
Southern Cone						
Argentina	234.5	206.5	-11.9	143.5	130.7	-8.9
Chile	173.2	126.1	-27.2	144.0	91.8	-36.3
Uruguay	207.8	162.0	-22.0	142.8	112.0	-21.6
Central America						
Costa Rica	136.9	124.1	-9.3	124.9	87.1	-30.3
El Salvador	59.3	113.7	**91.7**	60.7	95.8	**57.8**
Guatemala	65.9	80.0	**21.4**	66.2	73.5	**11.0**
Mexico	108.8	98.7	-9.3	112.7	85.8	-23.9
Latin Caribbean						
Cuba	167.7	140.3	-16.3	143.6	116.7	-18.7
Dom. Republic	99.3	143.9	-9.8	95.0	129.1	-35.9
English Caribbean						
Barbados	197.5	154.6	-21.7	135.6	106.0	-21.8
Trinidad & Tobago	306.8	218.4	-28.8	229.6	162.7	-29.1
North America						
Canada	205.1	134.5	-34.4	117.0	76.5	-34.6
United States	253.5	161.6	-36.3	145.8	98.3	-32.6

* **Change in percent between three-year period 1 (around 1969) and three-year period 2 (around 1986).**

TABLE 13

Age-Adjusted Mortality Rates Attributable to Ischemic Heart Disease, per 100,000 Males and Females, by Country and Subregion* [71,72]

COUNTRY	MALES			FEMALES		
	Period 1	Period 2	%	Period 1	Period 2	%
Andean Area						
Colombia	51.2	63.7	**24.4**	37.9	41.4	**9.2**
Venezuela	89.1	67.6	-24.1	56.7	42.3	-25.4
Southern Cone						
Argentina	108.3	55.2	-49.0	53.3	25.1	-52.9
Chile	68.0	54.1	-20.4	46.7	32.7	-30.0
Uruguay	103.3	66.9	-35.5	57.1	33.8	-40.8
Central America						
Costa Rica	53.4	71.2	**33.3**	39.3	41.7	**6.1**
El Salvador	14.7	37.2	**153.1**	13.0	24.7	**90.0**
Guatemala	10.1	25.2	**152.5**	7.1	16.5	**132.4**
Mexico	31.9	33.5	**5.0**	22.8	19.7	-13.6
Latin Caribbean						
Cuba	93.5	86.5	-7.4	68.2	63.7	-6.5
Dom. Republic	31.3	41.7	**33.2**	22.0	30.3	**37.7**
English Caribbean						
Barbados	38.7	41.0	**5.9**	18.2	23.7	**30.0**
Trinidad & Tobago	105.4	104.5	-0.9	61.8	65.0	**5.2**
North America						
Canada	152.3	97.1	-36.2	71.1	45.7	-35.7
United States	187.9	97.3	-48.2	92.1	50.0	-45.7

* **Change in percent between three-year period 1 (around 1969) and three-year period 2 (around1986).**

TABLE 14

Age-Adjusted Mortality Rates Attributable to Cerebrovascular Disease, per 100,000 Males and Females, by Country and Subregion* [71,72]

COUNTRY	MALES Period 1	MALES Period 2	MALES %	FEMALES Period 1	FEMALES Period 2	FEMALES %
Andean Area						
Colombia	37.3	41.4	**10.9**	41.4	41.2	-0.4
Venezuela	38.3	36.1	-25.3	44.6	34.5	-22.6
Southern Cone						
Argentina	59.0	46.4	-21.4	43.7	33.6	-23.1
Chile	56.1	44.0	-21.6	52.5	36.0	-31.4
Uruguay	61.8	47.0	-23.9	56.1	45.5	-18.9
Central America						
Costa Rica	36.0	30.1	-16.4	36.4	26.2	-28.0
El Salvador	27.8	31.1	**11.9**	27.2	31.1	**14.3**
Guatemala	16.8	16.7	-0.6	17.8	20.0	**12.4**
Mexico	31.3	23.7	-24.3	34.8	23.0	-33.9
Latin Caribbean						
Cuba	45.9	33.9	-26.1	46.3	32.0	-30.9
Dom. Republic	33.4	37.6	**12.6**	35.6	35.8	**0.6**
English Caribbean						
Barbados	79.9	55.9	-30.0	57.9	38.4	-33.7
Trinidad & Tobago	98.1	64.9	-34.3	84.3	55.2	-34.5
North America						
Canada	36.1	19.7	-45.4	31.9	17.8	-44.2
United States	44.2	20.2	-54.3	37.8	18.8	-50.3

* **Change in percent between three-year period 1 (around 1969) and three-year period 2 (around 1986).**

FIGURE 18

Ischemic Heart Disease Mortality
Males, 1968-1987 [71,72]

