

WOMEN, HEART DISEASE AND STROKE IN CANADA:



Issues and Options



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The Heart and Stroke Foundation of Canada (HSFC) is dedicated to furthering the study, prevention and reduction of disability and death from heart disease and stroke through research, education and the promotion of healthy lifestyles.

While it is becoming more recognized that women are vulnerable to cardiovascular disease (CVD), albeit with a later age of onset than men, it is not widely known that each year nearly as many women as men die from CVD in Canada. Since the 1960s, mortality from CVD has been declining in women of all ages – however, the increase in smoking by younger women raises concerns about an increased burden of disease, particularly of CVD, in years to come.

HSFC hopes that this discussion document will assist the heart health community in its efforts to design and implement research, intervention and policy initiatives to further the heart health of Canadian women.

Acknowledgements

This document is based on a report prepared for the Heart and Stroke Foundation of Canada by Dr. Ron Plotnikoff.

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WOMEN, HEART DISEASE AND STROKE IN CANADA: EXECUTIVE SUMMARY

Cardiovascular diseases (CVD) are the leading causes of mortality for both men and women, in Canada and throughout most of the industrialized world. The problem of CVD for Canadian women is especially pronounced; 41% of all deaths of Canadian women are CVD-related, compared to 37% for men.

CVD includes myocardial infarction, ischemic heart disease, valvular heart disease, peripheral vascular disease, arrhythmias, high blood pressure and stroke.

Heart health is as much an issue for women as for men. While the rates of heart disease and stroke are comparable in both sexes, the diseases usually occur a decade later in women. Indeed, despite recent gains in the prevention and treatment of CVD, ischemic heart disease ranks first and stroke second for all-cause mortality in Canadian women by specific disease. In 1993, the direct costs for treating Canadian women reached \$725 million for heart disease, and \$777 million for stroke.

Although the risk factors for heart disease and stroke are well known, a large proportion of Canadian women have not acted to significantly reduce their controllable risk factors for heart disease and stroke. Indeed, the behaviours of many young Canadian women – such as increased smoking among young women – threatens to reverse recent gains in combatting heart disease and stroke.

Furthermore, women tend to be more concerned about cancer than heart disease. Underestimating the seriousness of symptoms, they are also less likely to seek medical attention for angina. This misperception can be reinforced by medical practitioners, who frequently underestimate CVD risk in women. As a result, women are less likely to undergo diagnostic procedures. As well, they may receive less intensive treatment.

At greater risk are women with low levels of education, low income, and low control over their work environment. These women are more likely to smoke and to be both sedentary and obese. As well, visible minority women are also more at risk, notably South-Asian and Black women.

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 Canadian female population with respect to stroke has decreased noticeably, whereas the difference for ischemic heart disease has remained the same. The higher prevalence of risk factors for cardiovascular diseases such as high blood pressure, diabetes, obesity and smoking may partly account for this trend.

Opportunities exist, and further action is required, to achieve better heart health outcomes for women, and to build on previous initiatives emerging from the Victoria Declaration on Heart Health (1992). Research, policies and programs to combat heart disease and stroke in women must be integrated and must work synergistically, at all levels, to accomplish our goal of increased heart health for women.

The Individual Context

There are many factors that affect women's behaviours as they relate to heart health. Many women find it hard to adhere to good heart health practices because benefits seem so remote. Many women think of heart disease as "a middle-aged man's disease," and many are unaware of the risk factors for heart disease and stroke. Some women may also lack the opportunity for physical activity and the financial resources to purchase heart healthy foods. Respect for women's health service delivery preferences and self-esteem needs on an individual basis can support women's commitment to heart health.

The Social Context

Family and peers can be powerful determinants of heart healthy behaviour, yet many women have no social or family support systems. Many women's multiple roles of wage-earner, spouse and mother may overwhelm any capacity to make even modest lifestyle changes. Younger women may be too busy to exercise, and older women may find it too difficult to travel to organized activities, or too dangerous to walk in their neighbourhood.

The Community-Organization Context

Schools, workplaces, churches and clubs can contribute significantly to the prevention of heart disease and stroke by providing instruction, support services, physically-enriching environments and social support. Businesses can adopt and promote health and safety policies in the workplace, fund health-promotion programs and adopt non-smoking policies.

The Professional Context

Professional health organizations can provide mechanisms for health promotion. Community-based professional initiatives can target multiple audiences, use diverse communication strategies and focus on multiple health-related outcomes. Health professionals have the responsibility to encourage investigations into women's CVD health issues, and to influence medical and health professional curricula and continuing education programs.

As well, health professionals are at the front-line in focusing special attention on the prevention of women's CVD throughout the lifespan, especially as women enter the peri- and post-menopausal years.

The Government Policy and Legislation Context

Municipal, regional and national governments have the responsibility for: achieving and fostering agreement on broad health promotion and disease prevention issues; elevating these to the level of government policy; helping to ensure that policies are implemented; and ensuring that policies influence public health in order to improve nutrition, promote physical activity, and reduce smoking.

WOMEN, HEART DISEASE AND STROKE IN CANADA

By the year 2015, almost half of all women in Canada will be aged 45 years or over, which means a large contingent will be in the heart-disease- and stroke-prone years. Although significant progress has been made in the area of women's heart health to ensure women's continued health, we must prevent high-risk behaviour in younger women now.

Health providers play a key role in providing appropriate education about risk for cardiovascular disease (CVD) and its diagnosis and treatment. The 1992 Victoria Declaration on Heart Health, issued by the Advisory Board of the First International Heart Health Conference in Victoria, recommended that:

- programs dealing with the prevention of CVD address the risk reduction needs of both women and men;
- public health and clinical guidelines identify and manage women at high risk for CVD and recognize the risk factors that particularly affect women; and,
- governments and all others concerned with anti-smoking programs direct special efforts to the prevention and cessation of smoking by women, particularly young women.

In addition, in 1993, the Canadian Task Force for Cardiovascular Science ⁽¹⁾ recommended the organization of national symposia to:

- highlight the impact of CVD in women;
- support the dissemination of public health information concerning CVD prevention; and,
- recruit scientists with an interest in women's health and the prevention of CVD.

Women must have access to knowledge, a healthy environment, health care and the skills they need to prevent and reduce risk from CVD. This paper is designed to focus research, policy and programs aimed at the prevention and treatment of heart disease and stroke in Canadian women, in part by illustrating the priority that women's heart health should assume in Canada's health objectives.

The Problem of Heart Disease and Stroke in Canadian Women

Prevalence/Incidence

CVD continues to be the leading cause of mortality in Canada. In 1993, CVD accounted for 39% of all deaths in Canada, including heart disease (22%), stroke (8%) and other CVD (9%).⁽²⁾

CVD is the leading cause of death for both Canadian women and men; 41% of all deaths in Canadian women are CVD related and 37% in men.⁽³⁾ Canadian South-Asian women have an excess prevalence of CVD, and heart disease morbidity and mortality is becoming more common in Canadian Blacks.⁽⁴⁾

Heart disease and stroke, the two major components of CVD, rank first and second respectively for all-cause mortality in Canadian women by specific disease.⁽⁵⁾

Aboriginal women experience higher death rates than the general Canadian female population from ischemic heart disease and stroke.⁽⁶⁾ During the past decade, the difference between Aboriginal women and the general Canadian female population with respect to stroke mortality has decreased noticeably, whereas the difference for ischemic heart disease has remained the same. 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.

Although heart disease is widely viewed as a health problem of middle-aged men, the death rate from heart disease in women increases significantly after menopause and is significantly higher at age 75 in women than in men.⁽³⁾ Stroke is also a major health problem for Canadian women. Women aged 75 years and over have a stroke mortality rate 26% higher than men of the same age.⁽³⁾

In 1992, heart disease mortality rates were highest for women in Newfoundland (244 per 100,000 population), and lowest in Saskatchewan (166 per 100,000 population).⁽³⁾ This variation may be explained by factors including: genetic predisposition, differences in environment, lifestyle and income. Regional differences in mortality from stroke are less noticeable.⁽³⁾

The rate of decline for heart disease in women has not been as rapid as in men over the last two decades.⁽⁵⁾ The mortality rate for stroke declined approximately 2% per year since the 1950s, but has remained stable for both sexes since 1988.⁽³⁾

Impact

The burden of disability imposed by CVD can be measured in terms of its economic impact (direct and indirect costs to health care and the economy), and its social impact (personal costs incurred by individual patients and their families).

