THE COST OF CHRONIC DISEASE
in
CANADA

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for
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EXECUTIVE SUMMARY

Four types of chronic disease – cardiovascular disease, cancers, chronic obstructive pulmonary disease, and diabetes – kill an estimated 153,000 Canadians every year, account for nearly three-quarters of all deaths in the country, and are the major causes of premature death and hospitalization. The biggest killer is cardiovascular disease (heart disease, stroke, and atherosclerosis), which claimed the lives of 76,321 Canadians in 2000, and accounted for 35% of all deaths in the country. Cancer kills an estimated 62,600 Canadians every year, accounting for 29% of all deaths in the country.[1]

Other chronic conditions disable many more Canadians. Arthritis and rheumatism afflict 14% of Canadians, with Nova Scotians having the highest rates at 20%. Nearly 13%of Canadians (11.4% of males and 13.9% of females) suffer from high blood pressure, with Nova Scotia once more the highest at 16.2% and Alberta lowest at 10.5%; 14% have chronic back problems with Saskatchewan having the highest rate at 17%.[2] Sixteen percent of all Canadians have a long-term limitation or handicap that interferes with their activity at home, school, or work. Chronic conditions are becoming increasingly common.[3]

Medical care costs for people with chronic diseases account for 42% of total direct medical care expenditures, or $39 billion a year in Canada.[4] Because of the debilitating nature of these illnesses, and because cancer and heart disease kill so many at an early age, the indirect costs of chronic illness due to productivity losses are particularly high, accounting for over 65% of total indirect costs – $54.4 billion annually. Premature death due to cancer alone costs the Canadian economy $11.6 billion each year, while musculoskeletal disorders such as arthritis and osteoporosis cost the economy $14.9 billion due to disability, the single largest cost component for any category of illness. Circulatory diseases cost Canada almost $12.8 billion a year in productivity losses (all costs in C$2002).[5]

Combining direct medical costs ($38.9 billion) and indirect productivity losses ($54.4 billion), the total economic burden of seven types of chronic illness (cardiovascular diseases, cancer, chronic respiratory ailments, diabetes, musculoskeletal disorders, diseases of the nervous system and sense organs, and mental illness), exceeds $93 billion a year.

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[1] Federal, Provincial and Territorial Advisory Committee on Population Health, *Statistical Report on the Health of Canadians,* Health Canada and Statistics Canada, Ottawa, 1999, pages 291, 318, and 287 (hereafter referenced as Health Canada, *Statistical Report);* Heart and Stroke Foundation of Canada, *The Changing Face of Heart Disease and Stroke in Canada 2000,* Ottawa, October, 1999, page 76; National Cancer Institute of Canada, *Canadian Cancer Statistics 2002,* Toronto, April 2002, page 24-25; Statistics Canada, *Canada at a Glance,* 2nd edition, page 7, at: http://collection.nlc-bnc.ca/100/201/301/statcan/can_at_glance/12-581-XIE.pdf.

[2] Statistics Canada, *Canadian Community Health Survey, 2000/01*.

[3] Health Canada, *Statistical Report,* page 268.

[4] Estimate extrapolated from Health Canada, *The Economic Burden of Illness 1998*, Ottawa, 2002, (EBIC 98).

[5] Productivity loss cost estimates are from Health Canada, *The Economic Burden of Illness 1998,* Ottawa, 2002.

These seven chronic diseases account for 66% of productivity losses due to premature death, 65% of productivity losses due to disability, and more than half of the total economic burden of illness in Canada (estimated at $174.7 billion in 2002$ by EBIC 98[6]), including both direct and indirect costs. They cost the country the equivalent of 9% of its GDP annually. All categories of chronic disease combined are estimated to account for over 53% of the total economic burden of illness in Canada. Cardiovascular diseases alone cost Canada almost $25 billion a year in direct and indirect costs, cancer costs another $17.1 billion, and musculoskeletal diseases (such as arthritis and osteoporosis) add another $19.7 billion in costs.

It is estimated that 40% of chronic illness can be prevented. Epidemiological studies indicate that 25% of all direct medical costs – or nearly $9.7 billion (C$2002) a year in Canadian costs of chronic diseases – are attributable to a small number of excess risk factors such as smoking, obesity, physical inactivity, and poor nutrition.[7]

Socio-economic causes of chronic illness, such as poverty, inequality, and poor education, and environmental causes such as exposure to toxic pollutants, are also modifiable. Low-income women under the age of 40 are 62% more likely to be hospitalized than higher income women; over the age of 40, they are 92% more likely to be hospitalized. Those with low incomes and without a high school diploma have been found to use physician services much more frequently than those with higher incomes and with a B.A. And low-income groups have higher rates of smoking, obesity, physical inactivity, and cardiovascular risk. A York University study attributed 6,366 deaths and $4 billion a year in health care costs to poverty-related heart disease in Canada.[8]

The Cost of Chronic Disease study was originally done for Nova Scotia, and this report is the first to present estimates for Canada. It indicates that Canada's high rates of chronic illness can be reduced through concerted health promotion initiatives that reduce risk behaviours and conditions. The evidence demonstrates that the country's escalating health care costs can be significantly lowered by improving the health of the population and thereby reducing the need and demand for medical care.

[6] EBIC 98 refers to Health Canada, *The Economic Burden of Illness 1998*, Ottawa, 2002.
[7] Goetzel, Ron, (ed.), "The Financial Impact of Health Promotion," *American Journal of Health Promotion* 15 (5), May/June, 2001.
[8] References to these and other studies on the socio-economic determinants of illness are in Part III of this report.

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PART I
COSTS OF CHRONIC DISEASE

The nature of illness in Canada has changed dramatically in this century. Public health improvements, social reforms, and technological advances have sharply reduced the incidence of acute disease and infant mortality in the last hundred years, and thereby substantially increased average life expectancy at birth.

In 1900, the major causes of death were tuberculosis, dysentery, and diphtheria, and average life expectancy at birth was less than 50. Today, Canadians can expect to live to 78 (ranking third behind Switzerland and Japan among countries that are members of the Organization of Economic Co-operation and Development [OECD]); deaths from the deadly infectious diseases of the early 20th century are extremely rare; smallpox has been eradicated, and measles nearly eliminated through immunization.[9] At the same time, the incidence of chronic disease has increased sharply during the same period, with coronary heart disease surpassing infectious diseases in the 1930s as the major cause of death in Canada and the U.S. The second half of the 20th century, in turn, saw a sharp increase in cancer incidence up to the early 1990s, while deaths from cardiovascular disease fell by nearly half.[10]

Yet despite the marked changes in the nature of illness and primary causes of death in 1900 and 2000, there is a remarkable similarity that provides reason for optimism, and that is the primary motivation behind this report. Control of the infectious diseases that afflicted Canadians 100 years ago had far less to do with any break-through medical cures than with interventions that tackled the precursors and social causes of fatal diseases. Disease outbreaks were prevented by safer and more hygienic water, food, housing, and work conditions, and by immunization campaigns, even more than by medical advances. Though once epidemic in nature, the acute, infectious diseases of the early 20th century are today regarded as almost entirely preventable.

Similarly, the chronic diseases that today cause untold suffering, debilitate hundreds of thousands of Canadians, and drain tax dollars, are largely preventable. By some estimates, up to 70% of premature deaths and two-thirds of the cases of chronic disability are preventable and therefore unnecessary.[11] An analysis in the Canadian Medical Association Journal more than 30 years ago concluded that living conditions are probably far more important than medical care to physical and mental health.[12] Just as prevention overcame the acute, infectious diseases of the early 20th century, prevention can reduce a significant portion of the chronic disease burden that today afflicts the modern world, and consumes such a large proportion of its resources:

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[9] Health Canada, *Statistical Report on the Health of Canadians,* Ottawa, September, 1999, page 324; Almer, Robert, and Donald Eddins, "Cross-Sectional Analysis: Precursors of Premature Death in the United States," in Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness,* Oxford University Press, New York and Oxford, 1987, page 181.

[10] Thompson, Beti, and Michael Pertschuk, "Community Intervention and Advocacy," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 494. For cancer trends, see http://www.calacreek.com , summarizing the U.S. National Cancer Institute's *Annual Report to the Nation on the Status of Cancer, 1973-1997*, as published in the May 15, 2000 issue of *Cancer,* authors: Hannah K. Weir, Ph.D. (CDC), Harry M. Rosenberg, Ph.D. (NCHS), Sally W. Vernon, Ph.D. (University of Texas), Kathleen Cronin, Ph.D. (NCI), and Brenda K. Edwards, Ph.D. (NCI). Although these are U.S. statistics, the broad historical trends are applicable to Canada.

[11] U.S. Department of Health and Human Services, 1990, *Prevention '89/'90: Federal Programs and Progress,* Public Health Service, Washington D.C.

[12] Gelman, D., "The Price of Progress: Technology and the Cost of Medical Care," *Canadian Medical Association Journal* 1971; 104: 401-406.

"The public health revolution of the early twentieth century brought unprecedented benefits to the U.S. population and economy…. [O]pportunities exist to achieve additional, comparable gains at the present time."[13]

1. Deaths and Costs Due to Chronic Disease in Canada

Four types of chronic disease now account for more than 70% of all deaths in Canada. Cardiovascular diseases (mainly heart disease and stroke) and cancers together account for nearly two-thirds of all deaths in Canada, 35% and 29% respectively. Chronic obstructive pulmonary disease (bronchitis, emphysema, asthma, and chronic airway obstruction) accounts for another 4.2% of deaths in the country, and diabetes accounts for at least 2.4% more deaths (Table 1).[14] When all illness categories are considered, estimates from the medical literature suggest that chronic diseases account for more than 80% of all deaths and an even higher fraction of cases of total disability.[15]

Table 1. Deaths Due to Four Chronic Diseases as Percentage of all Deaths, Canada (2000 estimates)

Cause of Death	Estimated # of Deaths	Percent of all Deaths
Cardiovascular diseases	76,321	35%
Cancers	62,600	28.7%
Chronic obstructive pulmonary diseases	9,083	4.2%
Diabetes[16]	5,265	2.4%
Total: Four chronic diseases	**153,269**	**70.3%**

Sources: Estimates for cardiovascular disease and cancer for 2000 are from Statistics Canada, *The Daily* Wednesday April 2, 2003; Estimates for COPD and diabetes are based on age-standardized mortality rates (1998) from Statistics Canada, *Canada at A Glance*, 2002; these rates are extrapolated to the year 2000, based on Canadian population of 30,790,800 in 2000. Percentages are based on total number of deaths (218,062) in 2000 from Statistics Canada, *The Daily*, Wednesday April 2, 2003.

[13] Almer, Robert, and Donald Eddins, "Cross-Sectional Analysis: Precursors of Premature Death in the United States," in Almer, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness,* Oxford University Press, New York and Oxford, 1987, page 187.

[14] Statistics Canada, *The Daily*, April 2, 2003, available at www.statcan.ca/Daily; Statistics Canada, *Canada at a Glance*, 2002, available at: www.statcan.ca; Statistics Canada, *Population, provinces and territories 1998-2002*; available at: www.statcan.ca; Federal, Provincial and Territorial Advisory Committee on Population Health, *Statistical Report on the Health of Canadians*, Health Canada and Statistics Canada, Ottawa, 1999 (hereafter referenced as Health Canada, *Statistical Report*).

[15] Fries, James, "Aging, Natural Death, and the Compression of Morbidity," *The New England Journal of Medicine* 303 (3): 130-135, July 17, 1980, page 132.

[16] These are deaths directly attributable to diabetes. Diabetes is the underlying cause for many more deaths that are attributed to other causes. Some estimates place the number of deaths caused directly or indirectly by diabetes at five times the reported number. See Health Canada, *Diabetes in Canada*, available at: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/diabet99/d02_e.html; Statistics Canada, *Selected Leading Causes of Death By Sex*, http://www.statcan.ca/english/Pgdb/health36.htm.

Seven categories of chronic illness cost the Canadian health care system $24 billion a year (C$2002) in direct costs for hospitals, physicians, and drugs alone. These illnesses are:

- cardiovascular diseases (mainly heart disease, stroke, and hypertension),
- cancers,
- chronic obstructive pulmonary diseases (chronic bronchitis, emphysema, asthma),
- endocrine and related disorders (particularly diabetes),
- musculoskeletal disorders (like arthritis and osteoporosis),
- diseases of the nervous system and sense organs (including Parkinson's disease, multiple sclerosis, cerebral palsy, glaucoma, cataracts, blindness and hearing loss), and
- mental illness (like schizophrenia, depression, and anxiety disorders).

These seven diagnostic categories account for about 42% of all direct health care spending on hospitals, doctors, and drugs in Canada, including 45% of all hospital costs, 34% of physician services, and 44% of prescription drug expenditures.[17]

When other health care expenditures are added, such as costs of other institutions, home care, alternative medicine, private medical expenditures, and health science research, the total direct medical costs for these seven diagnostic categories are $38.9 billion (C$2002), annually (Table 2).

Even more costly than the direct medical burden is the toll that chronic illnesses take on the economy at large. The indirect costs of these seven categories of chronic illness alone, estimated according to the value of time lost due to disability and the discounted present value of future productivity lost due to premature death, amount to about $54.4 billion a year (C$2002). This amounts to 66% of all productivity losses due to all illnesses combined in Canada (total $82.7 billion in C$2002). This high cost is due to the debilitating nature of these particular chronic illnesses, and the fact that cancer and heart disease kill so many at an early age.

Combining direct medical costs ($38.9 billion) and indirect productivity losses ($54.4 billion), the total economic burden of these seven types of chronic illness comes to more than $93 billion a year (Table 2). This amounts to more than half of the total economic cost of illness in Canada, which is estimated in EBIC 98 at $174.7 billion (C$2002), or 9% of the country's total gross domestic product.

The estimates in Table 2 do not reflect the full costs of chronic diseases to the Canadian health care system. First, important categories of chronic illness are excluded, including all chronic digestive system disorders such as colitis, Crohn's disease, gallbladder disease, and cirrhosis of the liver. It was not possible to separate out these costs from those associated with acute and infectious digestive system illnesses such as diarrhea and gastroenteritis (stomach flu), so all digestive system disease costs have been excluded here. All congenital and chromosomal anomalies (such as Down's syndrome) are also excluded, as are chronic skin conditions (such as skin ulcers), diseases of the genitourinary system (such as chronic renal failure), all blood diseases (such as anemia), and conditions originating in the perinatal period.[18]

[17] Health Canada, *The Economic Burden of Illness 1998,* 2002. And online at: http://ebic-femc.hc-sc.gc.ca/home_e.php?Lang=e.

[18] For a full classification of all diseases by ICD-9 code, and therefore of all diagnostic categories excluded from the listings in Table 2, see: http://www.e-mds.com/services/icd9/index.html.

Table 2. Cost of Chronic Illness In Canada 1998 (C$2002 million)

Diagnostic Category	Hospital	Doctor	Drugs	Other[19]	Total[20] Direct	Premat. Death	Dis-ability	TOTAL
Cardiovascular	4,560.4	901.0	1,942.6	4,620.1	12,024.0	9,040.1	3,730.9	24,795
Cancer	2,014.8	365.0	230.3	1,628.7	4,238.8	11,639.3	1,244.7	17,122.8
Respiratory[21]	489.0	240.9[22]	464.3	745.2	1,939.3	920.8	1,218.3	4,078.4
Musculoskeletal	1,579.7	633.6	673.1	1,801.1	4,687.4	137.7	14,910.3	19,735.5
Endocrine[23]	522.7	280.1	896.6	1,060.4	2,759.7	1,109.2	950.5	4,819.4
Nervous System[24]	1,562.1	903.8	587.8	1,905.5	4,959.2	913.8	5,089.1	10,962
Mental	2,939.6	969.3	1,197.6	3,186.4	8,292.9	525.9	2,970.3	11,789.1
TOTAL	13,668.2	4,293.6	5,992.2	14,947.3	38,901.4	24,286.7	30,113.2	93,302

Source: Health Canada, The Economic Burden of Illness in Canada 1998, 2002.

[19] Hospital, physician, drug, and research costs are currently available for Canada by diagnostic category. However, at the present time, other direct health care costs, including private spending for other institutions and home care, are available only for all illness categories combined. These additional direct costs are therefore extrapolated here for the separate diagnostic categories, on the assumption that they occupy the same proportion of total direct health care costs for each diagnostic category separately as they do for all diagnostic categories combined. Thus, the ratio of additional Direct Costs for all diagnostic categories to Total Hospital, Physician and Drug Costs for all diagnostic categories is 0.624. To determine the Other Direct Costs for any particular category, we have therefore multiplied the Hospital, Physician, and Drug costs for that category by 0.624. The absence of direct information for this column will not substantially impact the total results, since the total figures given here do reflect the actual proportional breakdown for *all* diagnostic categories for Canada. (Although EBIC 1998 does provide some figures by diagnostic category for research costs, these are subsumed here within the "other" category, as research costs amount to less than one percent of total costs, and so are not separately attributed in Table 2 to any disease category). The same procedure was applied to determine provincial Other Direct Costs.

[20] "Total direct" refers to hospital, physician, and drug costs plus other medical expenses, health science research, privately funded medical expenses, home care, and costs of other institutions.

[21] These cost estimates are confined to chronic bronchitis, emphysema, and asthma only, and do not include costs of pneumonia, influenza and other acute respiratory infections. Diagnostic subcategory costs for respiratory illnesses, except for physician costs, are available in Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

[22] Physician cost estimates for the chronic bronchitis, emphysema, and asthma portion of respiratory diseases are not available in the Health Canada *Economic Burden of Illness in Canada 1998*. Instead, the percentage of physician costs for chronic bronchitis, emphysema, and asthma as a proportion of physician costs for all respiratory diseases was calculated from the *Economic Burden of Illness in Canada 1993* (28.3%). This percentage was used to calculate the physician costs attributable to chronic respiratory illness in Table 2 above.

[23] This row gives the total for all endocrine and related diseases, including thyroid and adrenal disorders, nutritional deficiencies, and other metabolic and immunity disorders. According to Health Canada's *Economic Burden of Illness in Canada 1993* (Ottawa, 1997, Table 2, page 10), diabetes accounts for 43.3% of the direct costs of all these endocrine-related disorders and 26.8% of the indirect costs. According to Katzmarzyk, Peter, Norman Gledhill, and Roy Shephard, "The Economic Burden of Physical Inactivity in Canada, (*Canadian Medical Association Journal* 163 (11), 28 November, 2000, page 1437), type 2 diabetes constitutes 92.5% of all diabetes cases, and would therefore constitute 40% of all endocrine-related disorders. For the purposes of this analysis, all endocrine and related diseases, nutritional deficiencies, and other metabolic and immunity disorders, are treated as chronic diseases.

[24] Because it is not possible to separate out costs by different categories of nervous system and sense organ disorders, these figures represent the total costs for all diseases of the nervous system and sense organs. Although diseases like Parkinson's, multiple sclerosis, cerebral palsy, glaucoma, cataracts, and disorders of the conjunctiva are chronic, as are conditions like blindness and hearing loss, the nervous system and sense organ category also includes some acute and infectious diseases such as meningitis and ear infections. These nervous system/sense organ disease costs therefore somewhat overstate the particular costs for chronic illness. Nevertheless, the exclusion of other categories of chronic illness (including dental disease, all digestive disorders like colitis, Crohn's disease, and cirrhosis of the liver, plus chronic conditions related to the skin, blood, and genitourinary systems, and all congenital anomalies) ensures that the total cost estimates for chronic diseases in Table 2 remain underestimates.

Some of the chronic conditions associated with these excluded conditions are clearly preventable. For example, alcohol abuse causes cirrhosis of the liver. Smoking during pregnancy and poor nutrition are associated with a higher incidence of low birth-weight babies and consequent developmental problems. Obesity is highly correlated with gallbladder disease: overweight individuals are 85% more likely to have gallbladder disorders, and 21% of all gallbladder disease in Canada is attributable to obesity.[25]

Nevertheless, the costs of these and other chronic conditions are excluded from Table 2, because costs for the general diagnostic categories of which they are part could not be broken down to separate out chronic from acute disorders. To give just one illustration of the impact of these additional cost categories, the direct and indirect costs of low birth weight babies alone would add about $1.4 billion a year to the totals in Table 2.[26]

As well, because Health Canada's *Economic Burden of Illness in Canada 1998* did not classify dental care costs by diagnostic category or break them down between regular and preventative dental care, acute conditions, and long-term chronic dental disease, Table 2 excludes dental care from its chronic illness totals. Dental costs are substantial. Health Canada's *Economic Burden of Illness in Canada 1998* estimates direct dental care costs alone at about $7 billion a year (C$2002), representing more than 26% of the additional direct health expenditures that were not classified by diagnostic category and 7% of all direct health care costs in Canada.[27]

On the other hand, Table 2 somewhat overstates the costs of chronic nervous system and sense organ disorders, because the figures represent the total costs for all diseases of the nervous system and sense organs, including some acute and infectious illnesses. Although diseases such as Parkinson's, multiple sclerosis, cerebral palsy, glaucoma, cataracts, disorders of the conjunctiva, and conditions like blindness and hearing loss are chronic, the nervous system and sense organ disease category also includes some acute and infectious illnesses such as meningitis and ear infections. Nevertheless, most nervous system and sense organ disorders are chronic, and the exclusion of other whole categories of chronic illness, like those described above, ensures that the total estimates for chronic diseases in Table 2 remain underestimates.