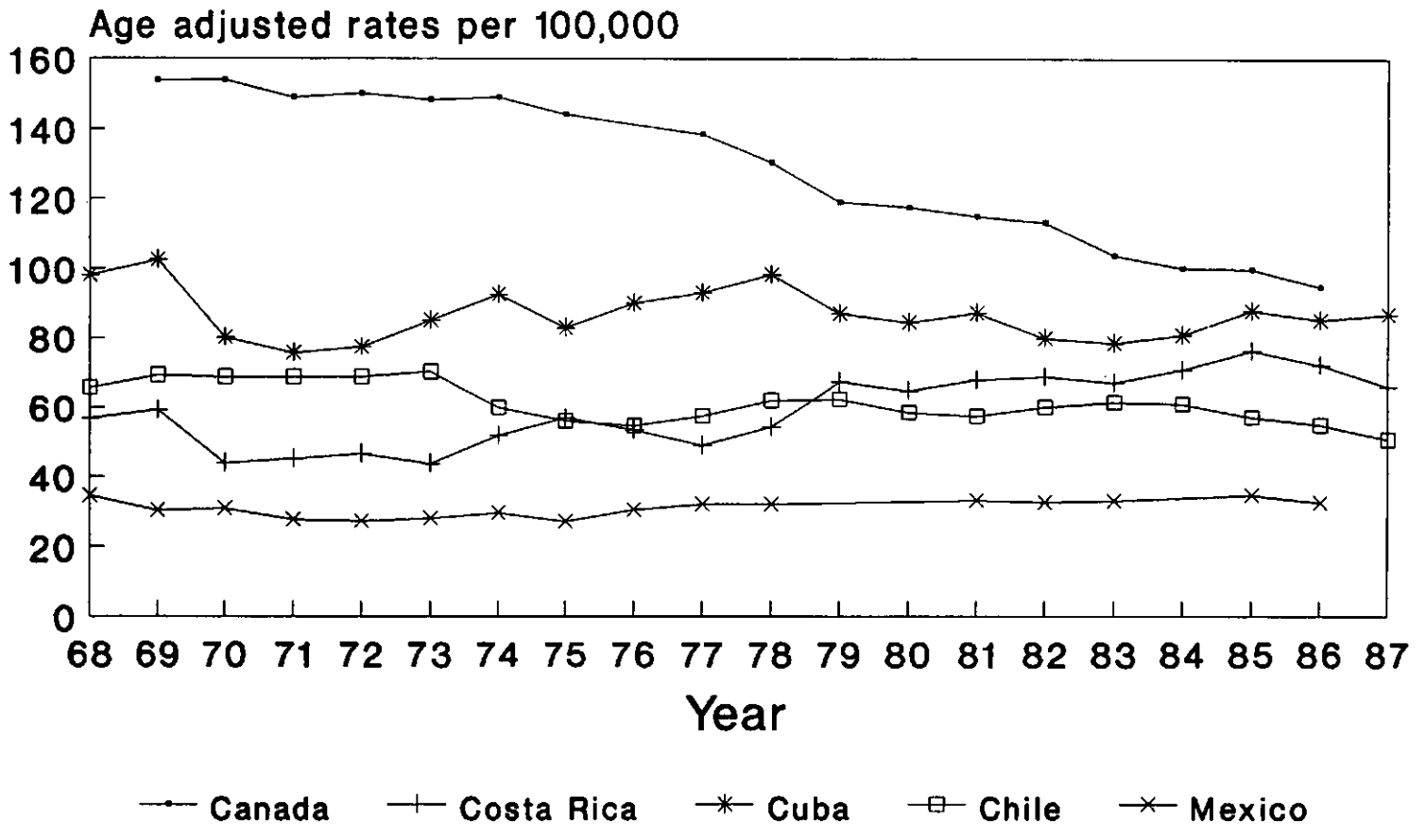
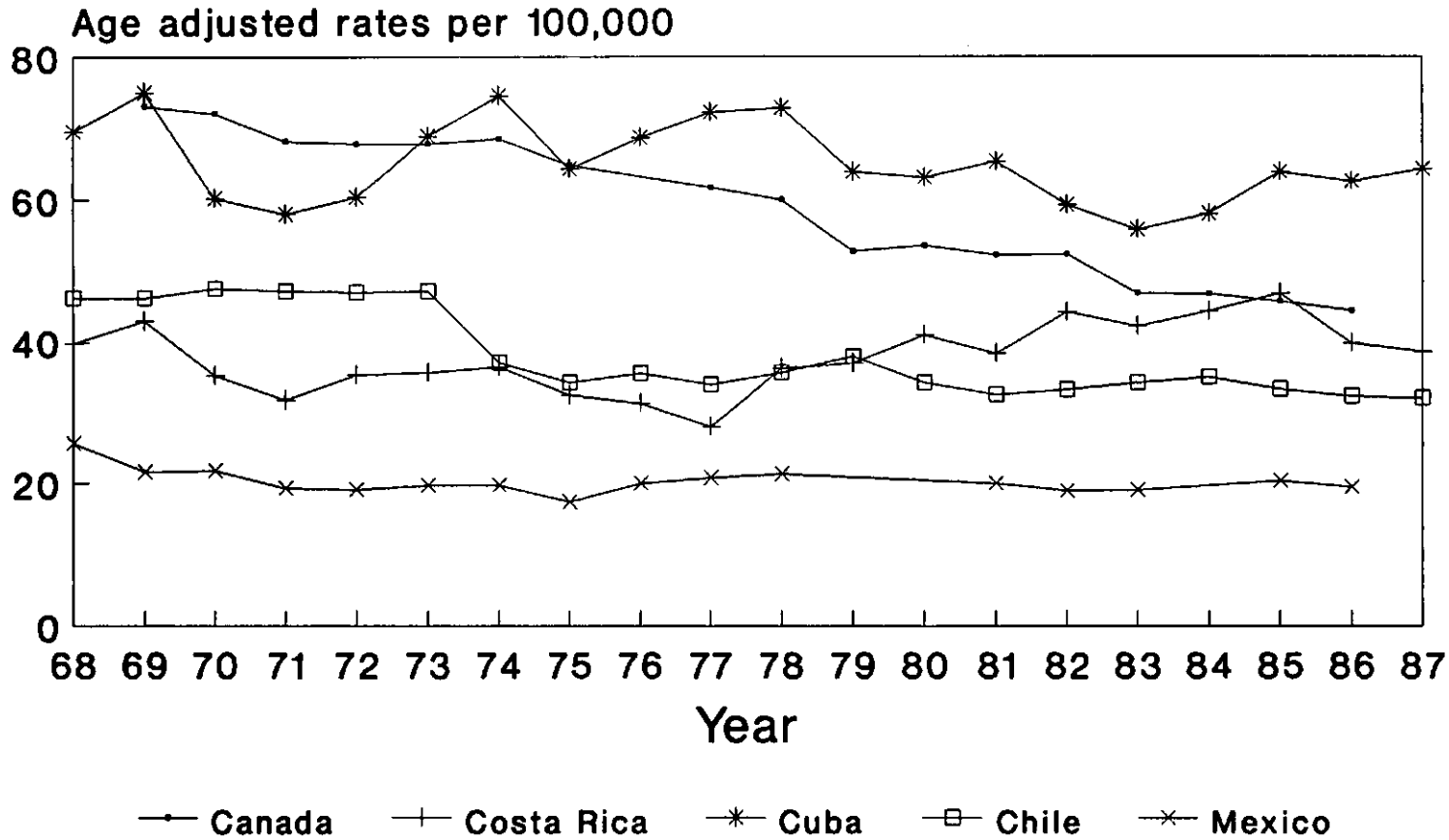