Economic impact. Until recently, the economic burden of work-related disability and death may have been more noticeable in men than in women because of male predominance in the paid workforce. As well, women are generally affected by CVD in their older, non-working years.⁽⁷⁾

In 1993, the direct costs of CVD (i.e., hospitals, physicians, and drugs) were \$7.27 billion, while the indirect costs (i.e., costs related to mortality, long-term and short-term disability) were \$12.37 billion.⁽⁸⁾

Physician consultation for CVD in 1994 cost an estimated \$26 million, about 10% of all physician visits.⁽³⁾ CVD is also the most common cause of hospitalization, accounting for 12% of total admissions during the fiscal year 1991/92.⁽³⁾

Specifically for Canadian women, the direct costs of CVD in 1993 were \$3.43 billion.⁽⁸⁾ CVD in women was responsible for more than four million hospital days during 1991.⁽⁵⁾ During 1991/92, 46% of CVD-related hospital days for women resulted from stroke (40% for men), almost double the days resulting from heart disease including heart attacks.⁽³⁾ In Canadian women, the direct costs involved in treating stroke during 1993 reached \$777 million – for heart disease, costs were \$725 million.⁽⁸⁾

In one major Canadian hospital during 1991/92, the average direct costs of acute stroke care for all first admissions were \$32,000 in women (\$23,000 in men).⁽⁹⁾ Significantly more women than men died in the first admission, but because they died later in the course of their illness, the costs were greater overall.⁽⁹⁾

During 1993, indirect costs for CVD in women – lost productivity due to illness or disability, and loss of future earnings due to premature death – totalled \$4.72 billion.⁽⁸⁾ Indirect costs of heart disease in women (measured by mortality and long-term disability only) were \$1.59 billion, and for stroke they were \$566 million (measured by mortality only).

Social impact. One measure of the social impact of CVD is the potential years of life lost by Canadians due to premature death (i.e. before age 75). Cardiovascular disease resulted in 90,000 years of life lost during 1994. Stroke ranked tenth during the same period, accounting for over 61,000 years of life lost.⁽⁵⁾ However, this low ranking may be explained by the fact that most women die from stroke at an older age.

The quality of life of CVD survivors – the satisfaction of physical, social, and emotional needs and aspirations – is another indicator of social impact. Unfortunately, there is minimal research on this on women (most studies are on men).⁽¹⁰⁾

CVD Risk Issues

Social change. Several social changes in Canada may influence the heart health of women: increased life expectancy; the low income and social isolation of senior, immigrant and visible minority groups; the rise in female employment; the multiple role responsibilities of women; and changes to family structure.

Women's longer life expectancy accentuates the dramatic growth in the number of senior women (women constitute approximately 58% of all Canadians aged 65 or more).⁽¹¹⁾ In 1991, 13% of all Canadian women were aged 65 or over, and by the year 2016 an estimated 18% of all women will be seniors, increasing to 25% by the year 2041.⁽¹¹⁾ This raises important heart health issues; older women have a greater risk of heart disease and stroke, a poorer prognosis and, possibly, a disadvantage in treatment because of age limits for admission to coronary care or clinical trials,^(12,13) and delayed⁽¹⁴⁾ or less vigorous⁽¹⁵⁻¹⁹⁾ therapeutic intervention compared with men.

Also, women are less likely than men to recover from CVD events.^(3, 9, 10) High social support is linked with better recovery for CVD survivors;^(9, 10, 20) senior women are less likely than men (49% versus 78%) to live with family and more than twice as likely to live alone.⁽¹¹⁾ One Canadian study found that family support for patients after stroke was significantly greater for men than for women because

men, being younger, were more likely to have a surviving spouse.⁽⁹⁾ On discharge from hospital, more men returned home or to rehabilitation facilities, while more women were referred to nursing homes and hospitals for long-term care.

Finally, senior women tend to experience lower incomes and social isolation. For example, 56% of all senior women living alone or with unrelated persons in 1993 had low incomes.⁽¹¹⁾ This trend is even more pronounced among senior women who are immigrants or belong to visible minorities.

Work/education roles. In 1994, women represented 45% of all paid workers. Although employment may reduce coronary risk in women,⁽²¹⁻²³⁾ a moderate amount of overtime work has been associated with an increased risk of myocardial infarction (MI),⁽²⁴⁾ possibly because of tensions induced by the multiple roles many women assume.⁽²⁵⁾ Multiple responsibilities may also prevent women from being able to maintain healthy lifestyles.

Overall, employed women appear to be in better health than those who stay at home or are unemployed.^(21, 26, 27) However, some studies report a higher rate of heart disease and risk factors among women employed in blue-collar occupations,^(28, 29) suggesting that perception of control over the job environment may be an important predictor of CVD risk.

Although the substantial increase in women's educational attainment over the last two decades may exacerbate multiple-role tension for some, the evidence suggests that better educated women are at lower risk for heart disease.⁽²⁶⁾

Cultural background. Regardless of age, immigrant and visible minority women tend to have low income and be socially isolated.⁽¹¹⁾ Immigrant women are less likely than men to speak one of the official languages, are almost three times more likely than women born in Canada to have literacy problems, therefore less likely to be employed; approximately one in five immigrant women's incomes are below Statistics Canada's "Low Income Cut-offs." Similarly, in 1990, 28% of visible minority women had incomes below Low Income Cut-offs.⁽¹¹⁾ These are substantially more than the proportion of other Canadian women below Low Income Cut-offs (16%).⁽¹¹⁾

Heart Disease Risk Factors

Although the important heart disease risk factors for men – elevated blood cholesterol levels, high blood pressure, cigarette smoking, physical inactivity, diabetes mellitus, obesity and certain lipoproteins – also apply to women, they affect women differently.⁽³⁰⁾ For example, diabetes mellitus, hypertriglyceridemia and low levels of high density lipoprotein (HDL) appear to be stronger risk factors for women.⁽³¹⁾ Some risks are unique to women; eg. use of oral contraceptives and menopause (natural or surgical). Overall, the strongest risk factors for women appear to be advancing age, low HDL concentrations, tobacco use and diabetes mellitus.⁽³²⁾

Sixty-two percent of Canadian women aged 18-74 possess one or more of the risk factors of: elevated blood cholesterol, regular cigarette smoking and high blood pressure.⁽³³⁾ The Canadian Provincial Heart Health Surveys (CPHHS)⁽³³⁾ and The Canadian Heart Health Surveys (CHHS)⁽³⁴⁾ have documented some of the following risk factors.

Non-modifiable. Albeit non-modifiable, advancing age in women is a particularly strong factor for heart disease.⁽³²⁾ The prevalence of heart disease in men increases steadily as they age; in women it is lower until after menopause, when it increases markedly.⁽³⁾ Menopause (natural, premature or

surgical) is associated with a significant rise in the incidence of heart disease. It is not known whether this increase is caused by lower postmenopausal estrogen levels or by advancing age in general. Women experience heart disease as often as men, but the disease occurs about 10 years later.⁽³⁵⁾ Women with a strong family history of early heart disease, particularly in female relatives, are also at greater risk.

Modifiable – blood cholesterol and lipid disorders. Elevated concentration of blood cholesterol in women is a major risk factor for heart disease and is amplified by smoking and high blood pressure.⁽³⁶⁾ The prevalence of elevated total blood cholesterol in women increases rapidly after menopause; by age 55 women have higher concentrations than men.⁽³⁶⁾ However, high total cholesterol in women does not seem to be as much of a risk as it is in men.⁽³⁵⁾ The combination of low HDL and elevated triglycerides increases women's risk of death from heart disease ten-fold.^(35,37,38)

The CPHHS (33) reported that:

- 43% of Canadian women aged 18-74 have a total blood cholesterol above the desired level of 5.2 mmol/L;
- 32% of women have elevated LDL (> 3.4 mmol/L) and 4% of women have depressed HDL levels (< 0.9 mmol/L);
- more than 25% of women over 44 years exceed the LDL risk level of 3.4 mmol/L;
- LDL rapidly increases in women some 20 years after it does in men, but after the age of 54, mean LDL concentrations are higher in women than in men; and,
- after the age of 64, women have appreciably higher mean triglyceride concentrations than men.⁽³⁶⁾

Modifiable – cigarettes. Cigarette smoking is the main preventable heart disease risk factor for women. It is a stronger risk factor for MI in middle-aged women than in men,⁽²⁵⁾ and the risk is greater in women who use oral contraceptives.^(3,30,39)

If current smoking patterns continue, smoking will be more common in women than men by the year 2000.^(40,41) Moreover, the prevalence of smoking among teenage women has increased alarmingly; between 1991 and 1994 the percentage of Canadian women aged 15-19 who smoked in Canada increased from 21% to 29%.⁽¹¹⁾ The CHHS⁽³⁹⁾ reported that women who smoke more than 25 cigarettes per day have a markedly greater prevalence of high blood pressure, diabetes mellitus and sedentary life style. Female smokers aged 18-24 are more likely to have a body mass index (BMI) of 25 or more (27% frequency) than non-smokers (21% frequency).