Table 2 also gives the total costs for all endocrine and related diseases, including thyroid and adrenal gland disorders, nutritional deficiencies, and metabolic and immunity disorders. According to Health Canada's *Economic Burden of Illness in Canada 1993*, diabetes accounts for 43.3% of the direct costs of all these endocrine and related disorders.[28] According to Katzmarzyk et al., type 2 diabetes constitutes 92.5% of all diabetes cases, and would therefore constitute about 40% of the direct costs of all endocrine and related disorders.[29] For the purposes

[25] Birmingham, C. Laird, et al., "The Cost of Obesity in Canada," *Canadian Medical Association Journal* 1999; 160: 483-8, Table 1.
[26] Health Canada, *Women and Sexual and Reproductive Health*. Available at www.hc-sc.gc.ca/english/women/facts. Rate of low-birth-weight babies is 8.8 per 10,000, or 27,297 in Canada, 2002; Estimated neonatal care for low-birth-weight babies is $32,000-$52,000. At $52,000 for neonatal care alone (not including other costs later in life), the total is $1.36 billion.
[27] Health Canada, *Economic Burden of Illness 1998*, 2002, page 35, Table 9.
[28] Health Canada, *Economic Burden of Illness in Canada 1993,* Ottawa, 1997, Table 2, page 10.
[29] Katzmarzyk, Peter, Norman Gledhill, and Roy Shephard, "The Economic Burden of Physical Inactivity in Canada," *Canadian Medical Association Journal* 163 (11), 28 November, 2000, page 1437.

of this analysis, all endocrine, nutritional and metabolic diseases, and immunity disorders, are treated as chronic diseases.[30]

Aside from the exclusion of certain conditions, the costs in Table 2 are likely to underestimate the full burden of chronic diseases for another reason. There are several proximate causes of illness and death that stem directly from chronic illnesses, but are not attributed in the official statistics to the diagnostic categories listed in Table 2, because death certificates and hospital records frequently list immediate rather than underlying conditions. For example, unintentional falls account for 54% of all hospital admissions due to injury, and 67% of all hospital days due to injury, with seniors accounting for nearly half of all lower limb fractures.[31] Yet these costs are generally attributed to the "injury" diagnostic category rather than to the osteoporosis that may be their underlying cause.

Similarly, complications due to diabetes, such as blindness, kidney failure, disorders of the pancreas, and infections involving the soft tissues and bone of the face, skull, and brain, may not be attributed to diabetes in the cost classification. Some of these costs may therefore be excluded from the cost estimates in Table 2. Kidney failure, for example, is reported as a genitourinary disorder, and is therefore not accounted for in the cost estimates. The indirect costs and productivity losses due to premature mortality resulting from diabetes are particularly likely to be underestimated. Because it so often leads to other complications and illnesses, diabetes is generally under-reported on death certificates—by perhaps as much as a factor of five.[32] In short, the listing of costs by diagnostic category may ascribe costs to the most immediate manifestation of an underlying chronic condition rather than attributing them to the chronic disease itself.

When these additional categories and costs of chronic illness are added to the seven diagnostic categories in Table 2, the full costs of chronic diseases to the Canadian health care system are likely to match the estimates of the U.S. Centers for Disease Control and Prevention, which attribute 60% of all health care costs in the U.S. to chronic diseases. When total economic costs, direct and indirect, are included in the equation, and when these additional categories and costs of chronic disease are also included, then chronic illnesses are likely to account for more than 70% of the total economic burden of illness in Canada.

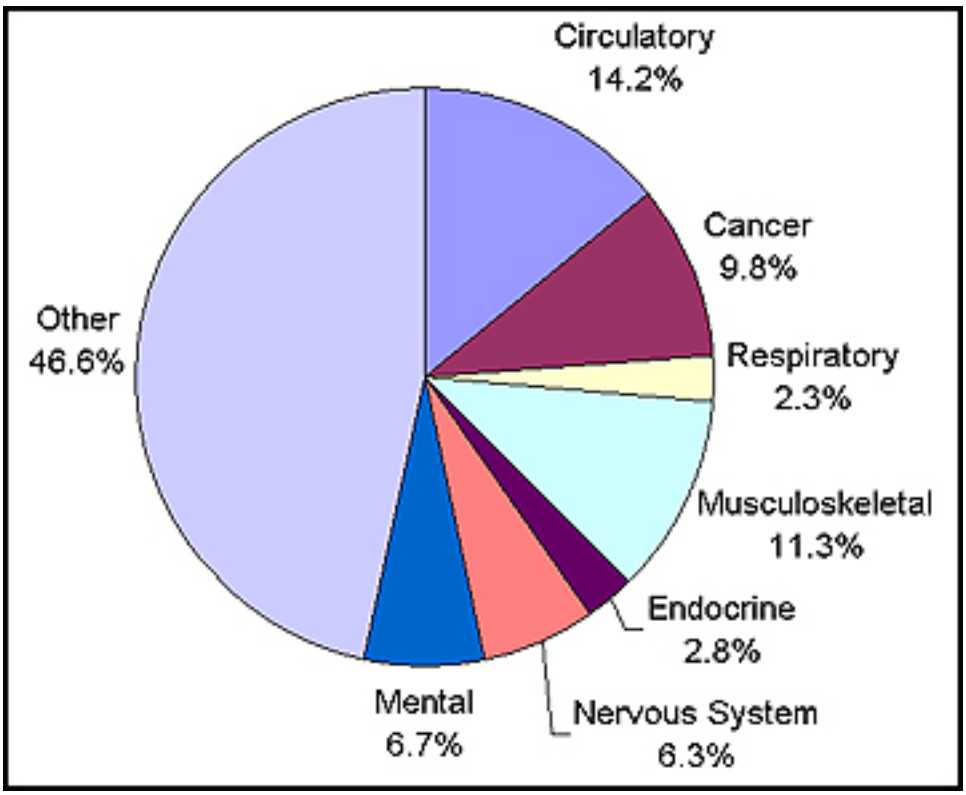
It is noteworthy that different kinds of chronic disease have very different cost distributions. Cardiovascular (circulatory) diseases and mental illnesses account, by far, for the highest direct health care costs in Canada (particularly hospital and drug costs), with cardiovascular diseases registering the highest direct health care costs. Cancer produces the highest losses in premature death, followed by cardiovascular diseases; and musculoskeletal disorders account for the highest disability costs in Canada. In fact, the disability costs attributable to musculoskeletal disorders are so high that they surpass the total hospital costs associated with all seven categories

[30] For a full listing of all endocrine, nutritional and metabolic diseases, and immunity disorders, see the classification of diseases according to ICD-9 codes, available at: http://www.e-mds.com/icd9/240-279/index.html.
[31] Health Canada, *Statistical Report on the Health of Canadians,* Ottawa, 1999, page 243; Canadian Institute for Health Information (CIHI), *Injury Hospital Admissions by Cause of Injury (1999)* (107,218/197,002), available at: http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=statistics_results_topic_hospital_e&cw_topic=Health%20Services&cw_subtopic=Hospital%20Discharges.
[32] Health Canada, *Diabetes in Canada*, available at: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/diabet99/d02_e.html; Statistics Canada, *Selected Leading Causes of Death By Sex*, available at: http://www.statcan.ca/english/Pgdb/health36.htm.

of chronic disease in Table 2. The seven categories of chronic disease in Table 2 account for 42% of total direct medical care expenditures, 66% of all productivity losses due to premature death, 65% of all disability costs, and more than half of the total economic burden of illness in Canada including both direct and indirect costs (Figures 1 through 3).

Two Atlantic Provinces – New Brunswick and Newfoundland and Labrador – have higher chronic disease costs as a percentage of their total economic burden of illness than the rest of the country, with New Brunswick the highest at 56.5%. Ontario and Saskatchewan have the lowest chronic disease costs as a percentage of their total economic burden of illness, at 51.6% and 51% respectively (Figure 4).[33]

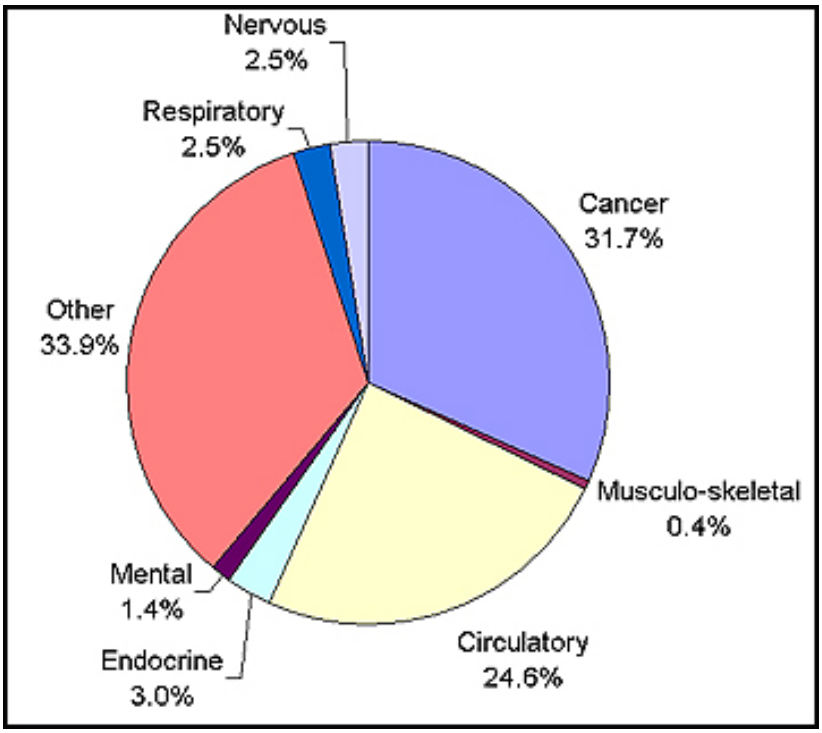
Figure 1. Distribution of Illness Costs in Canada, Direct and Indirect Costs, 1998 (%)



Source: Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

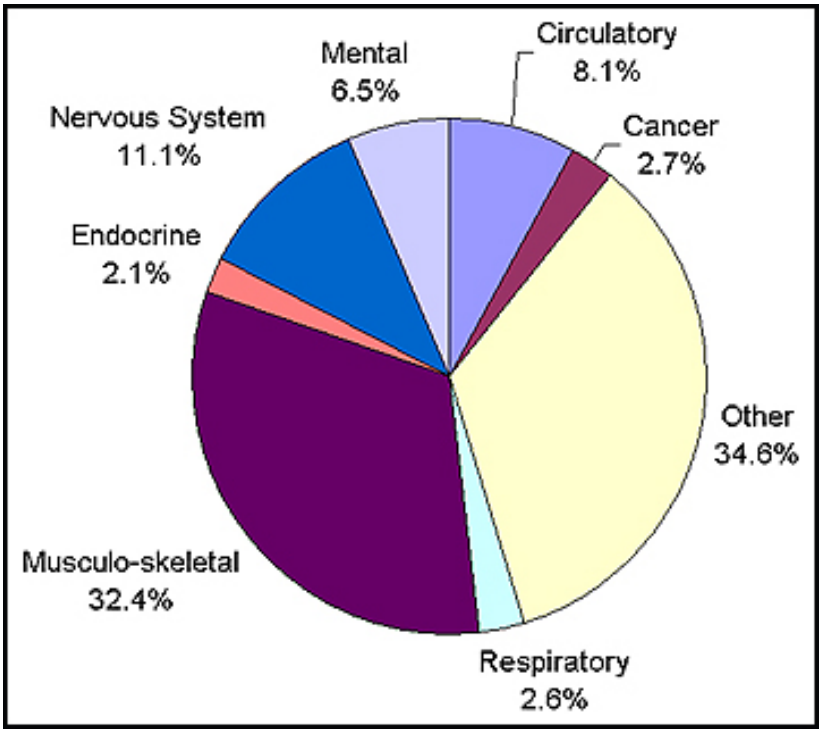
[33] Health Canada, *The Economic Burden of Illness 1998*, 2002.

Figure 2. Costs of Premature Death in Canada, by Illness, 1998 (%)



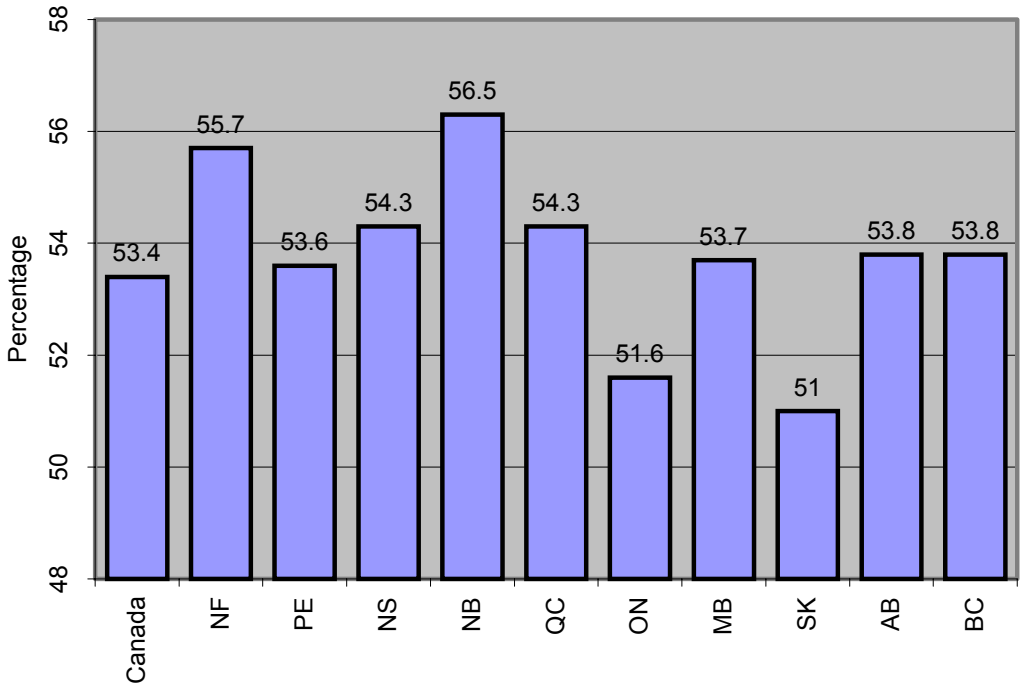
Source: Health Canada, *Economic Burden of Illness 1998*, 2002.

Figure 3. Costs of Disability in Canada, by Illness, 1998 (%)



Source: Health Canada, *Economic Burden of Illness 1998*, 2002.

Figure 4. Percentage of Chronic Disease Costs to Total Economic Burden of Illness, Canada, Provinces, 1998, (%)



Source: Health Canada, *The Economic Burden of Illness 1998*, 2002.

1.1 Cardiovascular Diseases

Cardiovascular diseases (mainly heart disease, stroke, atherosclerosis, and high blood pressure) are responsible for 35% of deaths in Canada annually, and are the leading causes of death in this country.

Ischemic heart disease, also called coronary heart disease or coronary artery disease, results from a reduced blood supply to the heart, and accounts for more than half of all deaths due to cardiovascular disease (CVD) in Canada. Stroke, or cerebrovascular disease, accounts for 19% of CVD deaths in the country, and acute myocardial infarction (heart attack) for more than 25%.[34]

Cardiovascular disease (CVD) death rates in Canada have fallen by nearly half in the last 30 years, mainly due to improved medical and surgical care, but also due to early diagnosis and treatment, reduced smoking prevalence, and other lifestyle changes.[35] In the U.S., mortality due

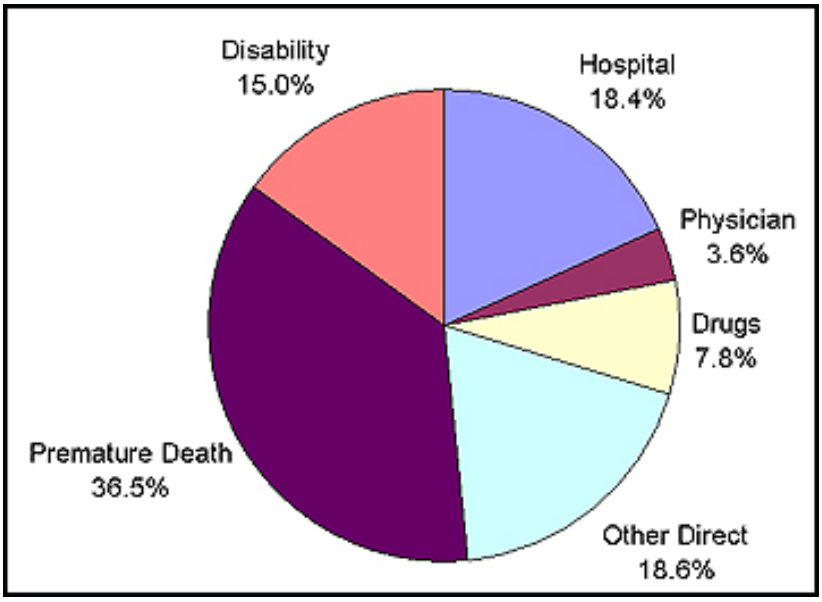
[34] Health Canada, *Statistical Report,* page 291; U.S. Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, *Chronic Diseases and Their Risk Factors: The Nation's Leading Causes of Death*, Atlanta, 1999, pages 10 and 14; Heart and Stroke Foundation of Canada, *The Changing Face of Heart Disease and Stroke in Canada 2000,* Ottawa, October, 1999, pages 72-73, 76-77.
[35] Heart and Stroke Foundation, op. cit., page 70.

to heart disease has fallen by an average of 2-3% annually since the 1950s, and is now 55% of the 1950s rate.[36]

Because only 25% of the mortality decline is attributable to better risk control and reduced disease incidence, a substantial portion of CVD mortality has been postponed to later ages rather than avoided, sometimes substituting prolonged disability for premature death. Canadians lose 164,400 potential years of life each year as a result of premature death due to heart disease and stroke.[37]

Smoking, physical inactivity, poor diet, obesity, high blood pressure, elevated cholesterol, and exposure to second-hand smoke are the major risk factors for heart disease and stroke. Many of these risk factors are linked, and surveys have found that 41% of Canadian men and 33% of women aged 18-74 have two or more of these risk factors. The Heart and Stroke Foundation of Canada notes that prevention of heart disease requires "modifying not only risk factors and risk behaviours but also such 'risk conditions' as poverty, powerlessness and lack of social support."[38]

Figure 5. Distribution of Costs: Cardiovascular Disease, Canada, 1998 (%)



Source: Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

[36] Goldberg, Robert, "Temporal Trends and Declining Mortality Rates from Coronary Heart Disease in the United States," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 41.

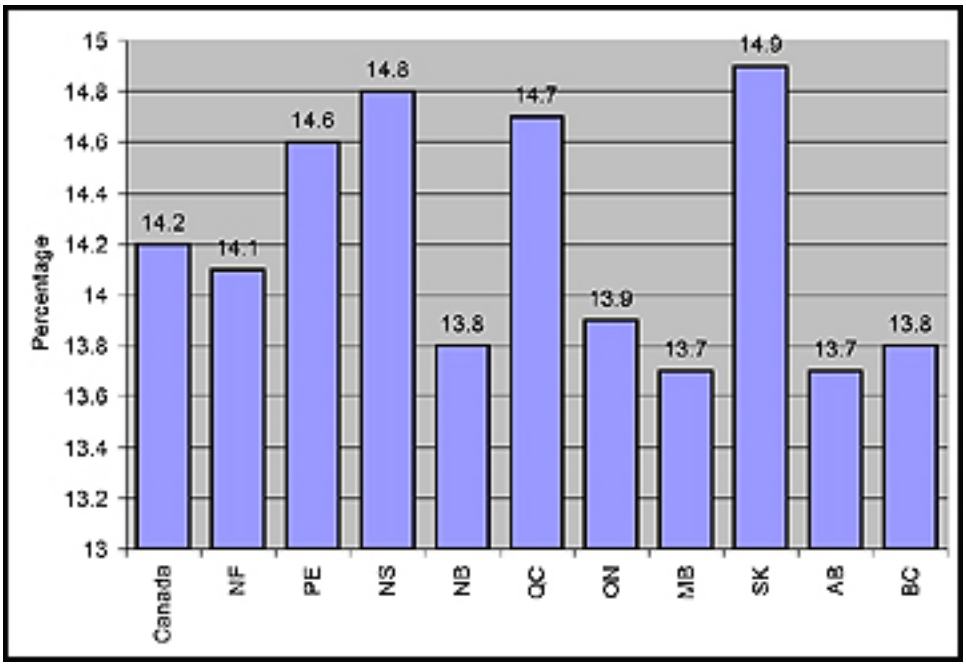
[37] Health Canada, *Statistical Report,* page 321; Heart and Stroke Foundation, op. cit., page 23. U.S. estimates cited in this publication indicate that 43% of the mortality decline is due to improved treatment; 29% to early diagnosis; and 25% to controlling risk factors and thus reducing disease incidence. There appears to have been a substantial shift in these proportions over time. Earlier estimates found that reductions in smoking, high serum cholesterol levels, and other risk factors, accounted for slightly over one half of the observed decline in CHD mortality between 1968 and 1976, while medical interventions contributed to about 40% of the decline. See Goldberg, Robert, "Temporal Trends and Declining Mortality Rates from Coronary Heart Disease in the United States," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 63.