FIGURE 19

Ischemic Heart Disease Mortality, Females, 1968-1987[71,72]



10. 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.

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

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

HIGH BLOOD PRESSURE: High blood pressure is defined as diastolic blood pressure equal to or greater than 90 mm HG 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

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

INCOME QUINTILES: Five approximately equal sized groups of census tracts ranked according to the percentage of population below Statistics Canada's low-income cut-off (See Wilkins, Adams, & Brancker, Health Reports, 1(2):137-174, 1989.)

INJURIES: The category "injuries" includes intentional (homicides, suicides, etc.) and unintentional (falls, motor vehicle accidents, poisonings, etc.) injuries. It is based upon ICD-9 (external causes of injury) E800-E999 and ICD-9 (nature of injury) 800-999.

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.

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

PHYSICAL INACTIVITY: In the Canada Fitness Survey, 1981, 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 70 being considered premature. Since the average life expectancy for males is 71 years, and 79 years for females, death prior to age 70 can be considered premature for both males and females.

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.

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.

STROKE: (ICD-9 430-438) Sudden development of a focal neurologic deficit due to disease of one or more blood vessels of the brain.

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

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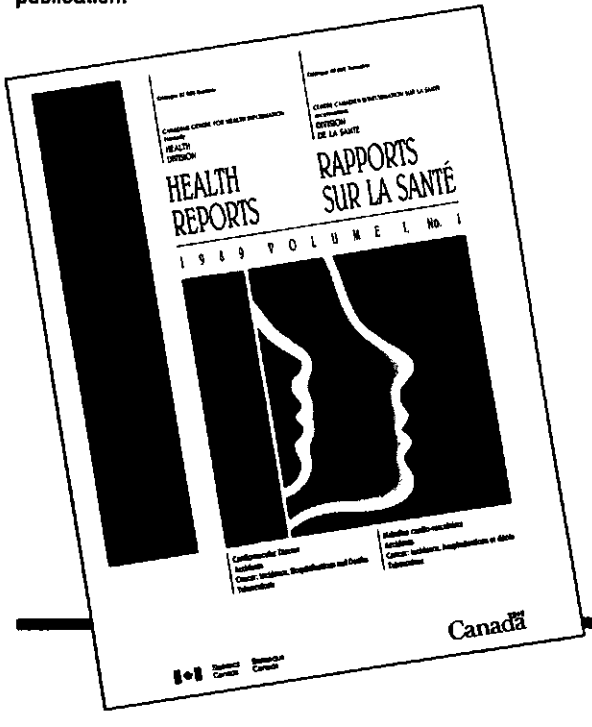

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