The prevalence of smoking varies widely among ethnic groups, the highest rate being among Canadian Aboriginal Peoples.⁽⁴²⁾ In 1990, Canadian-born women had higher smoking rates than foreign-born Canadian women across all age groups, and were more likely to smoke more than 25 cigarettes daily.⁽⁴²⁾

Modifiable – diabetes mellitus. Diabetes mellitus increases mortality from heart disease and MI more in women than in men;^(3,30,43,44) indeed, it eliminates the advantage for women in all atherosclerotic disease outcomes except stroke.⁽⁴⁵⁾ Diabetic women are three times more likely than

non-diabetic women to have events related to heart disease.⁽⁴⁶⁾ Diabetes mellitus in women is often associated with obesity and a sedentary lifestyle.⁽³⁾

Modifiable – high blood pressure. High blood pressure is an independent risk factor for heart disease in women.^(3,30,32,47) Mean blood pressure levels increase with age in both women and men,⁽⁴⁸⁾ however, after age 55, high blood pressure is more common in Canadian women than in men.⁽³⁾ Over a third of post-menopausal Canadian women have hypertension,⁽³⁾ but they tend to be more aware of the problem than are men⁽⁴⁷⁾ and, if treated, more likely to have it under control.⁽³³⁾

The CPHHS⁽³³⁾ reported that: 13% of Canadian women aged 18-74 have high blood pressure; the prevalence of hypertension in women increases with age more quickly than in men; and hypertensive women have a higher prevalence of high cholesterol, high body mass index, sedentary lifestyle and diabetes mellitus than do non-hypertensive women.

Modifiable – obesity. Obesity in women is clearly linked to a worsening of CVD risk.^(3,30,49,50) The 1981 Canada Fitness Survey⁽³⁰⁾ found that 19% of Canadian women aged 20-69 and 33% of women aged 50-59 had an “increased risk of developing health problems” because of excess weight (BMI > 27).

The CPHHS⁽³³⁾ found that:

- 41% of Canadian women aged 18-74 are overweight (BMI > 25);
- obesity (BMI > 27) is evident in 27% of women aged 18-74;
- the prevalence of obesity in women increases steadily from 13% at ages 18-24 to 45% at 65-74; and,
- 5% of women are likely to be massively obese (BMI > 35), primarily in the 55-74 age group.

Although there have been extensive attempts to promote healthy weights for over nearly two decades, there has been little change in age-distributed weights among women.

Modifiable – sedentary lifestyle. The US Surgeon General⁽⁵¹⁾ has identified physical inactivity as a major modifiable risk factor for heart disease. There is evidence to suggest that physical activity reduces heart disease mortality and morbidity for women.⁽⁵²⁻⁵⁴⁾ Physical activity also beneficially affects hypertension, elevated blood cholesterol and obesity in women.^(55,56)

The 1988 Campbell's Survey of the Well-Being of Canadians found that only 10% of women aged 20-64 engage in regular aerobic activity (30 minutes or more every other day at 50% or more of individual capacity).⁽³⁾ The CPHHS⁽³³⁾ reported that 36% of Canadian women aged 18-74 are physically inactive. Similar results have been found in other studies.^(11,57) Although Canadian women are increasing their physical activity, many, even among the well-educated, do not recognize the importance of physical activity in lessening the risk of heart disease.⁽⁴⁸⁾

Modifiable – oral contraceptives. Oral contraceptive (OC) use and the effects of menopause are risk factors unique to women. (3,30,31,41) Advancing age, cigarette smoking, and hypertension multiply chances of MI in women who take OC.⁽⁵⁸⁾ Most studies have found that use of OC carries an increased risk of CVD in older pre-menopausal women who smoke cigarettes.⁽³⁵⁾

Modifiable – alcohol. Excess consumption of alcohol has been linked to an increased risk of heart disease.^(59,60) Low-to-moderate daily use has been shown to be protective in women^(61,62); a risk reduction of 30% to 70% among moderate drinkers (average 2 drinks per day) compared with non-drinkers is estimated.⁽⁶²⁻⁶⁴⁾ However, moderate alcohol consumption has been linked to high blood pressure.⁽⁶²⁻⁶⁵⁾

Modifiable – psycho-social stress. Limited evidence links stress with heart disease, but most studies have focused on men.⁽⁶⁶⁾ Nevertheless, women strongly perceive stress to be a major risk factor for heart disease.⁽⁴⁸⁾

As more women assume more roles (eg. worker, spouse, mother, etc) the added responsibilities can increase stress that may adversely affect their heart health – however, evidence is equivocal.⁽⁶⁶⁾ Some research indicates that women with little control over their working day are more at risk, as are women with larger numbers of children.⁽⁶⁶⁾

Modifiable – environment/context. Employment, income and education factors are associated with risk of heart disease.⁽⁶⁷⁾ Women employed in a low level job with adverse working conditions (e.g., low social support, low control over their work, and high physical demand) are at excessive risk for CVD-related morbidity and mortality,⁽⁶⁸⁾ as are Canadian women living in poor neighbourhoods.⁽⁶⁹⁾ The most adverse health behaviour profiles are found among less educated women. In 1991, women with less than high school education were 2.69 times more likely to smoke, 1.52 times more likely to be physically inactive, and 2.27 times more likely to be overweight than female university graduates.⁽⁷⁰⁾

Multiple risk factors. Multiple risk factors can combine to increase the relative risk of heart disease in a synergistic (multiplicative), rather than additive fashion. The CHHS⁽⁴⁸⁾ revealed that:

- 19% of women have two or more of the risk factors of regular smoking, hypertension and elevated blood cholesterol;
- the prevalence of multiple risk factors in women increases with age; and,
- women in the 65-74 age group are most likely (37%) to have multiple risk factors.

Stroke Risk Factors

The main risk factors for stroke appear to be the same for both sexes⁽³¹⁾ and include: high blood pressure, transient ischemic attack (TIA), advancing age, cigarette smoking, ischemic heart disease, hypertensive heart disease, congestive heart failure, diabetes mellitus and family history of MI.⁽⁴¹⁾ High blood pressure is the most important; an estimated 66% of strokes in women (56% in men) are attributable to this factor.⁽³⁾

A recent TIA or completed stroke places both women and men at a very high risk for a subsequent stroke.⁽³⁾ The risk of stroke almost doubles with each successive decade of life.⁽⁴¹⁾ Women who smoke have 2.5 times greater risk of stroke than non-smoking women, and oral contraceptive use further increases this risk among female smokers.⁽⁷¹⁾ Heavy alcohol consumption and binge drinking also increase the risk of stroke in both sexes.

Atrial fibrillation has also been associated with stroke in both sexes, but it is unclear how independent it is of high blood pressure and heart disease.⁽⁴¹⁾ The attributable risk of stroke associated with atrial fibrillation for women increased from 1.5% in those aged 50-59, to 23.5% in those aged 80-89.⁽⁴⁴⁾

Some risk factors for stroke are unique to women. The occurrence of stroke in young women has been attributed to oral contraceptives, migraine headaches and pregnancy⁽⁷¹⁾ – 77% to 91% of strokes attributed to migraine occur in women.⁽⁷¹⁾ There may be other risk factors for stroke, however, the evidence is limited and very little research has focused on women.

WHAT IS BEING DONE TODAY?

Heart Disease and Stroke Prevention for Canadian Women

Mortality from heart disease and stroke in Canadian women has generally declined over the past two decades – largely because of improved rates of smoking cessation, low-fat diet consumption and physical activity, along with advances in medical management.

Canadian health promotion policies and programs – such as the: multidisciplinary and multi-sector developed “Canadian Heart Health Initiative”⁽⁷²⁾ with its science, policy and community approach; research funded by the Heart and Stroke Foundation of Canada and others; and Canada’s health-care system – may be credited for much of this significant improvement. However, a significant proportion of Canadian women have not yet experienced this improvement. In addition, the lifestyle habits of many young women threaten to reverse this trend.

For many Canadian women, prevention of heart disease and stroke requires changing diet, increasing physical activity and stopping smoking. Interventions focused on these behaviours are needed at the individual, social, and community-organization levels. Having an impact at all levels, decisive actions are also needed within professional and government policy areas.

Interventions are required to develop personal skills, strengthen community actions, create supportive environments, reorient health services and build healthy public policy. This ecological approach to heart health promotion aims not only at intra-personal behaviours, but aims at women’s personal environments (i.e., social networks, communities and organizations, and public policies).

The Individual Context

The individual context has been the focus for most research and programs, since at this level, change in individual behaviour and physiology can be assessed. According to current theories, (73-80) individual adults are most likely to practice a good health measure or change a faulty one when: the threat to health is severe; perceived personal vulnerability or the likelihood of developing health problems is high; the expectation is that carrying out recommendations will remove the threat; (81) and there is a belief that carrying out the recommended behaviour will reduce the threat. In all instances, ‘self-efficacy’ is a powerful component.⁽⁸²⁾ Indeed, self-concept and self-esteem are particularly strong predictors of heart health behaviour for female adolescents.