[38] Heart and Stroke Foundation, op. cit., page 23.

Cardiovascular diseases (particularly heart disease, stroke, and hypertension) cost the Canadian health care system an estimated $7.4 billion (C$2002) each year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add more than $4.6 billion to this sum, for total health care spending of $12 billion a year due to cardiovascular illnesses. Productivity losses due to premature death and disability as a result of heart disease, stroke, and hypertension cost the Canadian economy an additional $12.8 billion a year, for a total economic burden of $24.8 billion that can be attributed to circulatory diseases (Figure 5).[39]

In Canada as a whole, cardiovascular costs account for 14.2% of the total economic burden of illness. Cross-country, percentages range from lows of 13.7% in Manitoba and Alberta to highs of 14.9% in Saskatchewan and 14.8% in Nova Scotia (Figure 6).[40]

Figure 6. Cardiovascular Disease Costs as Percentage of Total Illness Costs, Canada, Provinces, 1998, (%)



Source: Health Canada, *The Economic Burden of Illness 1998*, 2002.

A substantial portion of these financial costs could potentially be avoided through preventive measures that reduce risk, and through health promotion initiatives. Above all, this study indicates that the independence and quality of life of older Canadians can be sustained and improved through reduction of risk factors and conditions.

[39] Health Canada, *The Economic Burden of Illness in Canada 1998,* 2002.
[40] Idem.

1.2 Cancers

Cancer is the second leading cause of death in Canada, and accounts for 29% of all deaths in the country. National Cancer Institute of Canada figures indicate that 61,650 people died of cancer in 1999.[41] Statistics Canada estimates that 62,600 Canadians died of cancer in 2000.[42] The National Cancer Institute has estimated 66,200 cancer deaths for 2002.

The number of new cases of cancer indicates the future burden and cost of cancer. An estimated 136,900 Canadians were diagnosed with cancer in 2002. Canada's cancer incidence in 1999 was 329.4 per 100,000, compared to 327.4 per 100,000 in the U.S.[43] If current trends continue, 41% of men will develop cancer during their lifetimes, and 39% of women will develop the disease.[44]

Many risk factors for heart disease, including smoking, poor nutrition, physical inactivity, and exposure to second-hand smoke, are also key risk factors for cancer, and are preventable. According to the American Cancer Society, one-third of all cancer deaths are related to poor nutrition.[45]

Excessive sun exposure is also an important modifiable cancer risk factor, with an estimated 840 deaths occurring from melanoma in 2002, and an estimated 3,850 new cases across the country.[46] Screening services can also help detect cervical cancer, breast cancer, and prostate cancer at an early stage, and thus enable effective treatment that can prevent premature death.

Lung cancer is the leading cause of cancer deaths in Canada for both men and women, and accounts for 28% of all cancer-related mortality in the country: 30% for men and 25% for women. In all, it is estimated that 10,700 men and 7,700 women died from lung cancer in 2002.[47]

A single behaviour – cigarette smoking – accounts for 85% of all lung cancer cases and is responsible for about one-third of potential years of life lost in Canada. Across the country, smoking cessation could prevent more than 17,000 lung cancer deaths per year.[48]

Prostate cancer is the second leading cause of cancer death for men, accounting for an estimated 4,300 deaths in 2002 or approximately 12% of male cancer deaths in Canada. Breast cancer is the second leading cause of cancer death for women, accounting for 5,400 or more than 17% of female cancer deaths in the country. About 30% of these breast cancer deaths could be prevented through mammogram testing for women 50 or older. Colorectal cancer is the third leading cause

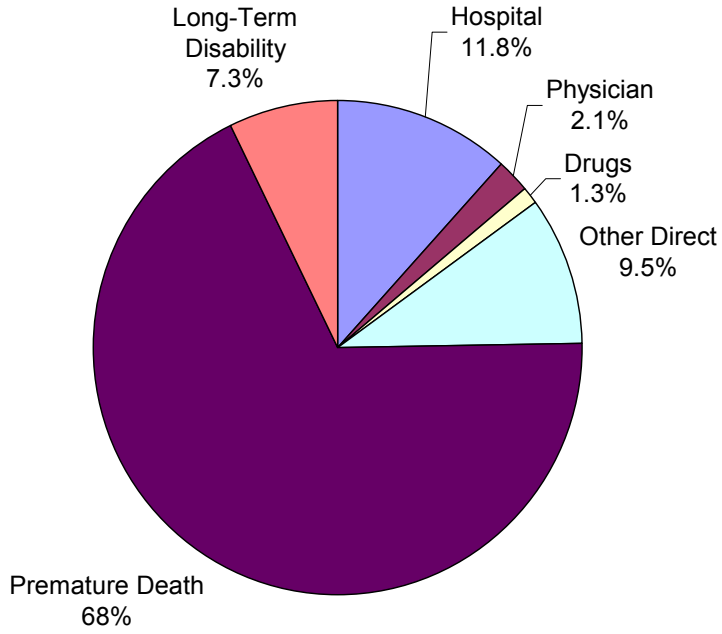
[41] National Cancer Institute of Canada 2003, *Canadian Cancer Statistics 2003*, available at: www.cancer.ca.
[42] Statistics Canada, *The Daily*, April 2, 2003, available at: www.statcan.ca.
[43] OECD Statistics, Health, *OECD Health Data 2003 Table 3: Cancer, Malignant neoplasms, Per 100,000 Population*, available at: http://www.oecd.org (search for Health Data 2003- Frequently asked Data) accessed Jan. 24, 2004.
[44] National Cancer Institute of Canada 2002, op. cit., pages 15, 16.
[45] Centers for Disease Control, op. cit., page 18.
[46] National Cancer Institute of Canada 2002, op. cit., pages 26, 28.
[47] Ibid., page 19.
[48] U.S. Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, *Chronic Diseases and Their Risk Factors: The Nation's Leading Causes of Death*, Atlanta, 1999, pages 10 and 14; Health Canada, *The Facts About Tobacco*, available at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/facts/health_facts/lungcancer.html, accessed Jan. 25, 2004.

of cancer deaths for both men and women (6,500 deaths in all), accounting for about 10% of all cancer deaths in the country. Physical inactivity, obesity, and diets high in saturated fats and low in vegetables and whole grains are risk factors for colorectal cancer.[49]

Cancer costs the Canadian health care system $2.6 billion a year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add $1.6 billion to this sum, for total direct health care spending of more than $4.2 billion a year due to cancer. Productivity losses due to premature death and disability as a result of cancer cost the economy an additional $12.9 billion a year, for a total economic burden of more than $17.1 billion that can be attributed to cancer.[50] A substantial portion of cancer costs could be avoided through preventive measures that reduce risk.

Cancer is the most costly illness in losses due to premature mortality (more than $11.6 billion annually), because it so often claims its victims at young ages. In fact, premature death costs make up 68% of all cancer costs (Figure 7). Circulatory diseases and cancer alone account for more than 30% of all productivity losses (premature death and disability) due to illness in Canada, and for almost $42 billion total in direct and indirect costs.[51]

Figure 7. Distribution of Cancer Costs, Canada, 1998 (%)

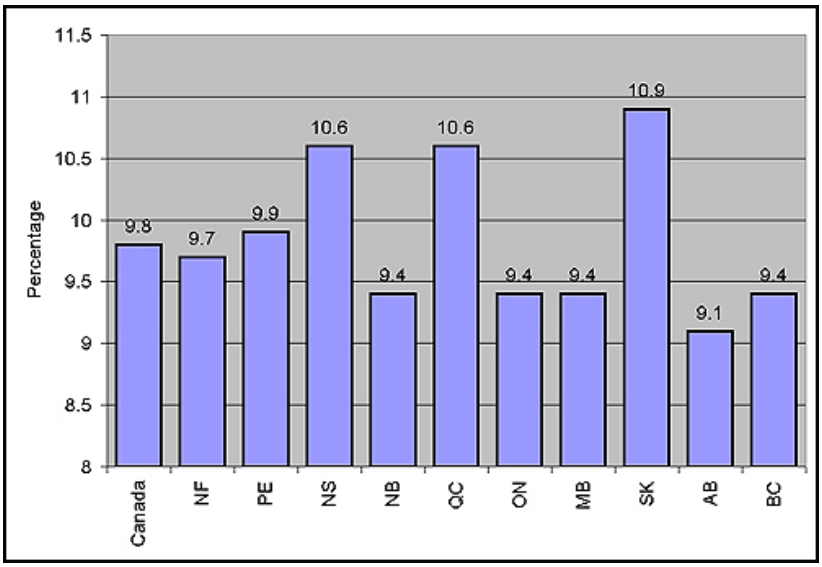


Source: Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

[49] National Cancer Institute of Canada, op. cit., page 28; Centers for Disease Control, op. cit., pages 26 and 30.
[50] Health Canada, *The Economic Burden of Illness in Canada 1998,* 2002. Hospital, physician, drug, and research costs are currently available for Canada by illness category, including cancer. However, at the present time, other direct health care costs, such as spending for other institutions and home care, have been assessed only for all illness categories combined. These additional direct costs are therefore extrapolated here for cancer, on the assumption that they occupy the same proportion of total direct health care costs for cancer as they do for all diagnostic categories combined.
[51] Idem.

In Canada as a whole, cancer costs constitute 9.8% of the total economic burden of illness. Among the provinces, Saskatchewan has the highest cancer costs as a percentage of total economic burden of illness at 10.9%, followed by Quebec and Nova Scotia at 10.6%, while Alberta has the lowest at 9.1%. (Figure 8).[52]

Figure 8. Cancer Costs as Percentage of Total Illness Costs, Canada, Provinces, 1998, (%)



Source: Health Canada, *The Economic Burden of Illness 1998*, 2002.

1.3 Diabetes

Diabetes is a serious, lifelong condition that can cause heart disease, kidney failure, and blindness, and often leads to disability and death. In 2000-2001, more than one million Canadians had non-insulin-dependent diabetes mellitus (often called adult-onset diabetes, or diabetes 2). This amounts to 4.1% of the total population of Canada, and 13% of those aged 65-74. Newfoundland had the highest rates of diabetes in the country at 5.8%.[53] U.S. estimates indicate that diabetes mellitus affects 12 million people in that country.[54]

Diabetes is responsible for the total disability of about 110,000 Canadians, including 1,300 who become blind each year because of diabetic eye disease; more than 6,600 who receive treatment for kidney failure; and another 6,600 who undergo diabetes-related lower-extremity amputations. Diabetes was estimated to be the underlying cause of 5,265 deaths in 2000, and a contributing cause to at least 11,000 more, for a total of 16,265 deaths attributable to diabetes (7.7% of deaths). These premature deaths represent a loss of 166,000 years of life every year.[55]

[52] Health Canada, *The Economic Burden of Illness in Canada 1998*, 2002.
[53] Statistics Canada, *Persons With Diabetes by Age and Sex*, available at: http://www.statcan.ca/english/Pgdb/health53a.htm; and *Persons With Diabetes by Sex, Provinces*, available at: http://www.statcan.ca/english/Pgdb/health54a.htm.
[54] Manson, Joann, and Angela Spelsberg, "Primary Prevention of Non-Insulin-Dependent Diabetes Mellitus," *American Journal of Preventive Medicine,* 10 (3), 1994.
[55] These estimates are extrapolated from U.S. data on deaths, blindness, kidney failure, and amputations attributable to diabetes. See Centers for Disease Control, op. cit., page 34; *MMWR* 35 (46), 21 November, 1986, pages 711-714,

Because it leads to other serious illnesses, diabetes is under-reported on death certificates. Similarly, conventional estimates of mortality, disease-specific disability, and health expenditures attributed to diabetes are almost certainly underestimates, because of the convention of classifying illnesses by principal diagnosis. Table 1 (above), based primarily on principal diagnosis listed on death certificates, attributes approximately 5,265 deaths a year to diabetes (2.4% of total deaths in Canada). By comparison, U.S. estimates attribute 6.8% of total mortality in that country to diabetes mellitus.[56] In Canada, a more comprehensive approach that includes diabetes as a contributor to other more proximate causes of death, would attribute at least 7.5% of total deaths to diabetes, rather than the 2.4% indicated in Table 1. According to Health Canada:

> *"There were 5,447 deaths in 1996* [5,699 in 1997] *for which diabetes was certified as the underlying cause. This ranks diabetes as the seventh leading cause of death in Canada. However, the actual number of deaths for which diabetes was a contributing factor is probably five times this number."*[57]

The U.S. Centers for Disease Control similarly report:

> *"Actually diabetes contributes to a much larger proportion of mortality, since it is reported on only about half of the death certificates for persons who die with the disease and is listed as the underlying cause on only one-quarter of the certificates on which it appears. The most frequent causes of death among persons with diabetes are ischemic and other forms of heart disease, cerebrovascular disease, and other forms of atherosclerosis; renal disease, including nephritis/nephrosis and uremia; respiratory disease; and infection."*[58]

More than 50% of diabetes cases are attributable to obesity.[59] Given the epidemic increase in obesity, it is not surprising that the global population with diabetes has jumped nearly five-fold from 30 million in 1985 to 143 million in 1998. The average age of diabetics is getting younger, and the global incidence of the disease is expected to double to 300 million by the year 2025.[60]

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available at: http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00000824.htm. Estimates of potential years of life lost and total disability attributable to diabetes mellitus are extrapolated from Huse, Daniel M. et al., "The Economic Costs of Non-Insulin-Dependent Diabetes Mellitus," *Journal of the American Medical Association,* 262 (19): 2708-2713, November 17, 1989. Note that these sources are 13-16 years old, and that the incidence of diabetes and its concomitant mortality, morbidity, and disability are higher today.

[56] Huse, Daniel M. et al., "The Economic Costs of Non-Insulin-Dependent Diabetes Mellitus," *Journal of the American Medical Association,* 262 (19): 2708-2713, November 17, 1989.

[57] Health Canada, *Diabetes in Canada*, available at: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/diabet99/d02_e.html; Statistics Canada, *Selected Leading Causes of Death By Sex*, available at: http://www.statcan.ca/english/Pgdb/health36.htm.

[58] Centers for Disease Control, op. cit., page 34. *MMWR* 35 (46), 21 November, 1986, pages 711-714, available at: http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00000824.htm.

[59] C. Laird Birmingham, M.D. et al., *Canadian Medical Association Journal,* 23 February, 1999: 160 (4), page 486. In this article, obesity is defined as a Body Mass Index of 27 or greater, whereas the international standard used by the World Health Organization and the National Institutes of Health in the United States define obesity as a BMI of 30 or higher. The attribution of 50% of diabetes cases to obesity is based on the *CMAJ* definition of BMI = 27+; Manson, Joann, and Angela Spelsberg, "Primary Prevention of Non-Insulin-Dependent Diabetes Mellitus," *American Journal of Preventive Medicine,* 10 (3), 1994.

[60] Gardner, Gary and Halweil, Brian, "Nourishing the Underfed and Overfed," in Worldwatch Institute, *State of the World 2000,* Chapter 4, W. W. Norton and Co., New York, 2000, page 72.

Statistics Canada reports that Canadians with a body mass index greater than 30 are four times as likely to have diabetes.[61]

Endocrine and related diseases (including diabetes) cost the Canadian health care system $1.7 billion a year in hospital, physician, and drug costs. Other direct costs, including private expenditures for other institutions and home care, add another billion dollars to this sum, for total direct health care spending of $2.7 billion a year due to endocrine and related diseases. Productivity losses due to premature death and disability as a result of endocrine-related disorders cost the Canadian economy an additional $2.1 billion a year, for a total economic burden of $4.8 billion that can be attributed to this category of diseases (Figure 9).[62]

According to the 1993 *Economic Burden of Illness in Canada,* diabetes accounts for 43.3% of direct endocrine and related disease costs, and 26.8% of indirect costs. Applied to the 1998 *Economic Burden of Illness in Canada* estimates for the country, this means that diabetes costs the Canadian health care system $736 million a year in hospital, physician, and drug costs, and accounts for $1.2 billion in total direct health care spending. Diabetes also accounts for $552 million in productivity losses, for a total economic burden of about $1.7 billion.

Type 2 diabetes constitutes 92.5% of all cases, accounting for $681 million a year in hospital, drug, and physician costs; $1.1 billion in total direct health care spending; $510 million in productivity losses; and $1.6 billion in total economic costs. This is, proportionally, a much more conservative estimate than comparable U.S. estimates, which have pegged the combined direct and indirect costs of diabetes in that country at $64.5 billion a year.[63, 64, 65]

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[61] Body mass index is calculated by dividing weight in kilograms by height in metres squared. See Gilmore, Jason, "Body Mass Index and Health," *Health Reports* 11 (1), Summer, 1999, Statistics Canada, pages 31-43.

[62] Health Canada, *The Economic Burden of Illness in Canada 1998,* 2002. Hospital, physician, drug, and research costs are currently available for Canada by illness category, including diabetes. However, at the present time, other direct health care costs, such as spending for other institutions and home care, have been assessed only for all illness categories combined. These additional direct costs are therefore extrapolated here for endocrine diseases, on the assumption that they occupy the same proportion of total direct health care costs for endocrine diseases as they do for all diagnostic categories combined.

[63] Manson, Joann, and Angela Spelsberg, "Primary Prevention of Non-Insulin-Dependent Diabetes Mellitus," *American Journal of Preventive Medicine,* 10 (3), 1994.

[63] Manson, and Spelsberg (1994), op. cit.

[64] Throughout this report, all monetary estimates are translated to 2002 Canadian dollars, for comparative purposes. In converting from U.S. dollars, the following method is used: U.S. dollars for the base year are converted to Canadian dollars for the same year, and Statistics Canada's Consumer Price Index is then used to convert the base year Canadian dollars to 2002 Canadian dollars. For example, 1990 U.S. dollars are converted to 1990 Canadian dollars; 1994 U.S. dollars are converted to 1994 Canadian dollars. Statistics Canada's Consumer Price Index is then used to convert the 1990 or 1994 Canadian dollars to 2002 Canadian dollars.

The $40 billion (US$1994) estimate in this sentence is given here as an example. Exchange rates are taken from http://www.x-rates.com/cgi-bin/hlookup.cgi which gives the rate as $US1 = $1.3825 Cdn on June 30, 1994. To convert 1994 U.S. dollars to 1994 Canadian dollars: Calculation (1): 1.3825 X $40 billion = $55.3 billion ($C1994). Then to convert 1994 Canadian dollars to 2002 Canadian dollars using Statistics Canada's Consumer Price Index (CPI): Calculation (2): 2002 CPI (119) divided by 1994 CPI (102) X $55.3b = $64.5 billion.

This same method is used for all conversions from U.S. dollars to 2002 Canadian dollars throughout the report, so it is possible for analysts to convert the Canadian dollar figures used in this report back to the original U.S. estimates provided in the cited studies. It should be noted that these conversions do *not* imply that the U.S. estimates would be actual costs in the Canadian system, since U.S. health care costs have been shown to be considerably higher than Canadian health care costs. The conversion to a common metric is intended for comparative purposes

A substantial portion of diabetes costs could be avoided through improved nutrition, physical activity, and weight reduction. One study found that the achievable reduction in the risk of non-insulin-dependent diabetes mellitus by altering modifiable risk factors was 50-75% for obesity and 30-50% for physical activity.[66]

In a study measuring the potential impact of three public health interventions on mortality attributable to type 2 diabetes in U.S. males – early detection and standard therapy; early detection and intensive therapy; and primary prevention – it was found that primary prevention offered the greatest benefit for both all-cause mortality (reductions of 6.2%-10%) and cardiovascular mortality (7.9%-9%).[67] As primary prevention is generally less costly than therapy, interventions aimed at modifiable risk factors such as nutrition, physical activity, and weight reduction are also likely to be the most cost-effective in reducing type 2 diabetes incidence and mortality.

Results from the Finnish Diabetes Prevention Study indicate that specific and properly controlled lifestyle changes can prevent the onset of type 2 diabetes in people with a high risk of getting the disease. In a randomized study of 522 overweight subjects between the ages of 40-65 with impaired glucose tolerance, follow-up results showed that the cumulative incidence of diabetes was 11% for the intervention group (which was given detailed instructions on weight reduction strategies, fat intake, increased fibre intake, and moderate exercise) compared to 23% for the control group (which was given only general information but no detailed instructions).[68]

In a similar study conducted by the Diabetes Prevention Program Research Group, 3,234 non-diabetics with elevated fasting and post-load plasma glucose concentrations were randomly assigned a placebo, metformin, or a lifestyle modification program. A three-year follow-up showed that, while metformin helped reduce the incidence of diabetes compared to the placebo, lifestyle intervention was the most effective method, reducing the incidence of diabetes by 58% compared to 31% for metformin.[69]

Endocrine and related disease costs as a percentage of the total economic burden of illness range from 2.6% for Newfoundland and Labrador and Manitoba to 2.8% in Prince Edward Island, Nova Scotia, Ontario and Saskatchewan (Figure 10).[70]

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only. Thus, whenever U.S. estimates are extrapolated to Canada, the higher costs of the U.S. health care system must be borne in mind, and the estimates are not intended to imply actual costs to the Canadian health care system.

[65] According to "OECD in Figures: Statistics on the Member Countries," *OECD Observer 2002, Supplement 1,* Health: Expenditure, page 8. U.S. per capita health care costs are currently 80% higher than Canadian costs. This is a sharp increase from 1989, when U.S. per capita health care costs were 60% higher than Canadian costs. Therefore, all conversions and cost extrapolations for Canada from U.S. data should really be reduced by 44.5% to assess disease costs and intervention benefits and costs in Canada. This additional step has not been taken in this report. It would involve reducing all conversions from U.S. costs and benefits to 2002 Canadian dollars by 44.5% throughout the whole report.

[66] Manson, and Spelsberg (1994), op. cit.

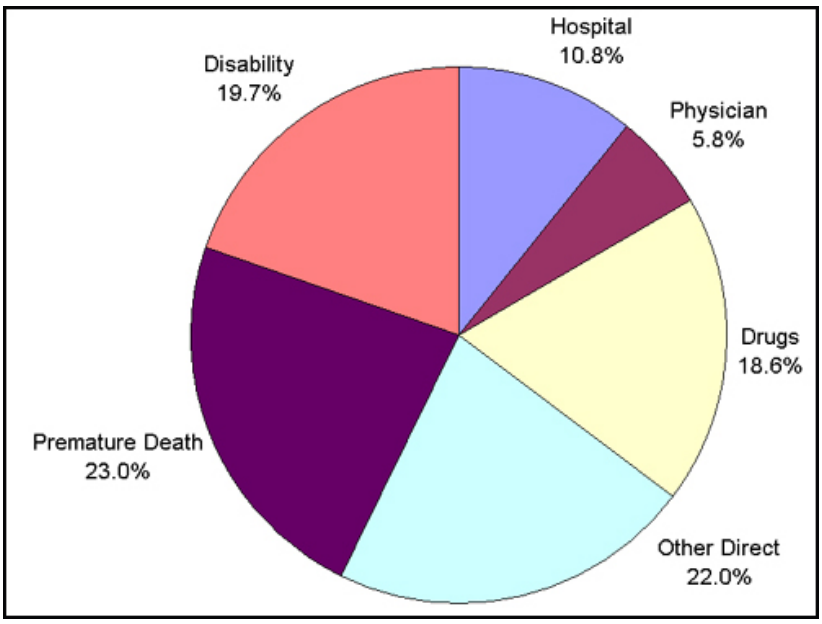
[67] Narayan, K.M., T.J. Thompson, J.P. Boyle, G.L. Beckles, M.M. Engelgau, F. Vinicor, and D.F. Williamson, "The use of population attributable risk to estimate the impact of prevention and early detection of type 2 diabetes on population wide mortality of U.S. males," *Health Care Management Science* 2(4), December 1999, pages 223-227.

[68] Tuomilehto, J. et al, "Prevention of type 2 diabetes mellitus by changes in lifestyle," *The New England Journal of Medicine,* 344(18), May 3, 2001, pages 1343-50.

[69] Diabetes Prevention Program Research Group, "Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin," *The New England Journal of Medicine*, 346(6), February 2002, pages 393-403.

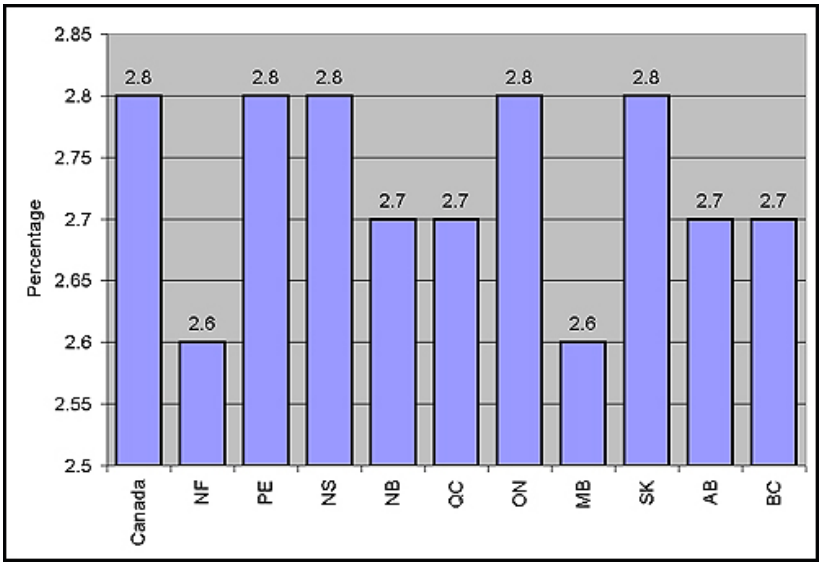
[70] Health Canada, *The Economic Burden of Illness in Canada 1998*, 2002. EBIC On-line.

Figure 9. Distribution of Costs for Endocrine, Nutritional and Metabolic Diseases (including Diabetes), Canada, 1998 (%)



Source: Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

Figure 10. Endocrine and Related Disease Costs as Percentage of Total Illness Costs, Canada, Provinces, 1998, (%)



Source: Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

1.4 Chronic Obstructive Pulmonary Diseases

About 10,000 Canadians die from chronic obstructive pulmonary diseases (COPD) each year. COPD rates include emphysema, bronchitis, asthma and chronic airway obstruction, and exclude acute respiratory infections like pneumonia and influenza.[71] About 8.4% of Canadians (2.2 million people in 2001) were estimated to have asthma in 2000-2001, up from 6.5% in 1994-95, with the highest rates among children.[72]

Smoking is a key risk factor for COPD, and causes a decline in lung function that is irreversible. It is estimated that smokers experience an annual decline in lung volume two to three times as great as the normal decline in volume that occurs with age in non-smokers. The risks of lung cancer and heart disease diminish rapidly when smokers quit, with light smokers returning to the risk levels of non-smokers after several years. By contrast, COPD risks diminish much more gradually upon cessation, and never return to non-smoker levels.

Bronchitis, emphysema, and asthma cost the Canadian health care system $1.19 billion a year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add $745 million to this sum, for total health care spending of $1.94 billion a year due to these types of chronic obstructive respiratory diseases. Productivity losses due to premature death and disability as a result of bronchitis, emphysema, and asthma cost the Canadian economy an additional $2.1 billion a year, for a total economic burden of $4.1 billion that can be attributed to these chronic respiratory disorders (Figure 11).[73] A substantial portion of these costs could be avoided through smoking cessation.

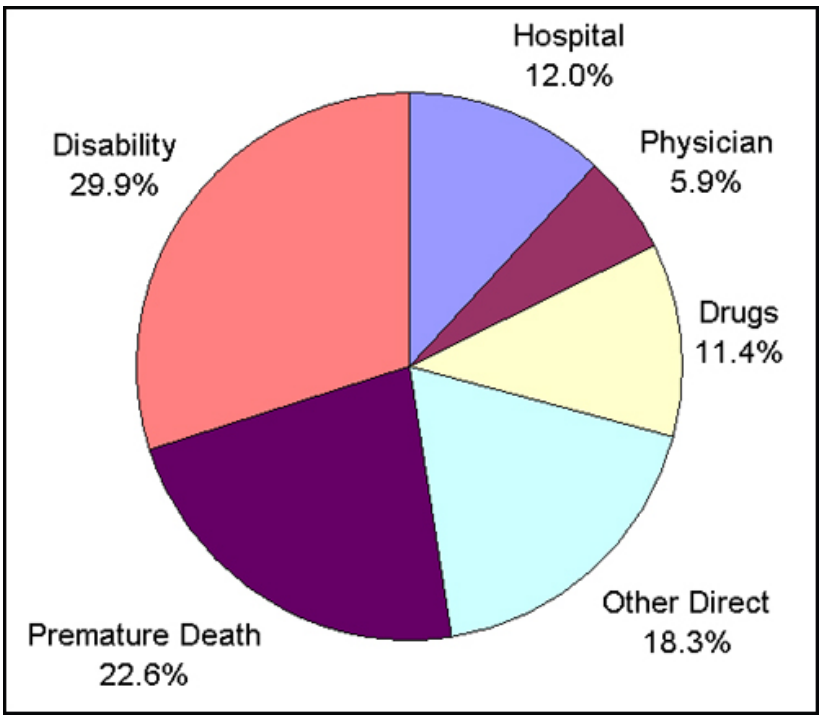
[71] Deaths from COPD extrapolated from Health Canada, *Statistical Report* chart. Chart indicates that the rate of COPD deaths (all respiratory minus pneumonia and influenza) was 36/100,000 in 1996. As the Canadian census of 1996 placed the population count at 28,850,000, that would indicate approximately 10,000 COPD deaths.

[72] Statistics Canada, *Persons With Asthma By Sex, Provinces*, available at: http://www.statcan.ca/english/Pgdb/health50b.htm.

[73] Health Canada, *The Economic Burden of Illness in Canada 1998,* published 2002. Hospital, physician, drug, and research costs are currently available for Canada by illness category, including respiratory diseases. However, at the present time, other direct health care costs, such as spending for other institutions and home care, have been assessed only for all illness categories combined. These additional direct costs are therefore extrapolated here for respiratory ailments, on the assumption that they occupy the same proportion of total direct health care costs for respiratory diseases as they do for all diagnostic categories combined.

Note: These cost estimates are confined to chronic bronchitis, emphysema, and asthma only, and do not include costs of pneumonia, influenza and other acute respiratory infections. Physician cost estimates for the chronic bronchitis, emphysema, and asthma portion of respiratory diseases are not available in Health Canada's *Economic Burden of Illness in Canada 1998*. Instead, the percentage of physician costs for chronic bronchitis, emphysema, and asthma as a proportion of physician costs for all respiratory diseases was calculated from the *Economic Burden of Illness in Canada 1993* (28.3%). This percentage was used to calculate the portion of physician costs attributable to chronic respiratory illnesses.

Figure 11. Distribution of Costs: Chronic Respiratory Diseases, Canada, 1998 (%)

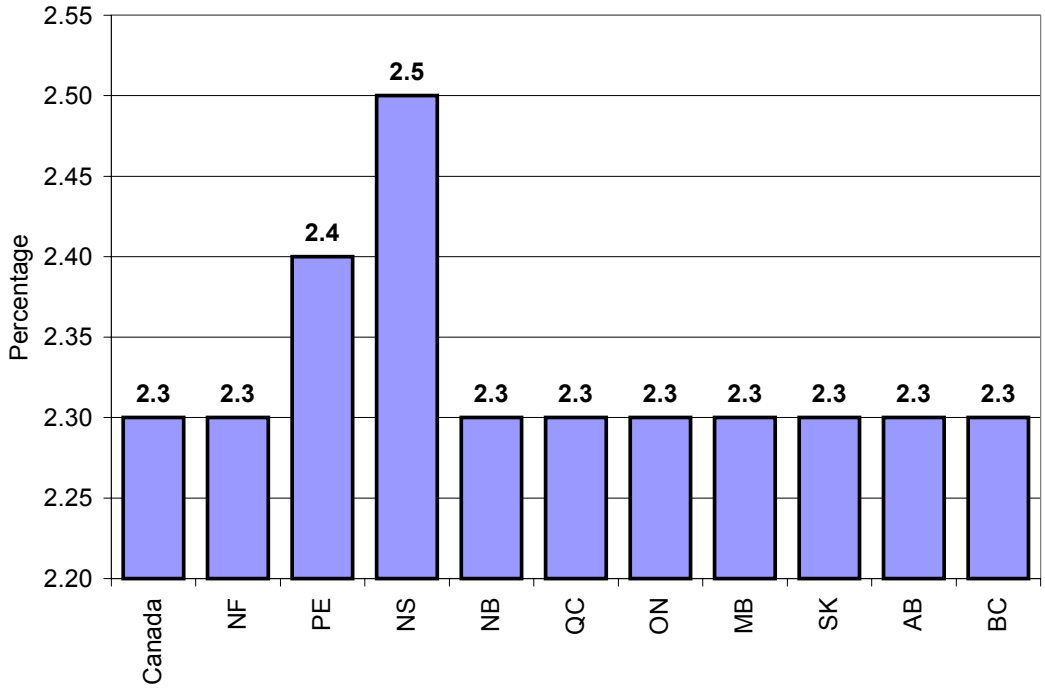


Source: Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

As a percentage of the total economic burden of illness in each province, chronic respiratory diseases range between 2.3% of total costs in most provinces to 2.5% in Nova Scotia (Figure 12).[74] Chronic respiratory illnesses therefore account for about the same proportion of the total economic burden of illness across the country with no distinctive patterns among the different regions. However, one province – New Brunswick – has disability costs alone for COPD exceeding total direct health care costs.

[74] At the provincial level, cost breakdowns are not available for the chronic obstructive pulmonary disease costs. Therefore, the figures for the hospital, physician, drugs, premature death and disability cost categories at the provincial level are assumed to be in the same proportion to total respiratory costs as they are for Canada as a whole. Provincial estimates for the costs attributable to COPD are therefore extrapolated from the Canadian figures. The ratios used to extrapolate figures for COPD from respiratory figures are as follows: Hospital costs, 28.6%; Physician costs, 28.3%; Drug costs, 38.2%; Premature Death, 51%; Short-term Disability, 11.1%; Long-term disability, 85%.

Figure 12. Chronic Obstructive Pulmonary Disease Costs as a Percentage of Total Illness Costs, Canada, Provinces, 1998 (%)



Source: Health Canada, *The Economic Burden of Illness in Canada 1998*, 2002.

1.5 Musculoskeletal Disorders

Fourteen percent of Canadians suffer from arthritis or rheumatism, with Nova Scotians registering the highest rate of musculoskeletal disorders in the country at 20%. As well, 14% of Canadians suffer from chronic back problems, with Saskatchewan showing the highest rate in the country at 17%.[75] Musculoskeletal disorders are the most prevalent of all chronic conditions in the country, and account for the highest disability costs. In fact, the disability costs of musculoskeletal diseases alone (nearly $15 billion) constitute the single largest cost category associated with any chronic disease, and are higher than the total hospital costs attributable to all seven types of chronic disease in Table 2 combined.

Disability costs account for three-quarters of the total costs associated with musculoskeletal disease. As a result, musculoskeletal disorders are now the second costliest category of illnesses in the country ($19.7 billion) after circulatory diseases ($24.8 billion) and ahead of cancers ($17.1 billion).

As people age, bones may become brittle, resulting in osteoporosis, which in turn can lead to serious falls and injuries. Unintentional falls account for more than half of all hospital injury

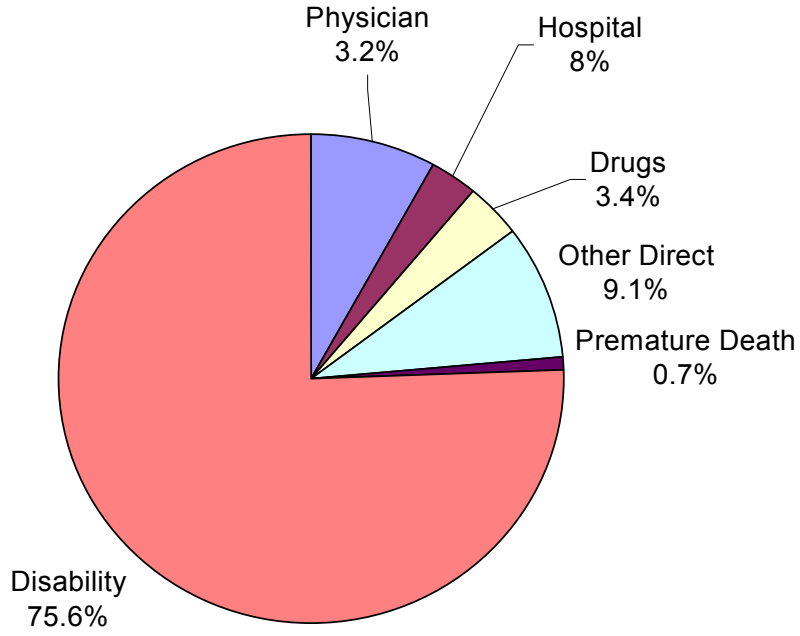
[75] Health Canada, *Statistical Report,* page 270.

admissions in Canada; 67% of all hospital days due to injury; and 75% of all in-hospital injury deaths. Seniors 65 and older account for 48% of all fractures and dislocations of the lower limbs, and 27% of all fractures and dislocations of the upper limbs.[76] Physical inactivity, obesity, and poor diet are key modifiable risk factors for chronic musculoskeletal disorders.

Sixteen percent of Canadians (4.8 million people in 2001) suffer from some long-term activity limitation at home, school, or work, with arthritis and back problems accounting for almost 30% of this number. Arthritis limits the daily activities of 482,000 Canadians, and back problems limit 682,000 more.[77]

Musculoskeletal diseases cost the Canadian health care system $2.9 billion a year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add $1.8 billion to this sum, for total health care spending of $4.7 billion a year due to musculoskeletal diseases. Productivity losses, due primarily to disability caused by arthritis and osteoporosis, cost the Canadian economy an additional $15 billion a year (with long-term disability accounting for $13.8 billion), for a total economic burden of $19.7 billion that can be attributed to musculoskeletal disorders (Figure 13).[78]

Figure 13. Distribution of Costs: Musculoskeletal Disorders, Canada, 1998 (%)



Source: Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

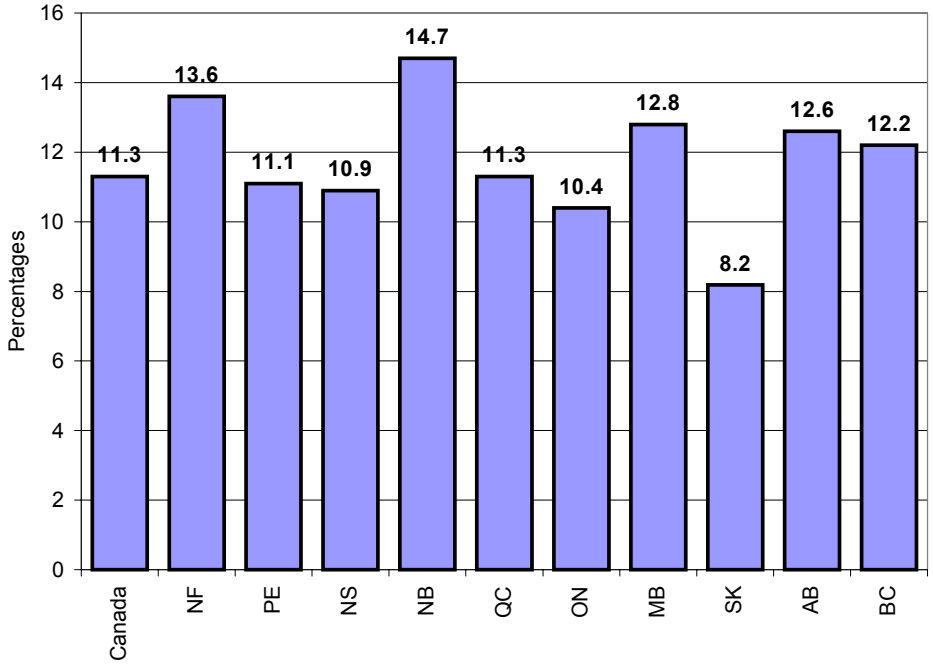
[76] Ibid., page 243.
[77] Ibid., pages 237 and 240.
[78] Health Canada, *The Economic Burden of Illness in Canada 1998,* 2002. Hospital, physician, drug, and research costs are currently available for Canada by illness category, including musculoskeletal diseases. However, at the present time, other direct health care costs, such as spending for other institutions and home care, have been assessed only for all illness categories combined. These additional direct costs are therefore extrapolated here for arthritis and osteoporosis, on the assumption that they occupy the same proportion of total direct health care costs for musculoskeletal diseases as they do for all diagnostic categories combined.

As noted, arthritis and osteoporosis account for greater productivity losses due to disability in Canada than any other diagnostic category.[79] A substantial portion of these costs could be avoided through increases in physical activity, improvements in diet, and weight reduction.