Many find it difficult to adhere to heart health recommendations,⁽⁸³⁻⁸⁶⁾ especially when symptoms are not apparent and the benefits are not immediate.⁽⁸⁷⁻⁸⁹⁾ In addition, many women lack knowledge about risk factors for heart disease, and believe heart disease is a ‘middle-aged man’s disease’ not

relevant to them.⁽⁹⁰⁾ Of Canadian women aged 18-74 years, only 51% identified smoking as a risk factor, 19% identified high blood pressure, and 28% elevated blood cholesterol.⁽³³⁾

Physical and socioeconomic factors may also determine women's heart health behaviour.⁽⁹¹⁾ For example, lack of opportunity for being physically active, or for purchasing or preparing healthy foods may interfere with healthy choices. Poverty may preclude purchase of more expensive low-fat foods or participation in some forms of physical activity.

The Social Context

Several barriers at the social level may affect women's heart health behaviour:⁽⁹¹⁾

- no stable family situation or support system;
- concomitant worker/wife/mother roles may impede a woman's desire to make lifestyle changes for lack of support, time or energy;
- society's view of women, especially older women, as dependent and powerless;
- difficulty initiating a regular exercise program and/or difficulty in leaving home to exercise; women may lack the time (eg., transportation, child-care), and older women may feel too vulnerable to travel to an organized group or even walk in their neighbourhood; and,
- cooking healthy foods may be a burden to women who also cook for family members that have no desire to follow a healthy diet.

The family is a powerful determinant of behaviour^(92,93) – parents particularly influence children.^(94, 95) Peers can also significantly influence heart health behaviour, particularly in adolescents.⁽⁹⁶⁾ Social strategies for behavioural change provide feedback and encouragement for women's heart healthy behaviour; such team building programs have successfully enhanced positive changes in heart health.^(97,98)

The Community-Organization Context

Community-based heart health interventions can influence women's behaviour and the social system in which they live.⁽⁹⁹⁻¹¹¹⁾ The major thrusts of community-based health promotion programs include:

- targeting multiple audiences;
- using multiple channels of communication; and,
- focusing on multiple outcomes.

Organizations are the targets of structural change for adopting new behaviours. Schools, workplaces, churches and clubs contribute to prevention of heart disease and stroke in women by providing an environment that brings people together and optimizes social support.

The school is highly effective for promoting the reduction of heart disease risk factors.^(87,112,113) The Comprehensive School Health approach in Canadian schools promotes heart health behaviours through instruction, support services, physical environment and social support.⁽¹¹⁴⁾

As well, health promoting businesses (1) have established workplace health, smoking and safety policies, (2) fund health promotion, and (3) regulate types of food sold.

The Professional Context

Health promotion practitioners most often target personal determinants of health rather than unhealthy aspects of the environment.⁽¹¹⁵⁾ However, recent Canadian programs have begun to evaluate integrated, multi-level heart health programs for women. For example, the promising Coeur en santé St-Henry, a 5-year, community-based heart health program in a low-income Montreal neighbourhood, focuses specifically on women at many levels.⁽¹¹⁶⁾

Most research on CVD risk has focused on men;⁽¹¹⁷⁻¹¹⁹⁾ for example, only 22 trials of exercise rehabilitation for MI involved women, who constituted only 3% of the randomized subjects, precluding any separate analysis or conclusions.⁽¹¹⁹⁾ A recent summary of the limited research specifically related to professionals' impact on the reduction of women's risk of heart disease from non-pharmacological interventions reported the following:⁽⁶²⁾

- smoking cessation– 50% to 80% reduction within three to five years;
- physical activity– 50% to 60% for active, compared with sedentary, women; and,
- avoidance of obesity– 35% to 60% for women at ideal weight, compared with obese women.

Health professionals are a powerful source of encouragement to: mobilize community leaders; guide local health care practices; assist in program leadership and planning; and provide technical input and credibility to planned programs. Medical organizations provide an infrastructure for the reinforcement of heart health promotion for women.^(120,121)

In Canada, health professionals have the responsibility to (1) advocate for policy changes supportive of women's heart health, (2) encourage investigations into women's CVD health issues, and (3) influence medical and health professional curricula and continuing education programs.

The Government Policy and Legislation Context

Municipal, regional and national governments have the responsibility for: achieving and fostering agreement on broad health promotion and disease prevention issues; elevating these to the level of government policy; helping to ensure that policies are implemented; and ensuring that policies influence public health – in order to improve nutrition, promote physical activity and reduce smoking.⁽¹²²⁾

Indeed, government policy frameworks guide specific heart health interventions, and modest levels of government funding help to catalyse the beginnings of mutually beneficial partnerships and community mobilization necessary for successful health promotion initiatives.

Heart Disease and Stroke Diagnosis and Management for Canadian Women

Four of the most significant issues related to diagnosis and management of heart disease and stroke in women are: (1) the ability of women and their medical practitioners to recognize the onset of disease and the effectiveness of medical treatments offered in primary and secondary prevention; (2) sex-specific medical aspects of MIs; (3) sex-specific medical aspects of stroke; and (4) hormone replacement therapy.

Recognition

Medically, women tend to focus on reproductive organ concerns rather than general health issues and are generally more fearful of breast, ovarian and uterine cancer than of heart disease – even though heart disease is much more prevalent among women.⁽¹²³⁾ Similarly, older women perceive the threat of cancer to be much greater than that of debilitating stroke.⁽⁹¹⁾

Angina. Many women, especially seniors, interpret exertional angina as fatigue and do not seek medical attention,⁽⁹¹⁾ especially those who fear being labelled a hypochondriac or nuisance.⁽⁹¹⁾ Many also do not believe they are prone to heart disease and fail to recognize cardiac symptoms.⁽⁹¹⁾ Further, many women do not acknowledge the seriousness of their symptoms,⁽¹²⁴⁾ however abnormal, until after using diverse coping mechanisms and self-treatments. As a result, angina in women is often unrecognized.⁽¹²⁵⁾

Angina is most likely to signal the onset of heart disease in women,⁽¹²⁶⁾ but difficulties in interpreting angina may impede diagnosis.⁽¹²⁷⁾ Also, some practitioners are not fully aware of the risks to women⁽⁸⁹⁾, therefore pay inadequate attention to possible signs and symptoms of angina.^(128,129) Indeed, practitioners regard a suspected infarction to be less urgent in women than in men.^(130,131)

Professional practices. Many women report that their medical practitioners do not take them seriously and think their symptoms are imaginary or psychosomatic.⁽⁹¹⁾ Notably, practitioners tend to give fewer technical explanations to women.⁽¹³²⁾ Since women visit practitioners more regularly than men, their complaints may be interpreted to be less important; some evidence suggests that practitioners perceive women to have more psychosomatic illnesses than men.^(91,128,129) A recent Canadian study found that practitioners over-estimated coronary risk for a hypothetical 40-year-old man more than for a 70-year-old woman.

Women appear to receive less intensive (invasive or non-invasive) treatment for heart disease than do men.^(128,133) Controlled for age, fewer women than men are referred for coronary angiography,⁽³⁰⁾ despite having positive diagnostic tests, acute MI, or greater functional disability due to angina. Women are three times less likely than men to undergo common diagnostic coronary arteriography.^(30,134)

Canadian women are also three times less likely than men to be referred for coronary angioplasty (PTCA) and five times less likely to be referred for coronary artery bypass graft surgery (CABG).⁽¹³³⁾ Such differences in treatment may partly result from the older age of women with heart disease because the results of surgery are known to be poorer in the elderly.

Whether the above findings represent a sex bias in the medical management of heart disease is controversial; they may reflect over-treatment of men rather than under-treatment of women.^(130,131)

Indeed, a recent review of the literature concluded that applying terms such as 'bias' and 'discrimination' to the treatment of women with heart disease is premature.⁽¹³⁵⁾

However, there does appear to be a significant sex bias in the medical research investigating heart disease and stroke.⁽⁸⁹⁾ Women have been greatly under-represented in the medical research investigating heart disease and stroke. This exclusion may be the result of age cut-offs used for the studies, the potential for adverse effects in women of child-bearing age or a sex bias.⁽⁸⁹⁾ However, women must be included, as in the past the selection and dose of drugs given to women with heart disease are often based on studies of primarily middle-aged men, even though hormonal status, older age and smaller body mass of women may affect drug concentrations, effectiveness, side effects and toxicity.

Myocardial Infarction

Although myocardial infarction (MI) and sudden death from MI are more common in men, most studies conclude that the prognosis is worse for women^(3,30) because they are more likely to have MIs with greater complications (non-Q wave infarction, re-infarction, strokes and congestive heart failure).⁽³⁾ The poorer prognosis may also be explained by several factors: women tend to have more unrecognized MI than men;⁽¹³⁶⁾ they are older; they have more concomitant disease; and they present later in the course of their MI.⁽¹³⁶⁾

The mortality rate for MI is higher in women than in men both in hospital and during the first year after the event.⁽⁴¹⁾ Women with established heart disease are more likely than men to be disabled and have a less favourable outcome of their MI (even after adjustment for increased age and other risk factors).⁽³⁾ Overall, two-thirds of sudden deaths occur among women with no history of disease and 40% of coronary events in women are fatal.⁽¹³⁷⁾

Although women report the same prevalence of disability from CVD as men in Canada,⁽³⁰⁾ and psychosocial adjustment after MI appears to be similar between the sexes,⁽¹³⁸⁾ female patients experience poorer physical recovery (competency to perform 'common activities' as defined by the Specific Activity Scale) after discharge from hospital than male patients.^(139,140)

Women who receive thrombolytic therapy for treatment of MI appear to be at greater risk than men for fatal and non-fatal complications; one-year mortality after MI is higher in women (29%) than in men (15%).⁽¹⁴¹⁾

At present, PTCA and CABG have similar long-term survival benefits for women and men,⁽³⁾ however, CABG in women is associated with an operative mortality twice that of men.⁽³⁾ As well, women report more difficulty with activities such as walking after CABG.⁽¹³⁹⁾ Drop-out rates appear to be higher among women than men in cardiac rehabilitation programs,⁽¹⁴²⁾ and women experience greater work disability 24 months after MI.⁽¹⁴⁰⁾

Stroke

Although overall stroke mortality has been declining in Canada for several decades, strokes remain a significant cause of death and disability, especially for elderly women. Women are more likely to survive a stroke than men, thus increasing the burden of disability. Because more women survive into the latter decades of life, they account for the greater proportion of disabled stroke patients occupying nursing homes.

Of the various types of stroke, young women appear to experience an excess of subarachnoid hemorrhage, the least common type of stroke overall. Women are also at increased risk of stroke when exposed to unique risk factors such as toxæmia in pregnancy and oral contraceptive use, and in the presence of conditions such as mitral valve prolapse and migraine headaches.⁽¹⁴³⁾

Although interventions including endarterectomy and treatment of atrial fibrillation with aspirin or warfarin are applied to women and presumed to be equally beneficial, their effects have been studied largely in men.

Hormone Replacement Therapy

Reduced estrogen levels after menopause adversely affect blood pressure, weight, body fat distribution, blood clotting factors, glucose metabolism and diabetes – all important risk factors for heart disease.⁽¹⁴⁴⁾ The decreased concentration of HDL cholesterol and increased LDL after menopause are particularly threatening to women's heart health.⁽¹⁴⁵⁾

Hormone replacement therapy (HRT) significantly reduces the risk of heart disease in healthy women.⁽¹⁴⁶⁾ It remains unclear in these studies to what extent the lower incidence is due to the HRT, as these women smoked less, had a better diet and exercised more.⁽³¹⁾ The results from two prospective ongoing trials should answer this question.

Since estrogen increases the risk of endometrial cancer, it is recommended that estrogen be combined with low-dose progestin in a women with a uterus;^(145,147) however, certain progestins may have unwanted effects,^(31,148) and the long-term health results are unknown. Similarly, although short-term HRT use does not increase the risk of breast cancer,⁽¹⁴⁸⁾ limited longitudinal studies report an increased risk of breast cancer after 10 or more years of HRT.⁽¹⁴⁹⁾

Further research is required, but the decrease in mortality due to CVD among HRT-users would appear to outweigh deaths from other diseases potentially related to lower postmenopausal estrogen levels. Many women are confused about the benefits of HRT and concerned about its potential risks.^(35,148) This may partly explain why 20% to 30% of women prescribed HRT do not comply with treatment.

Conclusion

In prevention and treatment, multiple intervention strategies within and between the various intervention levels must be undertaken, using existing infrastructures and the specialized roles of different community organizations and government. These strategies must be integrated, and should be monitored to assess appropriate outcomes of individual change (i.e., cognitive and behavioural) and supportive environmental change (i.e., change of the social, organizational, community and political contexts).

In research, further studies on medical issues concerning Canadian women's heart health need to be conducted to have reliable data for clinical decision making and public health recommendations. Collaborative inter-disciplinary research and national data bases should be designed to investigate and monitor the efficacy of medical management issues related to the diagnosis, treatment and prognosis of heart disease and stroke in Canadian women. As well as leading directly to health outcomes, the resulting information could provide – in conjunction with the Canadian Framework Policy on surveillance of mortality and risk factors for cardiovascular disease – a continuous, structured knowledge base to guide efforts in heart disease and stroke prevention and treatment for Canadian women.

WHAT CAN BE DONE TOMORROW? FUTURE DIRECTIONS...

1. More attention must be paid to the significant burden borne by women, especially the elderly, due to morbidity and mortality from heart disease.
2. Special attention must be focused on the prevention and treatment of heart disease and stroke in women as they enter their menopausal and post-menopausal years. Women should make informed decisions about the use of HRT based on the best evidence available.
3. Policies, practices, resources and support should be targeted to include marginalized groups of women, where the burden of heart disease is disproportionately high. Due consideration must be given to age, income, educational, professional and cultural diversity.
4. Issues particular to women's CVD health should receive increased attention in medical and health professional curricula and continuing education programs.
5. Resources and services to support women's CVD health must be easily accessible and reflect women's preferences related to delivery systems and health care providers.
6. Initiatives should be developed and supported to enhance positive self-esteem, self-concept, and self-efficacy in women, especially young women, as a foundation for heart health behaviours throughout their lives.
7. Resources must be directed towards programs, legislation and research designed to prevent and eliminate tobacco use among young women.
8. Physical activity for young women must be encouraged; both through quality daily physical education and equal access to resources and facilities for recreation and sport.
9. Since women often make food choices for the family unit and can be advocates for healthy eating, approaches must be developed to assist with food selection and preparation.
10. Strategies should be designed to promote accessibility to and use of cardiac rehabilitation programs for women.
11. Research funding should be made available to address gaps in knowledge regarding women, heart disease and stroke commensurate with the significance of the issue.
12. Women must be included appropriately in all heart and stroke research studies; any exclusion of women must be justified.
13. A comprehensive school health approach should be promoted and adopted throughout the school system.

GLOSSARY

ACUTE MYOCARDIAL INFARCTION

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.

ANGINA PECTORIS

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

CARDIOVASCULAR DISEASES

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

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.

HIGH BLOOD PRESSURE

High blood pressure is defined as:

- (1) diastolic blood pressure equal to, or greater than, 90 mm Hg, or

the condition experienced while on treatment, either pharmacologic or non-pharmacologic (weight control and/or salt restriction), for the purpose of lowering blood pressure.

INCIDENCE

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

ISCHEMIC HEART DISEASE

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 (BMI) [weight in kilograms/height in metres²] 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 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.

SMOKING

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

STROKE

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

TRANSIENT ISCHEMIC ATTACK

Reversible neurological or retinal deficits secondary to 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.

REFERENCES

- 1 Canadian Task Force for Cardiovascular Science. (1993). Canadian Task Force for Cardiovascular Science. *Canadian Journal of Cardiology*, 9 (8), 699- 709.
- 2 Heart and Stroke Foundation of Canada. (1996). *Causes of Death in Canada, 1993 (Supplement)*. Ottawa.
- 3 Heart and Stroke Foundation of Canada. (June, 1995). *Heart Disease and Stroke in Canada, 1995*. Ottawa.
- 4 Rambihar, V.S., & Jagdeo, D.G. (1995). Ethnocultural heart: Another challenge for an emerging diversity. *Canadian Journal of Cardiology*, 11 (5), 441-442.
- 5 Hayes, O. (1996). Fact sheet: Cardiovascular disease (ICD-9 390-448) and women. *Chronic Diseases in Canada*, 17 (1), 28-30.
- 6 HSFC. *Heart Disease and Stroke in Canada. 1995*, p.13.
- 7 Lindenmayer, J.M., & Monteiro, L. (1994). Cardiovascular disease and women. *Rhode Island Medicine*, 77, 409-411.
- 8 Moore, R., Mao, Y., Wielgosz, A., Johansen, H., & Taylor, G. (1996). Economic burden of cardio-vascular disease in Canada, 1993. *Chronic Disease in Canada*. (In press).
- 9 Smurawska, L.T., Alexandrov, A.V., Bladin, C.F., & Norris, J.W. (1994). Cost of acute stroke care in Toronto, Canada. *Stroke*, 25 (8), 1628-31.
- 10 Wingate, S. (1995). Quality of life for women after a myocardial infarction. *Heart & Lung*, 24 (6), 467-473.
- 11 Statistics Canada. (August, 1995). *Women in Canada: Third Edition*. Ottawa.
- 12 Adams, J.N., Jamieson, M., Rawles, J.M., Trent, R.J., & Jennings, K.P. (1995). Women and myocardial infarction: Ageism rather than sexism? *British Heart Journal*, 73 (1), 87-91.
- 13 Gurwitz, J.H., Col, N.F., & Avorn, J. (1992). The exclusion of the elderly and women from clinical trials in acute myocardial infarction. *Journal of the American Medical Association*, 268 (11), 1417-22.
- 14 Jackson, R.E., Anderson, W., Peacock, W.F., Vaught, L., Carley, R.S., & Wilson, A.G. (1996). Effect of a patient's sex on the timing of thrombolytic therapy. *Annals of Emergency Medicine*, 27 (1), 8-15.
- 15 Bearden, D., Allman, R., McDonald, R., Miller, S., Pressel, S., & Petrovitch, H. (1994). Age, race, and gender variation in the utilization of coronary artery bypass surgery and angioplasty in SHEP. SHEP Cooperative Research Group. *Systolic Hypertension in the Elderly Program. Journal of the American Geriatrics Society*, 42 (11), 1143-9.
- 16 Clarke, K.W., Gray, D., Keating, N.A., & Hampton, J.R. (1994). Do women with acute myocardial infarction receive the same treatment as men? *British Medical Journal*, 309 (6954), 563-6.
- 17 Gregor, R.D., Bata, I.R., Eastwood, B.J., Garner, J.B., Guernsey, J.R., MacKenzie, B.R., Rautaharju, P.M., & Wolf, H.K. (1994). Gender differences in the presentation, treatment, and short-term mortality of acute chest pain. *Clinical & Investigative Medicine*, 17 (6), 551-62.