One study found that hip fracture incidence in most western nations is about 130 cases per 100,000 population. Extrapolated to Canada by population, this indicates 40,328 hip fractures a year in the country in 2001, at a cost of about $670 million a year. Low calcium intake, vitamin D deficiency, and poor nutrition are linked to low bone mass and bone fragility, which in turn contribute to fracture risk.[80]

Among the provinces, New Brunswick has the highest musculoskeletal costs as a proportion of its total economic burden of illness, at 14.7%, followed by Newfoundland and Labrador, at 13.6%. The province with the lowest musculoskeletal costs in relation to total costs is Saskatchewan, at 8.1% – the only province under 10% (Figure 14).[81]

Figure 14. Musculoskeletal Disease Costs as Percentage of Total Illness Costs, Canada, Provinces, 1998, (%)

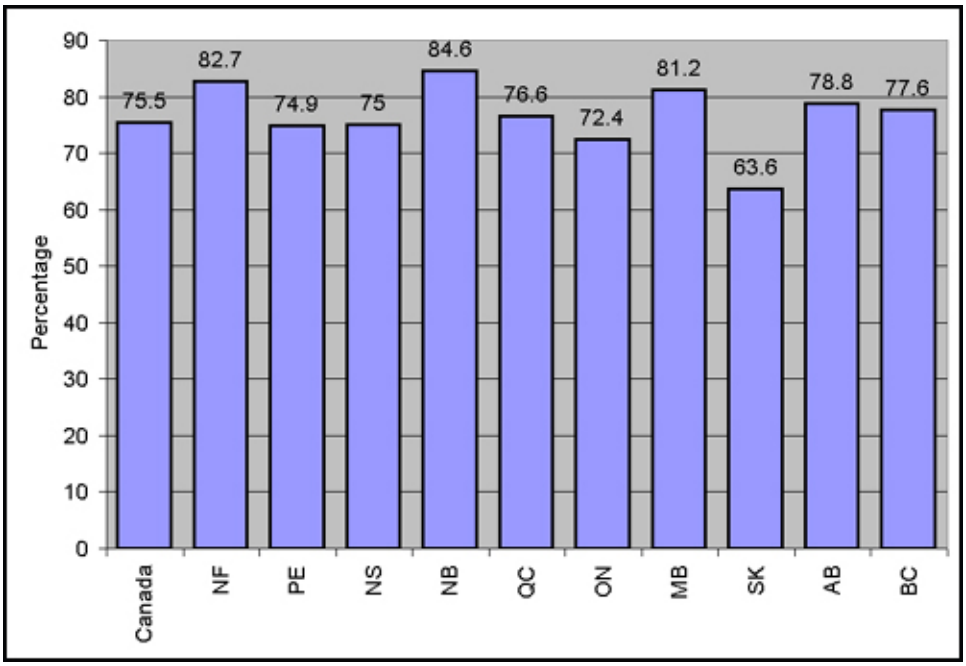


Source: Health Canada, *The Economic Burden of Illness in Canada 1998*, 2002. EBIC On-line.

[79] Idem.
[80] Heaney, Robert, "Hip Fracture: A Nutritional Perspective," *Proceedings of the Society for Experimental and Biological Medicine*, 200: 153-156, 1992, cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography*, prepared by the Nutrition Section, Prevention and Health Promotion, Ministry of Health, Province of British Columbia, July, 1996, page 37. To convert US$1992 to C$2002, exchange rates from http://www.x-rates.com/cgi-bin/hlookup.cgi show $US1 = $1.1972 Cdn on 30 June, 1992. Therefore calculation (1): 1.1972 X $470 million = $563 million (C$1992), and calculation (2): 2002 CPI (119) divided by 1992 CPI (100) X $563m = $670 million.
[81] Health Canada, *The Economic Burden of Illness 1998*, 2002. EBIC On-Line.

Figure 15 shows that in all provinces, the disability costs associated with musculoskeletal diseases far exceed any other cost component of those diseases. Among the provinces, New Brunswick has the highest percentage of disability costs associated with musculoskeletal diseases as a proportion of total musculoskeletal disease costs at 84.6%, followed by Newfoundland and Labrador at 82.7%. In Saskatchewan disability costs occupy a much lower proportion of total musculoskeletal disease costs at 63.6%.[82]

Figure 15. Disability Musculoskeletal Costs as Percentage of All Musculoskeletal Costs, Canada, Provinces, 1998, (%)



Source: Health Canada, *The Economic Burden of Illness in Canada 1998*, 2002. EBIC On-line.

[82] Idem.

PART II
CHRONIC DISEASE RISK FACTORS AND PREVENTION

2. Reducing Chronic Disease Risk Factors and Health Care Costs[83]

"Much of the risk for chronic disease is behavioral and can be controlled."
Thompson and Pertshcuk, 1992.[84]

"We have been too much consumed with the supply side of the health care equation and too little concerned with the demand side. The best way to reduce costs and improve health at the same time…is not just to control the services provided but also to reduce the need and demand for care….

"The costs of medical care are in large part a function of the amount of illness in a population. The amount of morbidity, in turn, is related in part to the prevalence of smoking, dietary fat intake, seat belt use, lack of exercise, and other behavioral risk factors in the population."
Fries, Koop, Sokolov, Beadle, and Wright, 1998.[85]

In other words, there are really two choices in dealing with escalating health care costs. One can either increase the supply of medical services to meet the rising chronic disease demands of an aging population, or one can reduce demand by reducing the prevalence of chronic illness. The first alternative may contribute to the economy and make the Gross Domestic Product grow through an expansion of the medical services industry. The second alternative is likely to save money—and lives.

Health care has conventionally been approached from the supply side, resulting in spiralling health care costs in a growth industry. The Genuine Progress Index, since it assesses progress not by growth but by health and well-being, focuses on reducing the demand for medical services through disease prevention and health promotion.

Disease prevention has been defined by the U.S. National Research Council as "personal, environmental, or social interventions that impede the occurrence of disease, injury, disability, or death – or the progression of detectable but asymptomatic disease." And health promotion is defined as "personal, environmental, or social interventions that facilitate behavioral adaptations

[83] It should be noted that costs and savings noted throughout this chapter and throughout the report are not cumulative, because individuals often have more than one risk factor and more than one chronic disease or disability. Reducing one risk factor may reduce risks for several different types of chronic illness. In addition, most estimates of savings assume that reduced incidence of an illness will produce a corresponding reduction in the costs associated with that illness. In actual fact, spending may not be cut proportionally, and resources already committed to certain types of treatment may not be diverted. For this reason, cost estimates given throughout this report should be regarded as illustrative of possibilities rather than as actual descriptions of reality.

[84] Thompson, Beti, and Michael Pertschuk, "Community Intervention and Advocacy," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 494.

[85] Fries, James, Everett Koop, Jacque Sokolov, Carson Beadle, and Daniel Wright, "Beyond Health Promotion: Reducing the Need and Demand for Medical Care: Health care reforms to improve health while reducing costs," *Health Affairs* 17 (2), March/April, 1998, pages 70-71.

conducive to improved health, level of function, and sense of well-being."[86] In other words, behaviour change is not only an isolated task controlled by an individual, but includes the social, economic, and cultural conditions and context of personal health behaviour.

Primary prevention refers to actions that prevent disease from occurring and reduce its incidence. These actions occur before the onset of disease and include health promotion and protection. They include immunization, fluoridation of water, smoking cessation, regular physical activity, good nutrition, and a wide range of government regulations such as pollution controls, occupational safety requirements, and food safety inspections.[87]

Secondary prevention involves early detection of disease that can minimize or interrupt its progression and thereby prevent irreversible damage. It includes Pap smears, blood pressure check-ups, mammograms, and other forms of screening. Primary and secondary prevention can be closely related: For example, secondary prevention of hypertension can be primary prevention of strokes.

Tertiary prevention refers to the control of a disease that has already developed, slowing its progress and reducing the resultant disability. Tertiary prevention may include both drug treatments and actions like physical activity and good nutrition that can help control heart disease and hypertension. While some aspects of tertiary prevention are an extension of curative treatment, others may be identical to primary preventive actions.

The purpose of a study that emphasizes the costs of illness is to identify possible measures that can reduce those costs. Part One indicates that chronic illnesses are not only the leading cause of death and disability in Canada, but are also enormously costly to the Canadian health care system and to the economy. Chronic diseases account for at least 70% of deaths due to circulatory diseases, cancers, COPD, and diabetes, and for 80% of deaths due to all categories of chronic disease combined, and they account for more than half of all medical care, premature death and disability costs. These chronic illnesses are responsible for almost 66% of all productivity losses and cost Canada more than $93 billion annually in direct health care costs and indirect productivity losses**.**

Epidemiological studies indicate that a very large proportion of this illness burden is preventable. We have both the knowledge and the means to reduce an enormous burden of unnecessary suffering, disability, premature death, spiralling health care costs, and productivity losses, and to improve the quality of life of Canadians.

One U.S. study found that more than 40% of deaths can be attributed to preventable causes, led by cigarette smoking, lack of exercise, and poor diet.[88] The U.S. Department of Health and Human Services concluded that up to 50% of chronic disease mortality is attributable to lifestyle

[86] Committee on Diet and Health, Food and Nutrition Board, Commission on Life Sciences, National Research Council, (1989), *Diet and Health: Implications for Reducing Chronic Disease Risk,* National Academy Press, Washington, D.C., page 99. See also Part VI of this study.
[87] Brown, Allen, *Costs and Benefits of Preventive Medicine,* Canadian Medical Association, Department of Medical Economics, 1984, definitions on pages 2-3.
[88] McGinnis, J.M., and Foege, W., "Actual Causes of Death in the United States," *Journal of the American Medical Association* 270 (19), 1993, pages 2207-2212.

factors that can be changed.[89] It noted that better control of 10 modifiable risk factors could prevent 40-70% of all premature deaths, and two-thirds of all cases of chronic disability.[90] And the U.S. Health Care Financing Administration estimates that behavioural risk factors contribute to 70% of the physical decline that occurs with aging.[91]

In an extensive review of the literature, Emory University's Carter Center concluded that 64% of all deaths, 71% of all potential years of life lost before age 65, and 30% of hospital days in the U.S. were preventable. In the U.S. this means that 8.4 million years of life each year before age 65 could potentially be saved.[92] Extrapolated to Canada by population, that amounts to about one million potential years of life saved each year.

The Carter Center also found that three preventable precursors of premature death accounted for 46% of all deaths, nearly three-quarters of all preventable causes of death, and more than half of preventable hospital days. These three were tobacco (17% of all deaths; 27% of preventable deaths; 20% of preventable hospital days); high blood pressure (15% of all deaths; 24% of preventable deaths; 12% of preventable hospital days); and over-consumption of high-calorie, fatty foods, which can lead to obesity and high serum cholesterol, (14.5% of all deaths; 23% of preventable deaths; 20% of preventable hospital days.) Because these three precursors lead to chronic diseases that may last a long time and kill people at relatively old ages, high blood pressure has been estimated to account for 4% of preventable years of life lost before age 65, and over-consumption of high calorie, fatty foods for 3.5%, while tobacco accounts for 12.6% of all preventable years of life lost before age 65. Other preventable causes of death, such as alcohol abuse and injuries, account for fewer deaths than these three, but relatively more preventable years of life lost before age 65, because they frequently kill people at younger ages.[93]

An Australian study determined that modifiable risk factors accounted for 38% of the total burden of disease in that country, with tobacco accounting for 9.7%; physical inactivity for 6.7%; high blood pressure for 5.4%; obesity for 4.3%; lack of fruit and vegetables for 2.7%; high blood cholesterol for 2.6%; alcohol for 2.1%; and illicit drugs, occupation, and unsafe sex for smaller proportions.[94]

Epidemiological studies demonstrate that these risk factors do not act in isolation, and that they are linked to deeper, underlying social causes that are discussed in the next chapter. Coronary heart disease, for example, is "a multifactorial disease, and a multiplicity of interacting factors

[89] U.S. Department of Health and Human Services, *Healthy People 2000: National Health Promotion and Disease Prevention Objectives,* Washington, D.C., 1990, DHHS (PHS) publication no. 91-50213.
[90] U.S. Department of Health and Human Services, 1990, *Prevention '89/'90: Federal Programs and Progress,* Public Health Service, Washington D.C.
[91] U.S. Health Care Financing Administration, "Healthy Aging Project," Fact Sheet, 14 October, 1998, available at: http://www.os.dhhs.gov/news/press/1998pres/981014.html.
[92] Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness,* Oxford University Press, New York and Oxford, 1987, pages v and 187.
[93] Almer, Robert, and Donald Eddins, "Cross-Sectional Analysis: Precursors of Premature Death in the United States," in Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness,* Oxford University Press, New York and Oxford, 1987, pages 184-185.
[94] Australian Institute of Health and Welfare, *Burden of Disease and Injury in Australia, 1999;* cited in National Public Health Partnership, *Preventing Chronic Disease: A Strategic Framework,* Melbourne, October, 2001, page 24.

are involved in its development."[95] Smoking, hypertension, high blood cholesterol, obesity, physical inactivity, and diabetes are all risk factors for heart disease, and those risks are more prevalent among lower socio-economic groups. The chain of causation can be long and involve many factors. For example, teenage pregnancy has been estimated to reduce high school completion rates by 50% and income by 80%.[96] These socio-economic disadvantages in turn may increase risk behaviours, susceptibility to chronic diseases, and use of health care services.

A University of Michigan database on health risks and medical care costs for over two million individuals indicates that excess risk factors account for about 25% of medical care costs.[97] Another analysis estimates that preventable illness constitutes 70% of the burden of illness and its associated costs, and predicts confidently that "we now have the knowledge that could improve population health and at the same time reduce medical claims costs by 20 percent or more."[98]

The widely differing estimates of the proportion of chronic illness and associated costs that are avoidable depend on the assumptions employed. For example, the "compression of morbidity" hypothesis, for which there is growing empirical evidence, argues that since the human life span is relatively fixed, the postponement of chronic infirmity can compress the lifetime illness burden into a shorter period nearer the age of death. According to this hypothesis, an aging population will not necessarily produce higher health care costs because a larger percentage of the population can expect to be healthy and independent for longer periods.

This hypothesis will clearly produce more optimistic estimates of potential health care savings than one that assumes health promotion and avoidance of risk factors simply transfer chronic illness costs to older age groups. These assumptions, and the associated empirical evidence, will be examined below. Here it is sufficient to acknowledge that a consensus exists that a substantial portion of chronic illness is related to preventable risk factors, risk behaviours, and risk conditions. The epidemiological evidence further confirms that a reduction of these risks can help avoid or delay the onset of these illnesses. A growing body of evidence further indicates that health promotion efforts can reduce medical costs and productivity losses, with studies typically demonstrating a $4-$5 saving for every one dollar invested in health promotion.[99]

Part Two surveys a few key risk factors for chronic illness, and their prevalence and costs in Canada. Part Three examines underlying risk conditions in Canada, including socio-economic factors associated with higher prevalence of chronic illness. Part Four explores the mental health dimensions of chronic illness. Part Five examines evidence on the association of chronic illness

[95] Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 10.
[96] Foege, William, Robert Amler, and Craig White, "Closing the Gap," *Journal of the American Medical Association* 1985; 254: 1355-1358, reprinted in Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness,* Oxford University Press, New York and Oxford, 1987, page 206.
[97] Edington, Dee, "Emerging Research: A View from one Research Center," in Goetzel, Ron (ed.), "The Financial Impact of Health Promotion," *American Journal of Health Promotion* 15 (5), May/June 2001, pages 341-349.
[98] Fries, et al. (1998), pages 71 and 73.
[99] Aldana, Steven, "Financial Impact of Health Promotion Programs: A Comprehensive Review of the Literature," in Goetzel, Ron (ed.), op. cit., pages 296-320.

with aging. And Part Six discusses the potential for reducing Canada's high health care costs through health promotion and disease prevention initiatives.

As noted above, the following brief review of single risk factors obscures the fact that several of these are often clustered together in high-risk individuals, and may have synergistic effects on the potential for disease. While two out of three Canadians have one or more of the major risk factors for cardiovascular disease, a significant proportion have concomitant risk factors that sharply exacerbate the likelihood of illness.[100]

2.1 Tobacco and Chronic Illness

Tobacco use is the single most preventable cause of illness and death in Canada, and substantially increases the risk for lung and other cancers, for cardiovascular diseases, and for respiratory ailments. At least one in four deaths in Canada, for those between the ages 35 and 84, can be attributed to cigarette smoke. In 1991, 45,000 deaths in Canada were attributed to smoking. In a hypothetical cohort of 100,000 males and 100,000 females aged 15 years, the expected number of deaths from chronic diseases before age 70 attributable to cigarette smoking was 29,310, with 16,894 of these deaths among those who never smoked but were exposed to second-hand smoke.[101]

According to data from the *National Population Health Survey*, of 100 non-smoking men aged 45 in 1995, 90 can expect to live to 65, and 55 can expect to live to 80; of 100 smoking men aged 45 in 1995, 80 can expect to live to 65, and fewer than 30 to the age of 80. For women, 70% of non-smokers can expect to live to 80 as opposed to 40% of smokers. Non-smokers can also expect better odds of living their lives without disability: two-thirds of non-smokers can expect to live to 65 without disability compared to less than 50% of smokers.[102]

The Canadian Cancer Society lists smoking among men as causing one-third of Potential Years of Life Lost (PYLL) due to all cancers; one-quarter of PYLL due to heart disease; and one-half of PYLL due to respiratory diseases.[103] Among women, smoking is responsible for one fifth of PYLL due to cancer.

Tobacco costs the Canadian health care system an estimated $3.18 billion a year in direct medical costs: more than $2 billion in hospital expenses, $544 million in prescription drugs, and $400 million in physician fees. When productivity losses due to premature death, disability, and absenteeism are added, smoking costs the Canadian economy about $11.3 billion a year (all figures 2002$).[104]

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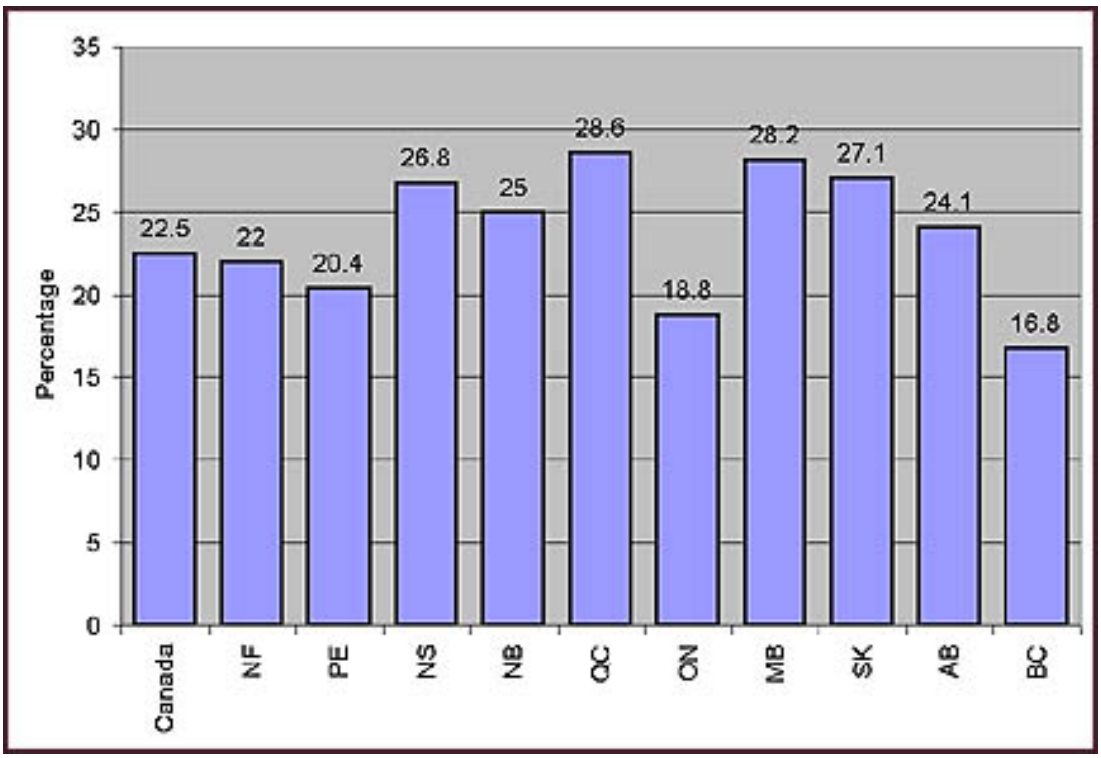
[100] Stachenko, Sylvie, Director, Preventive Health Services, Health Canada, *Preventive Guidelines: Their Role in Clinical Prevention and Health Promotion,* Health Canada, Ottawa.
[101] Health Canada, 2001, *Statistical Report on the Health of Canadians, 1999*, page 308 and 309.
[102] Statistics Canada, *The Impact of Smoking on Life Expectancy and Disability,* available at: http://www.statcan.ca/english/edu/feature/smk.htm.
[103] Canadian Cancer Society, National Cancer Institute of Canada, *Canadian Cancer Statistics 2003*, page 57.
[104] Single, Eric, Robson, Lynda, Xie, Xiaodi, & Rehm, Jürgen, *The Costs of Substance Abuse in Canada*, 1996, Centre for Health Promotion, University of Toronto, Canada.

Estimates indicated that in 2001, 21.7% of Canadians were current smokers. While the overall numbers have gone down, the percentage of youth smokers was comparatively high – 22.5% among those aged 15-19. However, several provinces show smoking rates for all ages that are higher than the national average—Manitoba at 25.9%; Newfoundland at 25.7%; PEI at 25.6%; Saskatchewan at 25.4%; Alberta at 25.1%; and New Brunswick at 25%. Although Nova Scotia, at 24.9%, is still above the national average, this number indicates a drop of 5% from the 2000 statistics. However, 26.8% of Nova Scotian teenagers aged 15-19 were current smokers in 2001, up from 25% in 2000, with Quebec (28.6%); Manitoba (28.2%); and Saskatchewan (27.1%) showing even higher numbers. By comparison, fewer than 17% of British Columbians, and fewer than 17% of B.C. teenagers aged 15-19 smoke[105] (Figure 16).

Figure 16. Percentage of Teens (aged 15-19) who Smoke, Canada, Provinces, 2001, (%)



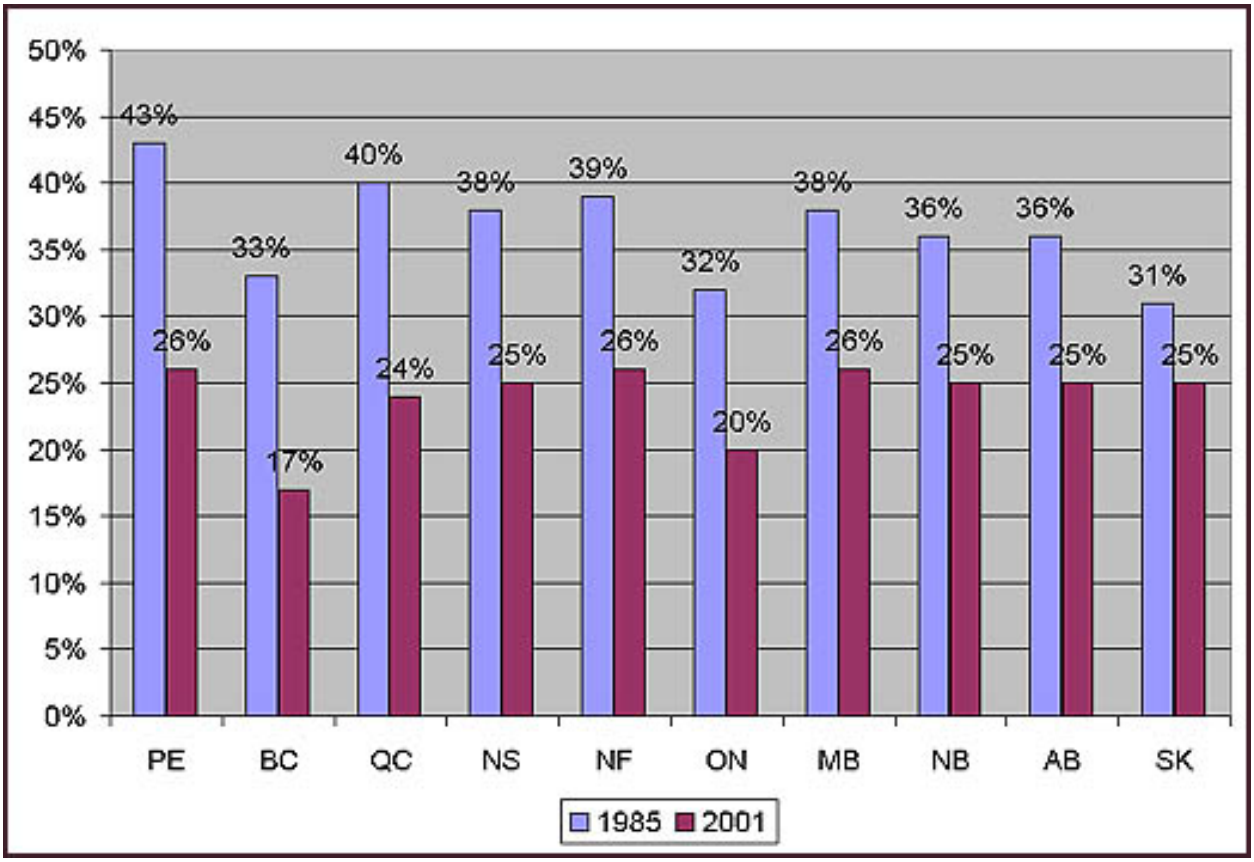
Source: Health Canada, 2001. *Canadian Tobacco Use Monitoring Survey 2001*, Table 1. 2001 CTUMS provincial data are now available at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/pdf/annual2001_supptables_eng.pdf (Table 2).

Since 1985, the percentage of those smoking in Canada has dropped from 35% to 22% nationwide. Figure 17 indicates the change in smoking prevalence in the Canadian provinces between 1985 and 2001. Provinces are ordered from left to right by the extent of decline in smoking prevalence. The biggest percentage drop has taken place in Prince Edward Island while Saskatchewan has shown the smallest drop. Of course, those numbers are attenuated by the fact

[105] Health Canada, 2001. *Canadian Tobacco Use Monitoring Survey 2001*, Table 1. 2001 CTUMS provincial data are now available at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/pdf /annual2001_supptables_eng.pdf (Table 2).

that Prince Edward Island had the largest percentage of smokers in 1985 and Saskatchewan the smallest.[106]

Figure 17. Percent of Population 15 and Over Who Smoke, Provinces, 1985 and 2001, (%)



Source: This chart is adapted from Canadian Tobacco Use Monitoring Survey (CTUMS) Fact Sheet 3, figure 3-2, and supplementary table 11. 1985 rates are directly from the fact sheet; http://www.hc-sc.gc.ca/hecs-sesc/tobacco/pdf/ctums/factsheets/CTUMS-2001e%20(Overview).pdf. 2001 rates are from the 2001 CTUMS data.

The introduction of a national tobacco control strategy in 1999, which called for co-operation and collaboration across levels of governments and with non-governmental groups, has led to important new strategies in tobacco control. Among the strategies are:

- Establishment of smoke-free environments in both the public and private sector
- Implementation of tax increases and new measures to reduce the smuggling of tobacco products
- Increased provincial allocations for tobacco control ($10 million annually in Ontario and Quebec)

[106] Canadian Tobacco Use Monitoring Survey (CTUMS) *Fact Sheet 3*, figure 3-2, and supplementary table 11. 1985 rates are directly from the fact sheet, available at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/pdf/ctums/factsheets/CTUMS-2001e%20(Overview).pdf. 2001 rates are from the 2001 CTUMS data.

- Co-ordinated mass media and educational programs to make Canadians aware of the dangers of tobacco use
- Interactive self-diagnosis and self-help smoking cessation Internet site (receiving 150,000 hits in one week in February 2001).[107]

Smoking is a risk behaviour that can be a particularly potent danger in combination with other risk factors. For example, experts have observed that "the combination of diabetes and smoking [is] a disaster that must be avoided at all costs," because of a high potential risk of heart disease. Yet studies show diabetics smoke as frequently as the general population.[108] In other words, chronic disease is multifactorial in nature, and effective preventive interventions must address multiple risk factors and account for their potentially synergistic interaction.

2.2 Obesity, Poor Nutrition, and Chronic Illness

Rates of overweight conferring a "probable health risk" (BMI = >27, according to Canadian standards) have more than doubled in Canada, going from 13% of adults in 1985 to 32% in 2001. Among the provinces, Newfoundland has the highest rates of overweight people at 42.8%, while BC has the lowest at 27%. It should be noted that, while the percentage of Canadians with a BMI indicating a "probable health risk" has stayed relatively stable since 1994/1995, when it was 29.4%, the actual numbers of overweight Canadians increased by about 900,000 since 1994.[109] The dramatic increase between 1985 and the present day is part of what the World Health Organization (WHO) has called a "global epidemic" that will have as great an impact on health as smoking.[110]

It is not only Canadian adults who are overweight. According to the National Longitudinal Survey of Children and Youth: Childhood Obesity, more than one-third of Canadian children aged 2 to 11 were overweight in 1998/99.[111]

In 1997, according to a 1999 study published by the Canadian Medical Association Journal, it was estimated that the total direct cost of obesity was more than $2 billion ($1.8 billion in 1997$), or 2.2% of total health care expenditures for all diseases.[112]

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[107] Advisory Committee on Population Health Working Group on Tobacco Control, *The National Strategy: Moving Forward: The 2001 Federal Provincial Territorial Progress Report on Tobacco Control*, available at: http://dsp-psd.communication.gc.ca/Collection/H21-175-2001E.pdf.

[108] Orchard, Trevor, "Intervention for the Prevention of Coronary Heart Disease in Diabetes," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 399.

[109] Statistics Canada, Health Indicators, May 2002, *Body Mass Index (BMI), Canadian Standard, 2000/2001*, Catalogue No. 82-221-XIE available at: http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/pdf/1216.pdf.; and *Body Mass Index, 1994/95-1998/99*, CANSIM Table No. 01040008, available at www.statcan.ca , both accessed Jan. 2004.

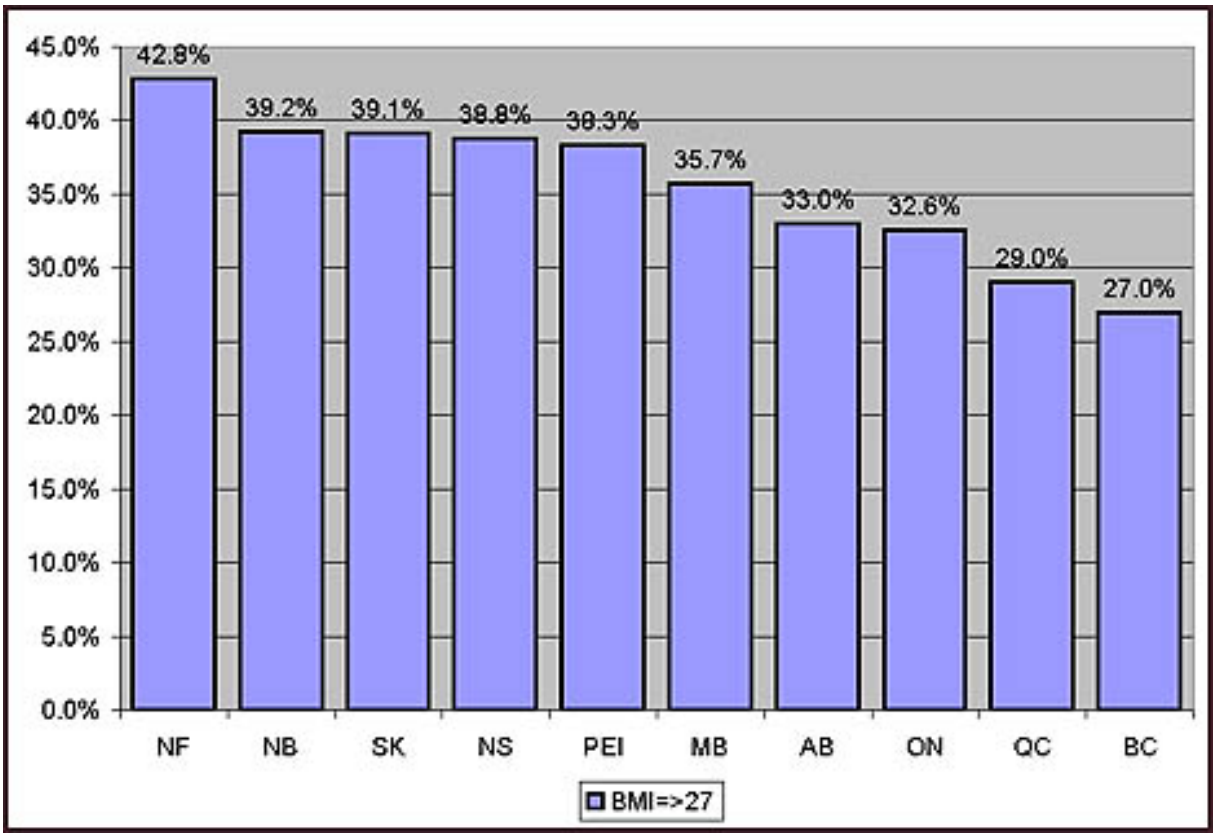
[110] World Health Organization, *Obesity: Preventing and Managing the Global Epidemic,* Report of a WHO Consultation on Obesity, Geneva, 1997; Statistics Canada, *Canadian Community Health Survey: A First Look*, available at: http://www.statcan.ca/Daily/English/020508/d020508a.htm.

[111] Statistics Canada, *National Longitudinal Survey of Children and Youth: Childhood Obesity,* available at: http://www.statcan.ca/Daily/English/021018/d021018b.htm.

Obesity is linked to heart disease, diabetes, hypertension, osteoarthritis, certain types of cancer, and a wide range of other chronic illnesses. A Statistics Canada analysis found that obese Canadians are four times more likely to have diabetes, 3.3. times more likely to have high blood pressure, and 56% more likely to have heart disease than those with healthy weights.[113]

Obese individuals are also 50-100% more likely to die prematurely from all causes than those with healthy weights. Obesity is now recognized by experts as the second-leading preventable cause of death after cigarette smoking.[114] Between 1985 and 2000, 57,181 deaths were attributed to overweight and obesity, with the strongest increases in eastern Canada. The number of Canadian deaths attributable to overweight and obesity among adults aged 20-64 nearly doubled during this period. About 1 in 10 deaths among this age group is the result of excess weight. [115]

Figure 18. Overweight Canadians by Province in Descending Order, Age 20-64, BMI ≥27, 2000/01 (%)



Source: Statistics Canada, Health Indicators, May 2002, "Body Mass Index (BMI), Canadian Standard, 2000/2001."

[112] Birmingham, C. Laird, J.H. Muller, Anita Palepu, J Spinelli, and A. Anis. 1999. "The Cost of Obesity in Canada," *CMAJ* 160(4):483-488.
[113] Gilmore, Jason, "Body Mass Index and Health," *Health reports* 11 (1), Summer, 1999, Statistics Canada catalogue no. 82-003, Ottawa, pages 31-43.
[114] *The Chronicle-Herald,* Halifax, October 9, 1999, page C1.
[115] Katzmarzyk,P.T. and C.I. Arden 2004. "Overweight and Obesity Mortality Trends in Canada," *Can. Journal Public Health* 95 (1): 16-20.

According to a study by Birmingham et al.,[116] obesity-related illnesses cost the Canadian health care system about $2 billion (2002$ - $1.82 billion in 1997$) annually, or about 2.2% of the total direct health care costs in Canada, which amounted to a total of $91.995 billion (2002$). This estimate is based on the obesity-related costs of ten diseases: breast cancer postmenopausal; coronary artery disease; colorectal cancer; endometrial cancer; gallbladder diseases; hyperlipidemia; hypertension; pulmonary embolism; stroke; and Type 2 diabetes.

These estimates of direct health care costs are conservative in two ways. First, they exclude certain obesity-related diseases, such as osteoarthritis and other musculoskeletal disorders, gout, asthma, back problems, thyroid problems, repetitive strain injury, hormonal disorders, sleep apnea, infertility, pseudo tumour cerebri, and impaired immune function. These conditions are not included in Birmingham's estimates, because Health Canada's Economic Burden of Illness[117] does not provide specific cost estimates for these specific disorders. It has been estimated in the literature that 15% of osteoarthritis and musculoskeletal disorders are due to obesity.[118]

Therefore we have adjusted the direct health care costs of obesity upwards to include an estimate for obesity-related musculoskeletal disorders, by adding 15% of the direct costs of musculoskeletal diseases. Since EBIC 1998 estimates the total hospital, physician and drug costs of musculoskeletal diseases at $2.9 billion (2002$),[119] we have taken 15% of that cost, or $435.3 million, as an estimate for the potential obesity-related costs of musculoskeletal diseases (Table 3).

Table 3. Estimated Total Economic Burden of Obesity in Canada C$2002). (Adjusted from Birmingham et al. 1999)

Item	Cost in C$2002 Billions
Birmingham et al. total (1,822,087 in C$1997)	$2
Addition of musculoskeletal costs related to obesity	$0.44
Adjusted Total	$2.44
Other Direct Costs (20%)	$0.49
Total Direct Costs	$2.9
Indirect costs @ 89% of Direct Costs	$2.6
Total Economic Burden	$5.6 Billion

The GPI Atlantic Cost of Obesity report[120] states that the Birmingham figures also did not include all of the direct costs listed in Health Canada's Economic Burden of Illness in Canada, such as capital costs and other direct health care costs. Following the example of this report, we have added 20% of the adjusted total of direct health care costs attributable to obesity ($0.49 billion) to account for these "other" costs.

[116] Birmingham, C.L., J.L. Muller, A. Palepu, J. Spinelli, and A.Anis 1999, "The cost of Obesity in Canada," *Canadian Medical Association Journal* 160:483-488.
[117] Health Canada 2002, *The Economic Burden of Illness in Canada*, Ibid.
[118] GPI Atlantic 2000, *The Costs of Obesity in Nova Scotia*, Available at: www.gpiatlantic.org.
[119] Health Canada 2002, op. cit.
[120] GPI Atlantic 2000, op. cit.

An estimate of the total economic burden of obesity must include an estimate of the indirect costs of loss of productivity due to mortality and short-term and long-term disability. As the obesity cost estimates provided by Birmingham and his colleagues included direct costs only, we have estimated the indirect costs of obesity based on the Canadian ratio of total indirect costs for all illnesses to direct costs for all illnesses (89%), based on EBIC 1998. Therefore we have added another $2.6 billion to account for indirect costs due to obesity, to arrive at a total estimated economic burden of $5.6 billion for obesity related illnesses, or 3.2% of the total economic burden of illness.

This is still likely a very conservative estimate for two reasons. First, many of the obesity-related conditions listed above are not included in the estimate. Even more importantly, the indirect cost estimate is likely much too low. Obesity is particularly related to chronic diseases, such as heart disease, diabetes, hypertension, musculoskeletal disorders, and certain cancers, where the indirect costs are very high. In fact, if we consider only the seven categories of chronic disease presented in Table 2, the indirect costs are 1.4 times the direct costs., whereas if we look at all categories of disease, the indirect costs are 89% of the direct costs. Based on the ratio of indirect to direct costs in Table 2 above, the indirect cost estimate for obesity would be $4.1 billion (instead of $2.6 billion), and the total direct and indirect costs of obesity in Canada would amount to $7 billion a year, not $5.6 billion as indicated in Table 3.

The $5.6 billion figure is beginning to approach the $10 billion in costs attributable to tobacco use in Canada. Because smoking is on the decline and obesity is rapidly increasing, it is predicted that obesity-related costs will soon overtake the costs of tobacco-related illness. The Surgeon General of the United States has said that obesity in the United States is reaching epidemic proportions and could soon cause as much preventable disease and death as cigarette smoking.[121]

It is clear that obesity is only one possible consequence of poor nutrition, and that unhealthy eating is a risk factor in its own right for many chronic illnesses. Health Canada estimates that the Canadian economy loses $6.3 billion a year to preventable diet-related disease.[122] "Rich" diets that are high in calories, cholesterol, saturated and total fats, and salt, and low in fibre, have been identified by analysts as "the *primary* and *essential* cause of epidemic CHD [coronary heart disease]":

> *"Rich diet is the pivotal mass exposure responsible for the coronary epidemic. Where rich diet does not prevail as a population wide trait, there is no CHD*

[121] Gupta, Sanjay 2002. *Satcher: Obesity Almost as Bad as Smoking*. CNN News. http://www.cnn.com/2001/HEALTH/conditions/12/13/satcher.obesity/.

[122] Health Canada, *Nutrition Labelling: The Background*, (October, 2000), available at: http://www.hc-sc.gc.ca/english/archives/releases/2000/2000_103e.htm and following link to "Nutrition Labelling: Support for Healthy Eating." For U.S. estimates of costs of diet-related diseases, see "Benefits of Nutrition Services – A Cost and Marketing Approach," *Ross Laboratories Report of the Seventh Ross Roundtable on Medical Issues*, August 18-19, 1986: 2-9, cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography,* Prevention and Health Promotion Branch, Ministry of Health, B.C., July, 1996, page 39.