- 18 Barry, P. (1993). Coronary artery disease in older women. *Geriatrics*, 48 (Suppl.1), 4-8.
- 19 Green, L.A., & Ruffin, M.T. (1994). A closer examination of sex bias in the treatment of ischemic cardiac disease. *Journal of Family Practice*, 39 (4), 331-6.
- 20 Friedman, M.M. (1993). Social support sources and psychological well-being in older women with heart disease. *Research in Nursing & Health*, 16 (6), 405-13.
- 21 King, A.S., Threlfall, W.J., Band, P.R., & Gallagher, R.P. (1994). Mortality among female registered nurses and school teachers in British Columbia. *American Journal of Industrialized Medicine*, 26 (1), 125-32.
- 22 Haertel, U., Heiss, G., Filipiak, B., Doering, A. (1992). Cross-sectional and longitudinal associations between high density lipoprotein cholesterol and women's employment. *American Journal of Epidemiology*, 135 (1), 68-78.
- 23 Kritz-Silverstein, D., Wingard, D.L., & Barrett-Connor, E. (1992). Employment status and heart disease risk factors in middle-aged women: The Rancho Bernardo study. *American Journal of Public Health*, 82 (2), 215-9.
- 24 Theorell, T. (1991). Psychosocial cardiovascular risks - on the double loads in women. *Psycho-therapy & Psychosomatics*, 55 (2-4), 81-9.
- 25 Dixon, J.P., Dixon, J.K., & Spinner, J.C. (1991). Tensions between career and interpersonal commitments as a risk factor for cardiovascular disease among women. *Women & Health*, 17 (3), 33-57. 75. La Rosa, J.H. (1988). Women, work, and health: Employment as a risk factor for coronary heart disease. *American Journal of Obstetrics & Gynecology*, 158 (6 Pt.2), 1597-602.
- 26 Reviere, R., & Eberstein, I.W. (1992). Work, marital status, and heart disease. *Health Care for Women International*, 13 (4), 393-9.
- 27 Jin, R.L., Shah, C.P., & Svoboda, T.J. (1995). The impact of unemployment on health: A review of the evidence. *Canadian Medical Association Journal*, 153 (5), 529-540.
- 28 LaCroix, A.Z. (1994). Psychosocial factors and risk of coronary heart disease in women: An epidemiologic perspective. *Fertility & Sterility*, 62 (6 Suppl 2), 133S-139S.
- 29 Hall, E.M., Johnson, J.V., & Tsou, T.S. (1993). Women, occupation, and risk of cardiovascular morbidity and mortality. *Occupational Medicine*, 8 (4), 709-19.
- 30 Johansen, H., Nargundkar, M., Nair, C., Neutel, I., & Wielgosz, A. (1990). Women and cardiovascular disease. *Chronic Disease in Canada*, 41-47.
- 31 Eaker, E.D., Chesebro, J.H., Sacks, F.M., Wenger, N.K., Whisnant, J.P., & Winston, M. (1993). AHA medical/scientific statement. Special report: Cardiovascular disease in women. *Circulation*, 88 (4), 1999-2009.
- 32 Judelson, D.R. (1994). Coronary heart disease in women: Risk factors and prevention. *JAMWA*, 49 (6), 186-197.
- 33 Health Canada. (1995). *Canadians and Heart Health: Reducing the Risk*. Ottawa.
- 34 MacLean, D.R., Petrasovits, A., Nargundkar, M., Connelly, P.W., MacLeod, E., Edwards, A., Hessel, P., & Canadian Heart Health Surveys Research Group. (1992). Canadian heart health surveys: A profile of cardiovascular risk. Survey methods and data analysis. *Canadian Medical Association Journal*, 146 (11), 1969-1974.
- 35 MacPherson, K.I. (1992). Cardiovascular disease in women and noncontraceptive use of hormones: A feminist analysis. *Advances in Nursing Science*, 14 (4), 34- 49.

- 36 Connelly, P.W., MacLean, D.R., Horlick, L., O'Connor, B., Petrasovits, A., Little, J.A., & Canadian Heart Health Surveys Research Group. (1992). Plasma lipids and lipoproteins and the prevalence of risk for coronary heart disease in Canadian adults. *Canadian Medical Association Journal*, 146 (11), 1977-1987.
- 37 La Rosa, J.C. (1992). Lipids and cardiovascular disease: Do the findings and therapy apply equally to men and women? *Women's Health Issues*, 2 (2), 102-11.
- 38 Austin, M.A. (1989). Plasma triglyceride as a risk factor for coronary heart disease: The epidemiologic evidence and beyond. *American Journal of Epidemiology*, 129, 249-259.
- 39 Stachenko, S.J., Reeder, B.A., Lindsay, E., Donovan, C., Lessard, R., Balram, C., & Canadian Heart Health Surveys Research Group. (1992). Smoking prevalence and associated risk factors in Canadian adults. *Canadian Medical Association Journal*, 146 (11), 1989-1996.
- 40 Rafuse, J. (1993). Girls, women ignoring message about dangers of tobacco, doctors warned. *Canadian Medical Association Journal*, 149 (11), 1709-1710.
- 41 Eaker, E., Chesebro, J.H., Sacks, F.M., Wenger, N.K., Whisnant, J.P., & Winston, M. (1994). Special report: Cardiovascular disease in women. *Heart Disease and Stroke*, March/April, 114-119.
- 42 Millar, W.J. (1992). Place of birth and ethnic status: Factors associated with smoking prevalence among Canadians. *Health Reports*, 4 (7), 7-24.
- 43 Legato, M.J. (1994). Cardiovascular disease in women: What's different? What's new? What's unresolved? *Annals of the New York Academy of Sciences*, 30 (736), 147-157.
- 44 Murabito, J.M. (1995). Women and cardiovascular disease: Contributions from the Framingham Heart Study. *JAMWA*, 50 (2), 35-55.
- 45 Kannel, W.B., Thom, T.J., & D'Agostino, R.B. (1995). Controlling cardiovascular disease: A challenge for the 21st century. *British Journal of Clinical Practice* 1-15.
- 46 Kannel, W.B., & McGee, D.L. (1979). Diabetes and cardiovascular disease. The Framingham study. *JAMA*, 241, 2035-2038
- 47 Joffres, M.R., Hamet, P., Rabkin, S.W., Gelskey, D., Hogan, K., Fodor, G., & Canadian Heart Health Surveys Research Group. (1992). Prevalence, control and awareness of high blood pressure among Canadian adults. *Canadian Medical Association Journal*, 146 (11), 1997-2005.
- 48 MacDonald, S., Joffres, M.R., Stachenko, S., Horlick, L., Fodor, G., & Canadian Heart Health Research Group. (1992). Multiple cardiovascular disease risk factors in Canadian adults. *Canadian Medical Association Journal*, 146 (11), 2021-2029.
- 49 Reeder, B.A., Angel, A., Ledoux, M., Rabkin, S.W., Young, T.K., Sweet, L.E., & Canadian Heart Health Surveys Research Group. (1992). Obesity and its relation to cardiovascular disease risk factors in Canadian adults. *Canadian Medical Association Journal*, 146 (11), 2009-2019.
- 50 Manson, J.E., Colditz, G.A., Stampfer, M.J., Willett, W.C., Rosner, B., Monson, R.R., Speizer, F.E., & Hennekens, C.H. (1990). A prospective study of obesity and risk of coronary heart disease in women. *The New England Journal of Medicine*, 322 (13), 882-889.

- 51 US Department of Health and Human Services. Physical Activity and Health: A Report of the Surgeon General. Atlanta, GA, 1996, p7.
- 52 O'Toole, M.L. (1993). Exercise and physical activity. In: Cardiovascular Health and Diseases in Women. P.S. Douglas (Ed.), pp.253-268. Philadelphia: W.B. Saunders.
- 53 Blair, S.N., Kohl, H.W., Paffenbarger, R.S., et al. (1989). Physical fitness and all cause mortality. A prospective study of healthy men and women. JAMA, 262 (17), 2395-2401.
- 54 Powell, K.E., Thompson, P.D., Caspersen, C.J., et al. (1987). Physical activity and the incidence of coronary heart disease. Ann Rev Public Health, 8, 253-287.
- 55 Ready, A.E., Drinkwater, D.T., Ducas, J., Fitzpatrick, D.W., Brereton, D.G., & Oades, S.C. (1995). Walking program reduces elevated cholesterol in women postmenopause. Canadian Journal of Cardiology, 11, 905-912.
- 56 U.S. Department of Health and Human Services. (1996). Physical activity and health: A report of the Surgeon General. Atlanta, GA.
- 57 Canadian Fitness and Lifestyle Research Institute. (1995). Progress in prevention. How active are Canadians? (Bulletin No. 1). Ottawa.
- 58 Dalen, J.E., & Hickler, R.B. (1981). Oral contraceptives and cardiovascular disease. American Heart Journal, 101, 626-639.
- 59 Anderson, P., Cremona, A., Paton, A., Turner, C., & Wallace, P. (1993). The risk of alcohol. Addiction, 88 (11), 1493-508.
- 60 Hennekens, C.H. (1983). Alcohol. In N. Kaplan & J. Stamler (Eds.), Prevention of coronary heart disease: Practical management of the risk factors (pp.130-138). Philadelphia: W.B. Saunders.
- 61 Goldberg, D.M., Hahn, S.E., & Parkes, J.G. (1995). Beyond alcohol: Beverage consumption and cardiovascular mortality. Clinica Chimica Acta, 237 (1-2), 155- 87.
- 62 Rich-Edwards, J.W., Manson, J.E., Hennekens, C.H., & Buring, J.E. (1995). The primary prevention of coronary heart disease in women. The New England Journal of Medicine, 332 (26), 1758-1766.
- 63 Hankinson, S.E., Hennekens, C.H., Rosner, B., et al. (1995). Alcohol consumption and mortality among women. New England Journal of Medicine, 332 (19), 1245-50.
- 64 Garg, R., Wagener, D.K., & Madans, J.H. (1993). Alcohol consumption and risk of ischemic heart disease in women. Archives of Internal Medicine, 153 (10), 1211-6.
- 65 Beilin, L.J., & Puddey, I.B. (1993). Alcohol, hypertension and cardiovascular disease - Implications for management. Clinical & Experimental Hypertension, 15 (6), 1157-70.
- 66 Elliot, S.J. (1995). Psychosocial stress, women and heart health: A critical review. Social Science and Medicine, 40 (1), 105-115.
- 67 Kaplan, G.A., & Keil, J.E. (1993). Socioeconomic factors and cardiovascular disease: A review of the literature. Circulation, 88 (4), 1973-1998.
- 68 Hall, E.M., Johnson, J.V., & Tsou, T.S. (1993). Women, occupation, and risk of cardiovascular morbidity and mortality. Occupational Medicine, 8 (4), 709-719.

- 69 Wilkins, R. (1995). Special Tabulations from the 1991 Mortality by Income Study. Ottawa: Statistics Canada, Health Statistics Division.
- 70 Millar, W.J., & Stephens, T. (1993) Social status and health risks in Canadian adults: 1985 and 1991. *Health Reports*, 5 (2), 143-156.
- 71 Knepper, L.E., & Giuliani, M.J. (1995). Cerebrovascular disease in women. *Cardiology*, 86, 339-348. 60. Bellin, L.J., & Puddey, I.B. (1992). Alcohol and hypertension. *Clinical and Experimental Hypertension - Part A, Theory and Practice*, 14 (1-2), 119-38.
- 72 Health Canada. The Canadian Heart Health Initiative: A policy in action. *Health Promotion*, 1992;30:1-19.
- 73 Janz, N.K., and Becker, M.H. The health belief model: A decade later. *Health Education Quarterly*, 1984;11:1-47.
- 74 Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. 1986; Englewood Cliffs, NJ: Prentice-Hall.
- 75 Bandura, A. Self-efficacy mechanism in physiological activation and health promoting behaviour. In: *Adaptation, Learning and Effect*. J. Madden, S. Matthyse, & J. Barchas (Eds.) 1986; New York: Raven Press.
- 76 Ajzen, I., and Fishbein, M. *Understanding attitudes and predicting social behaviour*. 1980; Englewood Cliffs, NJ: Prentice-Hall.
- 77 Madden, T. J., Ellen, P.S., Ajzen, I. A comparison of the theory of planned behaviour and the theory of reasoned action. *Personality & Social Psychology Bulletin*. 1992;18: 3-9.
- 78 Rogers, R.W. Cognitive and physiological processes in fear appeals and attitude change: A revised theory of Protection Motivation. In J.R. Cacioppo & R.E. Petty (Eds.), *Social Psychology: A Source book*. 1983; New York: Guilford Press:153-176.
- 79 Triandis, H. *Interpersonal Behaviour*. 1977; Monterey, C.A.:Brooks-Cole.
- 80 Prochaska, J.O., and DiClemente, C.C. Stages of change in the modification of problem behaviours. In: *Progress in Behaviour Modification*. Hersen, M., Eisler, R.M., & Miller, P.M. (Eds). 1992; Newbury Park, CA: Sage Publications.
- 81 Weinstein, N.D. Testing four competing theories of health-protective behaviour. *Health Psychology*, 1993;12:324-333.
- 82 Schwarzer, R. Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In P. Bennett, J. Weinman, & P. Spurgeon (Eds.), *Current developments in health psychology* (pp.219-243). 1992; Switzerland: Harwood Academic Publishers.
- 83 Carmody, T.P., Matarazzo, J.D., and Istvan, J.A. Promoting adherence to heart-healthy diets: A review of the literature. *Journal of Complete Health Care*, 1987;2:105-123.
- 84 King, A.C., Blair, S.N., Bild, D.E., et al. Determinants of physical activity and interventions in adults. *Medicine and Science in Sports and Exercise*, 1992; 24(Suppl.):221-236.
- 85 Lipsey, M.W., and Wilson, D.B. The efficacy of psychological, educational and behavioral treatment. *American Psychologist*, 1993;48:1181-1209.
- 86 Godin, G. The effectiveness of interventions in modifying behavioral risk factors of individuals with coronary heart disease. *Journal of Cardiopulmonary Rehabilitation*, 1989;9:223-236.

- 87 Plotnikoff, R.C. An application of protection motivation theory to coronary heart disease risk factor behaviour in three Australian samples: Community adults, cardiac patients, and school children. 1994; Ph.D. thesis, University of Newcastle, Australia.
- 88 Plotnikoff, R., Williams, P., and Higginbotham, N. An evaluation of the Kurri Kurri Public School Healthy Heartbeat Project. *The ACHPER Healthy Lifestyle Journal*, 1996;43:21-25.
- 89 Beery, T.A. Diagnosis and treatment of cardiac disease: Gender bias in the diagnosis and treatment of coronary artery disease. *Heart & Lung*, 1995;24:4217-435.
- 90 Heart and Stroke Foundation of Canada. *Women's Heart Health News*. 1996.
- 91 Fields, S.K., Savard, M.A., and Epstein, K.R. The female patient. In *Cardiovascular Health and Disease in Women*. Douglas, P.S. (Ed). (pp3-21), 1993; Philadelphia, W.B. Saunders.
- 92 Lee, C. Attitudes, knowledge, and stages of change: A survey of exercise patterns in older Australian women. *Health Psychology*, 1993;12(6):476-480.
- 93 Knutsen, S., and Knutsen, R. The Tromso Survey: The Family Intervention Study- The effect of intervention on some coronary risk factors and dietary habits, a six year follow-up. *Preventive Medicine*, 1991;20:197-212.
- 94 Baranowski, T., and Nader, P. Family health behaviour. In *Health, Illness and Families*. Turk, D. & Kerns, R. (Eds.) (pp 51-80) 1985;New York, Wiley Press.
- 95 Wild, R.A., Taylor, L., Knehans, A, et al. Matriarchal model for cardiovascular prevention. *Obstetrical and Gynecological Survey*, 1994;49:147-152.
- 96 Cohen, R., Felix, M., and Brownell, K. The role of parents and older peers in school-based cardiovascular prevention programs: Implications for program development. *Health Education Quarterly*, 1989;16:245-253.
- 97 Carron, A., and Al, E. Team building in an exercise setting. *Sport Psychologist*, 1993;7: 8-18.
- 98 Spink, K., and Al, E. The effects of team building on the adherence patterns of female exercise participants. *Journal of Sport and Exercise Psychology*, 1993;15:39-49.
- 99 Dobbins, M., Thomas, H., Ploeg, J., et al. The effectiveness of Community-Based Heart Health Projects: A systematic Overview. The Quality of Nursing Work life Research Unit, McMaster University and University of Toronto, Working Paper Series, Hamilton, ON: 96-1, May 1996.
- 100 Puska, P., Nissinen, A., Tuomilehto, J., et al. The community based strategy to prevent coronary heart disease: Conclusions from the ten years of the North Karelia project. *Annual Review of Public Health*, 1985;6:147-193.
- 101 01 Farquhar, J.W., Fortmann, S.P., Maccoby, N., et al. The Stanford Five-City Project; Design and methods. *American Journal of Epidemiology*, 1985;122:323-334.
- 102 Elder, J.P., McGraw, S.A., and Abrams, D.B. Organizational and community approaches to community wide prevention of heart disease: The first two years of the Pawtucket Heart Health program. *Preventive Medicine*, 1986;15:107-117.
- 103 Blackburn, H., Luepker, R., Kline, F.G., et al. The Minnesota heart health program: A research and demonstration project in cardiovascular disease prevention. In *Behavioral Health: A Handbook of Health Enhancement and Disease Prevention*. Matarazzo, J. (Ed.) Minnesota: University of Minnesota, 1984; 1171-1178.