> *epidemic. This is the case even when high blood pressure and cigarette smoking are prevalent (witness Japan).”*[123]

Rich diets include an excessive proportion of foods with a high ratio of calories to essential nutrients, including high-fat animal products, dairy products, processed foods including processed meats, junk food, and foods with high proportion of refined sugars, including many baked goods. These foods are also frequently low in essential constituents like potassium, fibre, and anti-oxidant vitamins.

In addition to coronary heart disease, unhealthy eating contributes substantially to four other of the 10 leading causes of death – cancer, stroke, diabetes mellitus, and atherosclerosis:

> *“Nutritional risk factors for chronic illness include obesity, elevated serum cholesterol, and overconsumption of fats, sugar, sodium, and highly refined foods. Reduction of such consumption can help in the prevention of chronic diseases.”*[124]

The good news is that this epidemic is reversible. In the words of a 12th century Chinese medical work: “When food is in order, the body is also in order.”[125] Modern analyses, too, have confirmed that:

> *“Nutrition plays an important role in reducing the risk of coronary heart disease (CHD) and other chronic illnesses…. If it is true that abnormal serum lipids are the* sine qua non *of the atherosclerotic process, then the modification of diet to lower serum cholesterol and LDL levels is a crucial part of any program to lower CHD risk…. Control of cholesterol and lipoprotein levels can reduce both the risk of coronary artery disease and the severity of its consequences.”*[126]

2.2.1 Secondary and Tertiary Prevention

Weight control and nutritional intervention can also be effective in secondary and tertiary prevention, controlling and even reversing a wide range of chronic illnesses. Well-nourished patients can also better tolerate treatment, experience fewer postoperative complications, shorten hospital stays, and recover more quickly from illness and injury, thereby producing public cost savings. Conversely, poor nutrition can adversely affect clinical outcomes.[127]

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[123] Stamler, Jeremiah and Rose, preface to Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown and Company, Boston, 1992, pages xi and xii.
[124] Glanz, Karen, “Nutritional Intervention: A Behavioral and Educational Perspective,” in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little Brown, and Company, Boston, 1992, page 232.
[125] Cited in Goldberg, Robert, “Coronary Heart Disease: Epidemiology and Risk Factors,” in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 23.
[126] Glanz, Karen, “Nutritional Intervention: A Behavioral and Educational Perspective,” in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little Brown, and Company, Boston, 1992, pages 231-232.
[127] Calvert Finn, Susan, “Nutrition in Home Care,” *Caring Magazine,* 4, October, 1990; Delmi, D., et al., “Dietary Supplementation in Elderly Patients with Fractured Neck of the Femur,” *The Lancet,* 335: 1013-1016, April, 1990; Heaney, Robert, “Hip Fracture: A Nutritional Perspective,” *Proceedings of the Society for Experimental and Biological Medicine,* 200: 153-156, 1992; “Nutrition Therapy Improves Health and Saves Money – Evidence from Iowa,” *Iowa Dietetic Association,* 1995; “Position of the American Dietetic Association: Cost-Effectiveness of

Nutritional intervention has been shown to be effective in controlling heart disease, hypertension, metabolic disorders, and a range of other chronic conditions. Researchers have found dietary treatment to be more cost effective than drugs in treating cardiovascular diseases, diabetes, hypertension, and obesity, and have called for the cost of dietetic treatment to be defrayed by health insurance.[128]

Studies demonstrate that weight loss, sodium restriction, and increased physical activity among moderate hypertensives reduce blood pressure and maintain it in the normal range, thereby reducing medication needs.[129] In contrast to improved diet and weight reduction, drugs may also have significant negative side effects and affect quality of life. Researchers have concluded that nutritional therapy may substitute for drugs in a sizable proportion of hypertensives, and tests demonstrate high success rates in withdrawing antihypertensive medications from those who modify their diets, lose weight, and reduce sodium intake.[130]

Diet education and weight reduction can help control non-insulin-dependent diabetes mellitus when it develops, and reduce hospital emergency visits, hospital stays, readmissions for diabetics, use of hypoglycemic agents and insulin, and need for amputations. One study found

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Medical Nutrition Therapy," *Journal of the American Dietetic Association,* 95 (1): 88-91, January, 1995; Cohen, Ian, "Establishing and Justifying Specialized Teams in Intensive Care Units for Nutrition Ventilator Management, and Palliative Care," *Critical Care Clinics,* 9 (3): 511-520, July, 1993; all cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography,* Prevention and Health Promotion Branch, Ministry of Health, B.C., July, 1996, pages 36, 37, 39, 40. For more information on the costs of malnutrition and the benefits of nutritional therapy to malnourished patients, please see Part V of this study.

[128] Kurty Deschesnes, Marie-Claude Prevost, *Report on Expenses Relating to the Treatment and Prevention of Ischemic Disease, Obesity and Diabetes*, February, 1994, cited in Province of British Columbia (1996), page 20.

[129] Stamler, Rose, et al., "Primary Prevention of Hypertension by Nutritional-Hygenic Means," *Journal of the American Medical Association* 262 (13): 1801-1807, October, 1989; Stevens, Victor, et al., "Weight Loss Intervention in Phase 1 of the Trials of Hypertension Prevention," *Arch Intern Med.* 153: 849-858, April, 1993; TOHP Collaborative Research Group, "The Effects of Nonpharmacologic Interventions on Blood Pressure of Persons with High Normal Levels," *Journal of the American Medical Association,* 267 (9): 1213-1219, March 4, 1992; Langford, Herbert et al., "Dietary Therapy Slows the return of Hypertension after Stopping prolonged Medication," *Journal of the American Medical Association,* 253 (5): 657-664, February 1, 1985; Applegate, William et al., "Nonpharmacologic Intervention to Reduce Blood Pressure in older Patients with Mild Hypertension," *Arch Intern Med.,* 152: 1162-1166, June, 1992; 1988 Joint National Committee, "The 1988 Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure," *Arch Intern Med.* 148: 1023-1038, May, 1988; Elmer, Patricia, et al., "Lifestyle Intervention: Results of the Treatment of Mild Hypertension Study (Tombs)," *Preventive Medicine,* 24: 378-388, 1995; all cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography,* Prevention and Health Promotion Branch, Ministry of Health, B.C., July, 1996, pages 22-25. The Elmer study found that length of follow up, number and frequency of contacts, a stringent diet prescription, and increased physical activity were all linked with greater weight loss and success in reducing blood pressure.

[130] David, Barry, "Reduction in Long-term Antihypertensive Medication Requirements," *ARCH Intern Med.,* 153: 1773-1782, August 9, 1993; and "Ambulatory Nutrition Care: Adults – Hypertension," *Supplement of the Journal of the American Dietetic Association* S26-29, April, 1989; Stamler, Rose, et al., "Nutritional Therapy for High Blood Pressure: Final report of a Four-Year Randomized Controlled Trial – the Hypertension Control Program," *Journal of the American Medical Association,* 257 (11): 1484-1491, March 20, 1987; Langford, Herbert et al., "Dietary Therapy Slows the return of Hypertension after Stopping prolonged Medication," *Journal of the American Medical Association,* 253 (5): 657-664, February 1, 1985; Elmer, Patricia, et al., "Lifestyle Intervention: Results of the Treatment of Mild Hypertension Study (Tombs)," *Preventive Medicine,* 24: 378-388, 1995; all cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography,* Prevention and Health Promotion Branch, Ministry of Health, B.C., July, 1996, pages 15, 18, 23, and 24.

annual cost savings of $873 for each patient who received diabetes and diet education. Other studies have found 40-50% drops in acute episode hospital admissions and in overall medical care costs, as well as 32% shorter hospital stays.[131]

Researchers have concluded that nutrition is the most critical and pivotal component of diabetes care in achieving target blood glucose goals.[132] While education programs are important, the most successful care includes follow-up monitoring. One study found that telephone calls were an inexpensive, cost-effective, and feasible way of motivating people to manage a chronic condition, and helped produce significant weight loss in the monitored patients.

Researchers have found that reducing saturated fat intake by one to three percentage points among persons with high cholesterol would reduce the incidence of coronary heart disease by 1-3% and save $6-$20 billion ($4-$13 billion in US$1996) over 10 years in medical expenses and avoided productivity losses.[133] Extrapolated to Canada by population, this would produce economic savings to the country of $720 million-$2.4 billion over 10 years.

British Columbia's Ministry of Health found that the use of lipid-lowering drugs was expensive and ineffective in improving the survival rate of cardiac patients, and that nutrition counselling

[131] Manson, JoAnn, and Angela Spelsbery, "Primary Prevention of Non-insulin-dependent Diabetes Mellitus," *American Journal of Preventive Medicine,* 10 (3), 1994; "Inpatient Nutrition Care: Adults – Diabetes Mellitus," *Supplement to the Journal of the American Dietetic Association,* April, 1989: S46; Levetan, C.C. et al., "Impact of Endocrine and Diabetes Team Consultation on Hospital Length of Stay for Patients with Diabetes," *The American Journal of Medicine,* 99: 22-28, July, 1995; Poduch, Carol, "The Dietitian as a Cost Efficient Agent," *Canadian Nursing Home,* 7 (1): 5-7, February-March, 1996; "Ambulatory Nutrition Care: Adults – Diabetes Mellitus, *Supplement to Journal of the American Dietetic Association,* S35-38; Geppert, Joni, and Patricia Splett, "Summary Document of Nutrition Intervention in Diabetes," *Supplement to the Journal of the American Dietetic Association,* November, 1991: 27-30; Daly, Anne, and Joan Hill, "DCE Launches Grassroots Project to Collect Diabetes Cost-Savings Example," *Diabetes Care and Education,* 14 (6): 21-22, Winter, 1993; Anders, Carol Louise, "Evaluating the Effectiveness of a Diabetes Education Program," *Diabetes Spectrum,* 6 (5): 314-319, September-October, 1993; all cited in Province of British Columbia (1996), op. cit., pages 25, 33, 40, 44, 47, 48. To convert 1987 US$446 to 2002 Canadian dollars: Statistics Canada's CANSIM database, Matrix 933, gives the June 1987 exchange rate as $1 US = $1.34 Cdn. Calculation (1): 1.34 X $446 = $597.64 (C$1987); Calculation (2): 2002 CPI (119) divided by 1987 CPI (81.5) X $597.64 = $853.56.

[132] Powers, Margaret, and Madelyn Wheeler, "Model for Dietetics Practice and Research: The Challenge is Here, but the Journey was not Easy," *Journal of the American Dietetic Association,* 93 (7): 755-757, July, 1993; Geppert, Joni, and Patricia Splett, "Summary Document of Nutrition Intervention in Diabetes," *Supplement to the Journal of the American Dietetic Association,* November, 1991: 27-30; both cited in Province of British Columbia (1996), op. cit., page 48.

[133] Oster, Gerry, "Estimated Effects of Reducing Dietary Saturated Fat Intake on the Incidence and Costs of Coronary Heart Disease in the United States," *Journal of the American Dietetic Association* 95 (2): 127-131, February, 1996, cited in Province of British Columbia (1996), op. cit., page 21.

To convert 1996 U.S. dollars to 2002 Canadian dollars: Exchange rates given at http://www.x-rates.com/cgi-bin/hlookup.cgi on June 28, 1996, indicate $1 US = $1.3657 Cdn.)

Calculation (1): 1.3657 X $4 billion = $5.46 billion (C$1996)

Calculation (2): 2002 CPI (119) divided by 1996 CPI (105.9) X $5.46b = $6.1 billion

Calculation (1): 1.3657 X $13 billion = $17.75 billion (C$1996)

Calculation (2): 2002 CPI (119) divided by 1996 CPI (105.9) X $17.75b = $20 billion

Canada's 2002 population (31,362 million) is 12% of the U.S. 1994 population (260,327 million).

and increased consumption of omega 3 fatty acids in the diet saved more lives and was relatively inexpensive.[134]

The good news here is that secondary prevention aimed at lowering blood cholesterol, LDL levels, and hypertension among patients with heart problems can actually reverse the course of coronary heart disease, even after the development of angina or myocardial infarction. Studies have demonstrated that the progression of plaque formation can be slowed or halted, and that regression of the atherosclerotic process and coronary artery disease is possible.[135]

Patients with hypertension and diabetes, both of which are associated with obesity and poor diet, are at greater risk of chronic kidney failure. Early control of these conditions through nutritional therapy, including a low protein diet, can therefore reduce the substantial health care costs required to treat renal failure, by reducing periods of hospitalization, length of dialysis treatment, and side-effects of medication, while improving the patient's quality of life substantially. Nutritional counselling can be particularly important in secondary prevention following discharge from hospital, and can help speed recovery and prevent readmission. Case studies at the Children's Hospital in Vancouver indicated that every dollar spent on nutrition services for discharged patients saved $180.[136] It has been estimated that nutrition services are required in fully half of all home care cases, and can produce significant cost savings.[137]

2.2.2 Primary Prevention

It is clear that obesity is only one possible consequence of poor nutrition, and that unhealthy eating is a risk factor in its own right for many chronic illnesses. High fat diets, for example, are associated with five of the leading causes of death in Canada and the U.S. – heart disease, some cancers, stroke, diabetes, and atherosclerosis.[138] Conversely, nutritional counselling and dietary interventions have proved successful in promoting health and preventing a wide range of

[134] Ministry of Health, Nutrition Branch, "A Comparison of the Cost and Efficacy of Nutrition Management and Lipid Lowering Drug Therapy for Heart Disease," April, 1992; and Carrow, Anne, and Lorne Klippert, "Ambulatory Health Care Services – Nutrition Counselling," *Issue Paper, Ministry of Health,* 1992/93, B.C.; both cited in Province of British Columbia (1996), op. cit., pages 16-17.

[135] Weiner, Bonnie, "Intervention for Secondary Prevention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 406-425.

[136] "BC Children's Hospital Clinical Nutrition Report," November, 1994, cited in Province of British Columbia (1996), op. cit., page 42.

[137] Rebovich, E. Jean et al., "Nutrition Services in Home Care," *Caring Magazine,* October, 1990: 8-14; Inouye, Teri, et al., *Assessment of Nutritional Status and Outcome of Nutrition Intervention in the Homes of Patients Discharged from Hospital at Nutritional Risk*, Great Victoria Hospital Society Interns, August, 1994: 3-26; Ross, Sue, *Cost Effectiveness of Nutrition Services*, B.C. Dieticians and Nutritionists Association, September, 1994; "Ambulatory Nutrition Care: Adults – Home Health," *Supplement to the Journal of the American Dietetic Association,* April, 1989: S41-43; "Nutrition Care is Essential to the Expanding Home Health Care Market, *Nutrition Screening Initiatives,* issue 16: 4-6, fall, 1995; all cited in Province of British Columbia (1996), op. cit., pages 45-46.

[138] Carrow, Anne, and Lorne Klippert, "Ambulatory Health Care Services – Nutrition Counselling," *Issue Paper, Ministry of Health,* 1992/93, Province of British Columbia.

conditions, including diabetes mellitus, cardiovascular disease, certain cancers, obesity, and low birth weight.[139]

The American Cancer Society attributes 30% of cancer deaths to dietary risk factors, indicating that almost19,000 Canadians a year may die prematurely from cancers that could be prevented by healthy eating. Numerous studies have also demonstrated that nutrition education and counselling can contribute significantly to the prevention and treatment of heart disease by reducing key risk factors, including cholesterol levels, blood pressure, and weight.[140]

For example, one extensive literature review confirmed the potential for reducing colorectal cancer risk by decreasing consumption of animal fats, red meat, alcohol, and cigarettes, and by increasing physical activity levels, and intake of fruits, vegetables, and dietary fibre. Eating more fruit and vegetables can cut colorectal cancer risk by 50%, as can increased dietary fibre intake, and exercising regularly, whereas eating more animal fats doubles the risk, and being overweight or eating large quantities of red meat or eggs triples the risk. The recommended diet is very similar to that recommended to reduce coronary heart disease mortality, while fruit and vegetable intake also appear to be protective against other cancers, such as lung and stomach cancers.[141]

A comprehensive view is expressed in the American Dietetic Association's official position:

> *"Optimal nutrition and physical activity can promote health and reduce the risk of chronic disease….To effectively reduce health care costs, the emphasis and delivery of health care must promote health as well as deliver treatment and rehabilitative services to the sick. Preventive measures, such as nutrition interventions that also encourage physical activity, can help prevent or halt progression of full-blown chronic disease and thus decrease chronic disease disability. Health promotion and disease prevention need to be integral parts of all health care, community, public health, and worksite programs across the life cycle. Correspondingly, such programs much be culturally competent and address the specific needs of vulnerable or underserved populations."*[142]

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[139] *The Surgeon-General's Report on Nutrition and Health,* U.S. Department of Health and Human Services, Washington, D.C., 1988, DHHS (PHS) publication no 88-50210, page 1; Committee on Diet and Health, Food and Nutrition Board, Commission on Life Sciences, National Research Council, (1989), *Diet and Health: Implications for Reducing Chronic Disease Risk,* National Academy Press, Washington, D.C.; U.S. Department of Health and Human Services, (1990), *Healthy People 2000: National Health Promotion and Disease Prevention Objectives,* Washington, D.C., DHHS (PHS) publication no. 91-50213; "The Role of Nutrition in Health Promotion and Disease Prevention Programs – Position of ADA," *Journal of the American Dietetic Association,* 98: 205-208, 1998; "Position of the American Dietetic Association: Cost-Effectiveness of Medical Nutrition Therapy," *Journal of the American Dietetic Association* 95: 88-91, 1995; "Position of the American Dietetic Association: Nutrition Services in Managed Care," *Journal of the American Dietetic Association,* 96: 391-395, 1996.

[140] See above, and also "Ambulatory Nutrition Care: Adults – Atherosclerosis," *Supplement of the Journal of the American Dietetic Association,* April, 1989: S22-25, cited in Province of British Columbia (1996), op. cit., page 16.

[141] Robertson, Iain, Rona Bound, and Leonie Segal, "Colorectal Cancer, Diet and Lifestyle Factors: Opportunities for Prevention," *Health Promotion International* 13 (2): 141-150. Note that this crude summary of relative risks does not indicate the baseline used for comparison, which varies for each factor. For example, relative risks for fruit, vegetable, and animal fat consumption compares highest and lowest quintiles, while red meat consumption compares men eating red meat five or more times per week with those eating those foods less than once a month.

[142] "The Role of Nutrition in Health Promotion and Disease Prevention Programs – Position of ADA," *Journal of the American Dietetic Association,* 98: 205-208, 1998.

Fifteen prestigious U.S. research, health, and medical associations produced a joint position paper demonstrating that good nutrition can save lives and money. They estimated that diet-related diseases contribute to close to $315 billion a year in direct and indirect costs in the U.S., while poor diet and lack of physical activity together cause 310,000 – 580,000 deaths a year.[143] Extrapolated to Canada by population, these figures indicate the causing of 37,000-70,000 deaths and costs of about $36 billion a year for this country.[144]

A series of surveys conducted by the National Institute of Nutrition (NIN) indicate that a lot of work still needs to be done in this area. For example, 1990 survey results conducted in three provinces showed that 8 out of 10 Ontarians and Nova Scotians ate too much fat. The overall energy that residents of Quebec, Nova Scotia and Ontario derived from fat decreased to 35% in 1990 from 37% in 1970-72, but was still well above the recommended fat intake of no more than 30% of energy. More men than women exceeded recommendations for both total and saturated fat. Only one in five Ontarians reported meeting the carbohydrate consumption goal of the 55% recommended level and Nova Scotian carbohydrate consumption was at 47% of total energy intake. Respondents from the three provinces also consumed too much protein from animal products, well above recommended levels.[145]

But perhaps the most revealing evidence is the low priority this nutrition information has on our health agendas. In the latest survey conducted by the NIN, the *Tracking Nutrition Trends 2001*, the number of Canadians who felt that nutrition was either extremely or very important had dropped to 53%, from a high of 66% in 1994. As well, the percentage of Canadians who rate their eating habits as only fair or poor has risen to 21% from 15% in 1994. According to NIN's president, Anne Kennedy: "The waning interest in nutrition action is particularly worrisome for health professionals who have identified obesity and overweight as a mountain population health issue."[146]

Stress, overwork, and low income also contribute to poor eating habits. Both the 1997 and 2002 surveys conducted by the National Institute of Nutrition concluded as much, with the 1997 survey stating: "A hectic lifestyle emerges as the main obstacle to healthy eating. Increasingly, limited income constitutes another barrier: 20% of households with incomes under $25,000 believe their household does not have enough money for a healthy diet, up from 14% in 1994." The 2001 survey found that 19% of respondents said a busy lifestyle was the leading factor causing fair or poor eating habits, while 12% listed eating take-out or fast foods. NIN's Anne Kennedy concludes: "The dichotomy between interest and action suggests that, although nine

[143] "R_x: Good Nutrition – Putting 'Health' into Health Care Reform," American Cancer Society, et al., June, 1994, cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography,* Prevention and Health Promotion Branch, Ministry of Health, B.C., page 13. (C$2002 $315 billion = US$1994 $200 billion, using the calculation methods given above.)
[144] Canada's population in 2002 is about 12% that of the U.S. in 1994 (31 million versus 260 million).
[145] Nova Scotia Heart Health Program, *Report of the Nova Scotia Nutrition Survey,* March, 1993; and National Institute of Nutrition, *Do Canadians Eat Better Than They Did 20 Years Ago?* November, 1993, available at: http://www.nin.ca/public_html/Publications/HealthyBites/hb1_93en.html. Accessed 1 February, 2004.; Health Canada, *Household Level Access to Food*, available at: http://www.hc-sc.gc.ca/datahpsb/npu/cpc8.htm.
[146] National Institute of Nutrition, *Canadians Losing Interest in Healthy Eating Says National Survey*, April 2002, available at: www.nin.ca/Media/Archives/.

out of ten Canadians identify nutrition as an important factor when choosing food, other concerns in their lives may be taking priority."[147]

Nutritional intervention for low-income pregnant women has been found to reduce the incidence of low birth weight babies by 50%. Low birth weight infants cost the health care system an average of 8-18 days in expensive neonatal intensive care, at an average medical cost of $18,400-$23,500 (C$2002) per instance. Compared to these costs, nutritional counselling yields a benefit to cost ratio of 5:1, or $5 in medical costs avoided for every $1 invested in nutritional counselling services.[148]

A Note on Supplements

While the evidence on the health-promoting role of whole food diets is very strong, trials on supplement use have yielded more mixed and controversial results. Applying the precautionary principle here (see Part VI), one research team has noted:

> *"[F]ood is not just a mixture of known food chemicals. It is a structured mix of interacting chemicals, some known, some not fully understood, some completely unknown. A prudent approach to these results would be a bias towards whole foods rather than adding or subtracting individual nutrient chemicals."*[149]

2.3 Physical Inactivity

Chronic conditions related to physical inactivity include coronary heart disease, stroke, hypertension, type 2 diabetes, colon cancer, osteoporosis and osteoporotic hip fractures, obesity, and anxiety and depression. An inverse dose-response relationship has been demonstrated between physical activity and many of these chronic diseases and conditions. Of all risk factors, sedentary living is the most prevalent, with fully 57% of Canadians insufficiently active for optimal health benefits according to the Canadian Fitness and Lifestyle Research Institute's *2001*

[147] National Institute of Nutrition, *Tracking Nutrition Trends 1989 - 1994 – 1997*, 10 November, 1997, available at: www.nin.ca/Media/Archives/. National Institute of Nutrition, *Canadians Losing Interest in Healthy Eating Says National Survey*, April 2002, available at: http://www.nin.ca/public_html/En/pdf/tntrelease.pdf.