- 104 Nutbeam, D., and Catford, J. The Welsh heart programme evaluation strategy: Progress, plans and possibilities. *Health Promotion International*, 1987;2:5-18.
- 105 Osler, M., and Jespersen, N.B. The effect of a community based cardiovascular disease prevention project in a Danish municipality. *Danish Medical Bulletin*, 1993;40:485-489.
- 106 Stunkard, A.J., Felix, M.J., and Cohen, R.Y. Prevention in Health Psychology. Rosen, J.C., & Solomon, L.J. (Eds.). Hanover, PA: University Press of New England, 1985:143-190.
- 107 Shea, S., Basch, C., and Lantigua, R. The Washington Heights Inwood Healthy Heart program: A third generation community based cardiovascular disease prevention program in a disadvantaged urban setting. *Preventive Medicine*, 1992;21:203-217.
- 108 Gutzwiller, F., Nater, B., and Martin, J. Community based primary prevention of cardiovascular disease in Switzerland: Methods and results of the National Research Program. *Preventive Medicine*, 1985;14:482-491.
- 109 Bandura A. Theoretical perspective. In: Bandura A, (Ed.) *Social learning theory*. (pp1-13) 1977; New Jersey: Prentice-Hall, Inc.
- 110 Rogers, T., Howard-Pitney, B., Feighery, E.C., et al. Characteristics and participant perceptions of tobacco control coalitions in California. *Health Education Research*, 1993;8:345-357.
- 111 Green, L.W., and Kreuter, M.W. Administrative and policy diagnosis: From PRECEDE to PROCEED. In Bull J and Howell Y, (Eds.) *Health promotion planning: An educational and environmental approach*. (pp188) 1991; Mountain View, CA: Mayfield Publishing Co.
- 112 Stone, E.J., Perry, C.L., Lupeker, R.V. et al. Synthesis of cardiovascular research. *Health Education Quarterly*, 1989;16:149-154.
- 113 World Health Organisation. Prevention in childhood and youth of adult cardiovascular disease: time for action. Report of a WHO Expert Committee, Geneva, World Health Organisation, 1990: Technical Report Series 792.
- 114 Canadian Association for School Health. Consensus Statement on Comprehensive School Health, 1991.
- 115 Richard, L., Potvin, L., Kishchuk, N., et al. Assessment of the integration of the ecological approach in health promotion programs. *American Journal of Health Promotion*, 1995;10:318-328.
- 116 O'Loughlin, J., Paradis, G., Kishchuk, N., et al. Coeur en santé St-Henri - A heart health promotion programme in Montreal, Canada: Design and methods for evaluation. *Journal of Epidemiology and Community Health*, 1995;49:495-502.
- 117 Godin, G. The effectiveness of interventions in modifying behavioral risk factors of individuals with coronary heart disease. *Journal of Cardiopulmonary Rehabilitation*, 1989;9:223-236.
- 118 Ice, R. Long-term compliance. *Physical Therapy*, 1985;65:1832-9.
- 119 O'Connor, GT, Buring JE, Yusuf S. et al., An overview of randomized trials of rehabilitation with exercise after myocardial infarction. *Circulation*. 1989; 80: 234-44.
- 120 Wilson, A. and Henry, D. A. General Practice. Meta-analysis: Assessing the quality of published meta-analyses. *The Medical Journal of Australia*, 1992;156: 173-187.

- 121 Schwarzer, R. Introduction to Meta-Analysis Software, Presentation at The Fourth International Congress on Behavioural Medicine, March 13-16, 1996, Washington DC.
- 122 Health and Welfare Canada. The Victoria Declaration on Heart Health. Declaration of the Advisory Board of the International Heart Health Conference. Victoria, Canada, May 1992.
- 123 Walters, V. Women's views of their main health problems. Canadian Journal of Public Health, 1992;83:371-374.
- 124 Dempsey, S.J., Dracup, K., and Moser, D.K. Women's decision to seek care for symptoms of acute myocardial infarction. Heart & Lung, 1995;24:444-456.
- 125 Moser, D.K., and Dracup, K. Gender difference in treatment-seeking delay in acute myocardial infarction. Progress in Cardiovascular Nursing, 1993;8,6-12.
- 126 Eaker E.D., Packard, B., Wenger N.K., et al. Coronary artery disease in women. American Journal of Cardiology, 1988;61:641-4.
- 127 Glazer MD, Hurst JW, Coronary atherosclerotic heart disease: some important differences in men and women. American Journal of Noninvasive Cardiology, 1987;1:61-67.
- 128 Tobin, N.J., Wassertheil-Smoller, S., Wexler, J.P. et al. Sex bias in considering coronary bypass surgery. Annals of Internal Medicine, 1987;107:19-25.
- 129 Ogur, B. Long day's journey into night: Women and prescription drug abuse. Women Health. 1986;11: 99-115,
- 130 Green, L.A., and Ruffin, M.T. A closer examination of sex bias in the treatment of ischaemic cardiac disease. Journal of Family Practice, 1994;39:33-6.
- 131 Green, L.A., and Ruffin, M.T. Differences in management of suspected myocardial infarction in men and women. Journal of Family Practice, 1993;36:389-93.
- 132 Wallen J, Waitzkin, H. Stoeckle, J.D. Physician stereotypes about female health and illness. Women Health, 1979; 4: 135.
- 133 Barry, P. Coronary artery disease in older women. Geriatrics, 1993;48(Suppl 1):4-8.
- 134 Jagal, S.B., Slaughter, P.M., and Baigrie, R.S. Good judgement or sex bias in the referral of patients for the diagnosis of coronary artery disease? Canadian Medical Journal, 1995;152:873-80.
- 135 Kee, F. Gender bias in treatment for coronary heart disease: Fact or fallacy? Quarterly Journal of Medicine, 1995;88:587-96.
- 136 Mendelson, M.A., and Hendel, R.C. Myocardial infarction in women. Cardiology, 1995;86:272-85.
- 137 Meilahn, E.N., Becker, R.C., & Corrao, J.M. (1995). Primary prevention of coronary heart disease in women. Cardiology, 86, 286-298.
- 138 Riegel B., and Gocka, I. Gender differences in adjustment to acute myocardial infarction. Heart & Lung, 1995;24:457-66.
- 139 Artinian, N.T., and Duggan, C.H. Sex differences in patient recovery patterns after coronary artery bypass surgery. Heart & Lung, 1995;24(6):483-94.

- 140 O'Callaghan W.G., Teo, K.K., O'Riordan J. et al. Comparative response of male and female patients with coronary artery disease to exercise rehabilitation. *European Heart Journal*, 1984;5:649-51.
- 141 Weaver, W.D., White, H.D., Wilcox, R.G., et al. Comparisons of characteristics and outcomes among women and men with acute myocardial infarction treated with thrombolytic therapy. *Journal of the American Medical Association*, 1996;275:777-82.
- 142 Chirikos T.N., Nickel, J.L., Work disability from coronary heart disease in women. *Women Health* 1984 9:55-74.
- 143 Barnett H.J.M. Stroke in Women. *Canadian Journal of Cardiology*. 6(suppl B), 11B-17B, 1990.
- 144 Stevenson, J.C. Hormonal influences on women's risk of CHD. In *Coronary Heart Disease: Are Women Special?* Sharp, I. (Ed.) (pp133-140); National Forum for Coronary Heart Disease Prevention, London.
- 145 Lobo, R. Hormones, hormone replacement therapy, and heart disease. In *Cardiovascular Health and Disease in Women*. Douglas, P.S. (Ed). (pp153-173) 1993; Philadelphia, W.B. Saunders.
- 146 Stevenson, J.C. The metabolic and cardiovascular consequences of HRT. *British Journal of Clinical Practice*, 1995;49:87-90.
- 147 Oparil, S. Hypertension in postmenopausal women: Pathophysiology and management. *Current Opinion in Nephrology & Hypertension*, 1995;4:438-42.
- 148 Boyd, M.E. The risks and benefits of hormone replacement therapy. *Canadian Journal of Surgery*, 1995;38:415-419.
- 149 Langer, R.D., and Barnett, E. Extended hormone replacement: Who should get it, and for how long? *Geriatrics*, 1994;49:20-29.