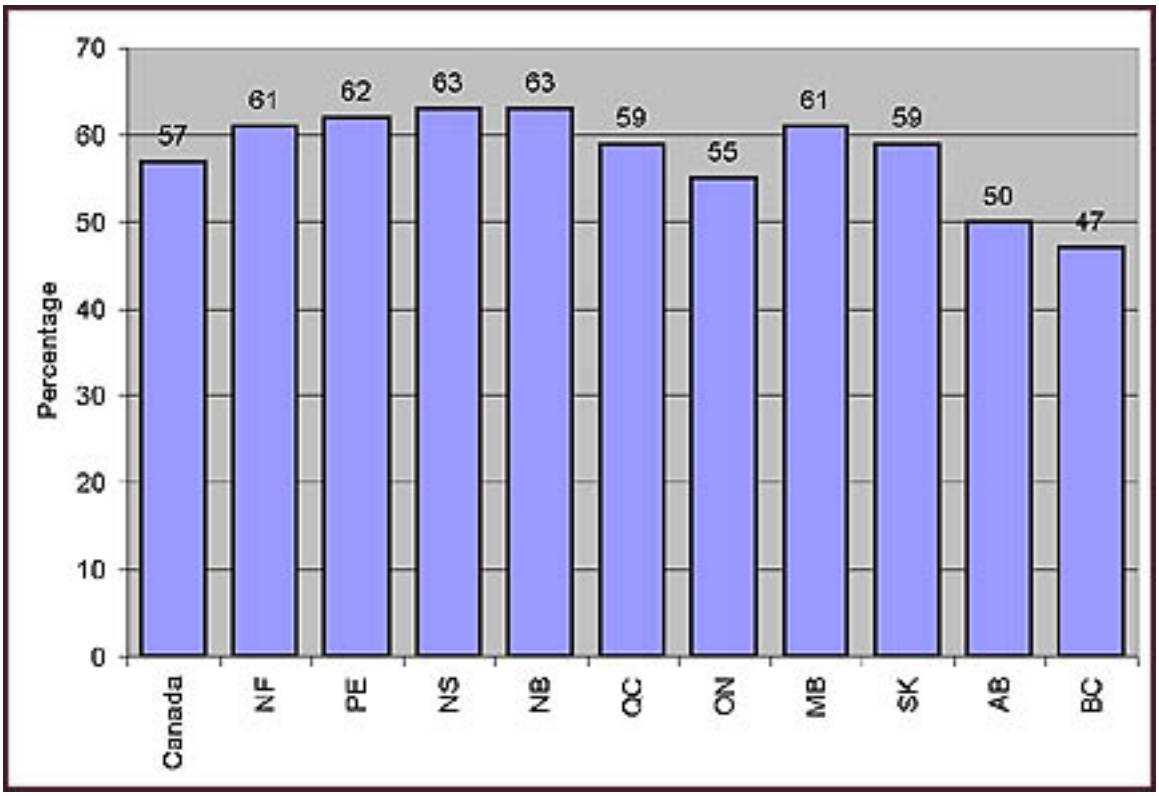
[148] Hixson Trouba, Peggy, et al., "Summary Document of Nutrition Intervention in Prenatal Care," *Supplement of the Journal of the American Dietetic Association,* November, 1991: 21-26; Higgins, Agnes, et al., "Impact of the Higgins Nutrition Intervention Program on Birth Weight," *Supplement of the Journal of the American Dietetic Association* 89 (8): 1098-1103, August, 1989; Orstead, Catherine, et al., "Efficacy of Prenatal Nutrition Counselling: Weight Gain, Infant Birth Weight, and Cost-Effectiveness," *Research,* January, 1985: 40-45; "What the 'Contract with America' Won't Tell You," *CNI Newsletter* 25 (3): 4-5, January 20, 1995; "Benefits of Nutrition Services – A Cost and Marketing Approach," *Ross Laboratories Report of the Seventh Ross Roundtable on Medical Issues*, August 18-19, 1986: 2-9; all cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography,* Nutrition Section, Prevention and Health Promotion, Ministry of Health, July, 1996, pages 1-2, 11, 39.

[149] Robertson, Iain, Rona Bound, and Leonie Segal, "Colorectal Cancer, Diet and Lifestyle Factors: Opportunities for Prevention," *Health Promotion International* 13 (2): 141-150.

Physical Activity Monitor. Among the provinces, the most inactive were New Brunswick and Nova Scotia at 63% and the least inactive British Columbia at 47%[150,151] (Figure 19).

Katzmarzyk et al. 2000[152] examined the relationship between physical inactivity and six chronic diseases in Canada: coronary artery disease; stroke; colon cancer, breast cancer, Type 2 Diabetes, and osteoporosis. They concluded that about $2.1 billion, or 2.5% of the total direct health care costs in 1999, were attributable to physical inactivity. They further concluded that inactivity resulted in the premature loss of 21,000 lives in 1995 and that a 10% reduction in physical inactivity could potentially reduce health care expenditures by $150 million a year. These costs estimates do not include indirect costs such as loss of productivity and premature loss of life.

Figure 19. Percentage of Canadians, 18 and Older, Considered Inactive, 2001 (%)



Source: Canadian Fitness and Lifestyle Research Institute, "Physical Activity Pays Big Dividends," and "An Economic Case for Physical Activity," *The Research File,* files from 1999 and 1995, and "Results of the 2001 Physical Activity Monitor, available at: http://www.cflri.ca/cflri/pa/surveys/2001survey/2001survey.html.

[150] Canadian Fitness and Lifestyle Research Institute, "Physical Activity Pays Big Dividends," and "An Economic Case for Physical Activity," *The Research File,* files from 1999 and 1995, and *Results of the 2001 Physical Activity Monitor*, available at: http://www.cflri.ca/cflri/pa/surveys/2001survey/2001survey.html.

[151] Results from the Canadian Community Health Survey 2001 were slightly more encouraging: 49% inactivity for Canadians; 38% for British Columbia. However, the overall pattern of inactivity is similar with the Atlantic Provinces showing some of the highest rates and Western provinces generally lower rates.

[152] Katzmarzyk, Peter T., Norman Gledhill and Roy Shephard 2000, "The Economic Burden of Physical Inactivity in Canada," *Canadian Medical Association Journal* 163: 1435-40.

A Harvard Medical School meta-analysis estimated that 22% of coronary heart disease in the U.S. could be attributed to physical inactivity.[153] This means that more than one-fifth of heart disease incidence could be avoided if everyone were physically active. Given that cardiovascular diseases cost the Canadian economy more than $20 (C$2002) billion a year, a well-coordinated plan of action to increase levels of physical activity in Canada could potentially save substantial sums of money and substantially increase the proportion of Canadians active enough to gain significant health advantages. According to the Coalition for Active Living in Canada, such a plan would include:

- Public education strategies including a media campaign as well as mandatory physical education in schools;
- Increased access to programs and services that encourage both formal and informal opportunities for leisure and non-leisure time physical activity;
- Improved physical environments that facilitate physical activity: transportation and community planning systems that encourage walking, biking, etc., as part of daily life; and
- Increased research and improved surveillance of physical activity levels.[154]

A 1999 Statistics Canada analysis of results from the National Population Health Survey, controlling for age, education, income, smoking, blood pressure, weight, and other factors, found that sedentary Canadians have *five times* the risk of developing heart disease as those who exercise moderately in their free time. The same analysis found that those with a low level of regular physical activity had 3.7 times the odds of developing heart disease compared to those who exercised moderately.[155]

The Harvard meta-analysis also found that 22% of colon cancer and osteoporotic fractures, 12% of diabetes and hypertension, and about 5% of breast cancer are attributable to lack of physical activity.[156] Physical inactivity is also linked to obesity, which is itself a risk factor for a wide range of chronic diseases. It is estimated that 19% of premature deaths in Canada are attributable to physical inactivity.[157]

Despite the high levels of inactivity, there is something positive arising from the surveys. According to Cora Lynn Craig, President of the Canadian Fitness and Lifestyle Research Institute:

[153] Colditz, G.A. (1999), cited in Canadian Fitness and Lifestyle Research Institute (CFLRI), "Physical Activity Pays Big Dividends," in *The Research File,* reference no. 00-01. A "meta-analysis" examines results from a large number of epidemiological studies. Statistical techniques are then used to estimate relative risks for particular behaviour patterns and the proportion of disease burden attributable to these risk behaviours, taking into account the findings of all studies examined as well as the sample sizes and methodologies of each study.
[154] For more details on the Coalition for Active Living's framework of key components of a national physical activity strategy, see http://www.activeliving.ca.
[155] Chen, Jiajian, and Wayne J. Millar, "Health Effects of Physical Activity," Statistics Canada, *Health Reports* 11 (1), Summer, 1999, catalogue no. 82-003-XPB, pages 21-30, especially, page 24.
[156] Colditz (1999), in CFLRI, op. cit.
[157] Canadian Fitness and Lifestyle Research Institute, "The Burden of Inactivity," *The Research File,* reference no. 98-01.

"The good news is that physical inactivity is at its lowest level in the 20 years we've been keeping track. This is not the case in other countries. In the United States, for example, there has been no progress at all since the early 1980s."[158]

Active living cannot only prevent a wide range of chronic diseases, but can also enable elderly people to age more successfully and independently, with a higher quality of life. In the short term, physical activity also provides more energy, promotes healthy weight, reduces stress, strengthens muscles and bones, improves posture and balance, and enhances the general sense of well-being.[159]

Evidence is accumulating on the biological pathways and mechanisms by which physical activity promotes physical and mental health. For example, a study on physical activity and mental health examines evidence on a number of hypotheses, including endorphin, serotonin, norepinephrine, and thermogenic responses to activity.[160]

As well, physical activity may help prevent cardiovascular disease by improving the balance between myocardial oxygen supply and demand. It may protect against cancer by increasing the proportion of free radical scavenging enzymes and circulating T and B lymphocytes, thus improving immune function, and by increasing gastrointestinal motility and decreasing the transit time of ingested food.[161]

Physical activity can protect against overweight and diabetes by reducing body fat, increasing the resting metabolic rate and the rate of glucose disposal, and improving cell insulin sensitivity. Regular exercise in childhood can protect against osteoporosis in old age by promoting the development of bone mass, and at older ages it can help maintain bone mineral density. Physical activity can also safeguard mental health through reducing muscle tension (and thereby stress and anxiety) and through biochemical brain alterations and release of endorphins, thereby protecting against depression.[162]

2.4 Lack of Screening

Screening allows early detection, and thus more effective treatment, of several chronic illnesses. Lack of screening can therefore be considered a risk factor in the progression of chronic diseases and in the likelihood of avoidable, premature death. Early detection and treatment of hypertension, for example, can also avoid the onset of other diseases like heart disease and stroke.

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[158] Canadian Fitness and Lifestyle Research Institute, *Canadians Still Not Active Enough*, May 12, 2000, available at: http://www.cflri.ca/cflri/news/2000/0005pr.html.
[159] Canadian Fitness and Lifestyle Research Institute, "Economic Costs of Physical Inactivity," *The Research File,* 2001.
[160] Morgan, William (ed), *Physical Activity and Mental Health,* Taylor and Francis, 1997, chapters 10-13.
[161] Slattery, Martha 1996, "How Much Physical Activity Do We Need to Maintain Health and Prevent Disease? Different Diseases – Different Mechanisms," in *Research Quarterly for Exercise and Sport* 67 (2), 1996, page 210.
[162] Ibid. Slattery 1996.

2.4.1 Pap Smear Tests

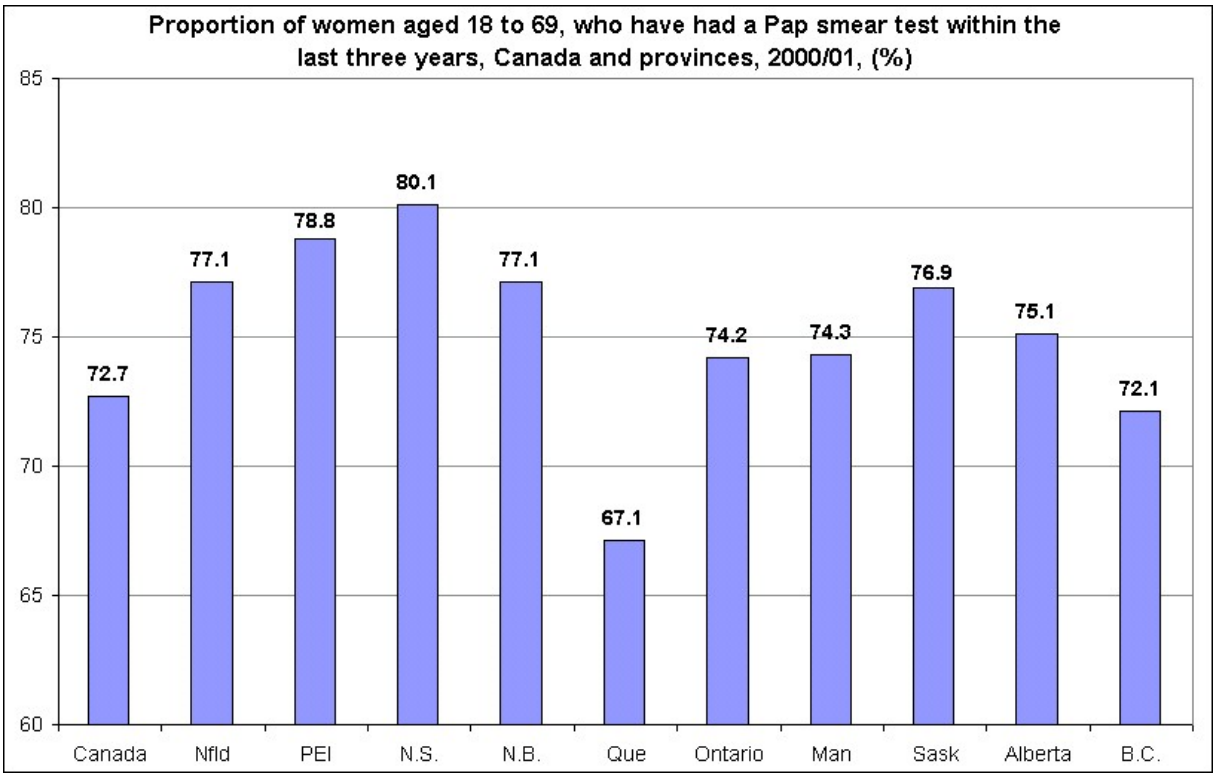
Cervical cancer is the 12th most common cancer diagnosed in Canadian women and the third most common in women aged 20-34 and 35-49. Since the treatment options and survival rates are good and dependent on early detection, the disease lends itself well to screening[163] Cervical cytology screening with a Pap smear reduces the incidence of and mortality from cervical cancer. As a result of the widespread adoption of this simple screening procedure, cervical cancer incidence and mortality rates have fallen dramatically across the country, with an almost 50% drop over the past 25 years. Between 1969 and 1998, the age-standardized incidence rate fell from 21.8 to 8.3 cases per 100,000, and the mortality rate from 7.4 to 2.2 deaths per 100,000. Disturbing, however, is the difference between the percentage of women in the lowest income level and the highest when it comes to reporting having had a Pap smear within the last three years (60% versus 76%).[164]

Surveys show that about 60% of cases of invasive cervical cancer today occur in women not previously screened *or* not screened in the last three years.[165] Among Canadian women aged 18-69, 52.6% have had a Pap smear test within the last year (Figure 20), and 72.7% have had a Pap smear within the last three years, as medically recommended. All four Atlantic provinces have higher proportions of women, 18 and over, who have had a Pap smear within the last three years than other regions of Canada. Four out of five women in Nova Scotia have had a Pap smear within the last three years – the highest rate in the country, compared to two-thirds of Quebec women, who have by far the lowest rate of testing in the country. PEI has the second highest rate of Pap smear testing in Canada, followed by Newfoundland and Labrador, New Brunswick, and Saskatchewan.[166]

As Pap smears are recommended on at least an every three-year basis for women aged 18 and over up to the age of 69, the results suggest that educational information focus on the importance of the time element.[167] In addition, Health Canada recommends that more efforts must be made to target non-compliant groups with educational campaigns.[168]

[163] Health Canada 2002. *Cervical Screening in Canada: 1998 Surveillance Report*, Ottawa: Health Canada.
[164] Judy Lee, Greg Parsons, Jane Gentleman, "Falling Short of Pap Test Guidelines," Statistics Canada, *Health Reports,* pages 9-19, esp. page 11, ACPH; *Toward a Healthy Future,* Pages 146-147; ACPH, *Statistical Report,* page 79.
[165] Morrison, B., 1994. "Screening for Cervical Cancer in Canada: Canadian Task Force on the Periodic Health Examination." *Canadian Guide to Preventive Health Care*. Ottawa: Health Canada 1994: 870-881.
[166] Statistics Canada, 2002, *Canadian community Health Survey 2000/01*.
[167] Health Canada, *Statistical Report,* page 81.
[168] Health Canada, 2002, Ibid.

Figure 20. Proportion of women aged 18 to 69, who have had a Pap smear test within the last three years, Canada and provinces, 2000/01 (%)



Source: Statistics Canada 2002. Canadian Community Health Survey 2000/01.

2.4.2 Mammogram Screening

According to Health Canada, early detection of breast cancer through mammograms has been shown to reduce mortality in women age 50-69. Currently mammograms are recommended every two years for women in this age group.[169] It is also recommended that mammogram screening be combined with physical breast examination by a health care professional and by teaching and monitoring of breast self-examination.

Canadian women have a one in nine lifetime risk of breast cancer, the most common cancer to afflict women. One in 25 Canadian women will die from breast cancer, and the incidence of breast cancer has been rising steadily. Because of the relatively young age at which women die from breast cancer, it results in 98,000 potential years of life lost each year in Canada. Nova Scotia has the country's highest breast cancer mortality rate at 112 per 100,000, followed by New Brunswick at 110 per 100,000. Newfoundland, at 94 per 100,000, has the lowest rates in Canada, followed by Manitoba at 98 per 100,000.[170]

[169] Health Canada, 1999, *Statistical Report on the Health of Canadians,* page 82.
[170] National Cancer Institute of Canada, *Canadian Cancer Statistics 2002,* pages 27, 57.

The good news is that early detection of breast cancer through mammograms has been shown to reduce mortality in women age 50-69, and the breast cancer mortality rate is now at its lowest since 1950. Health Canada reports that:

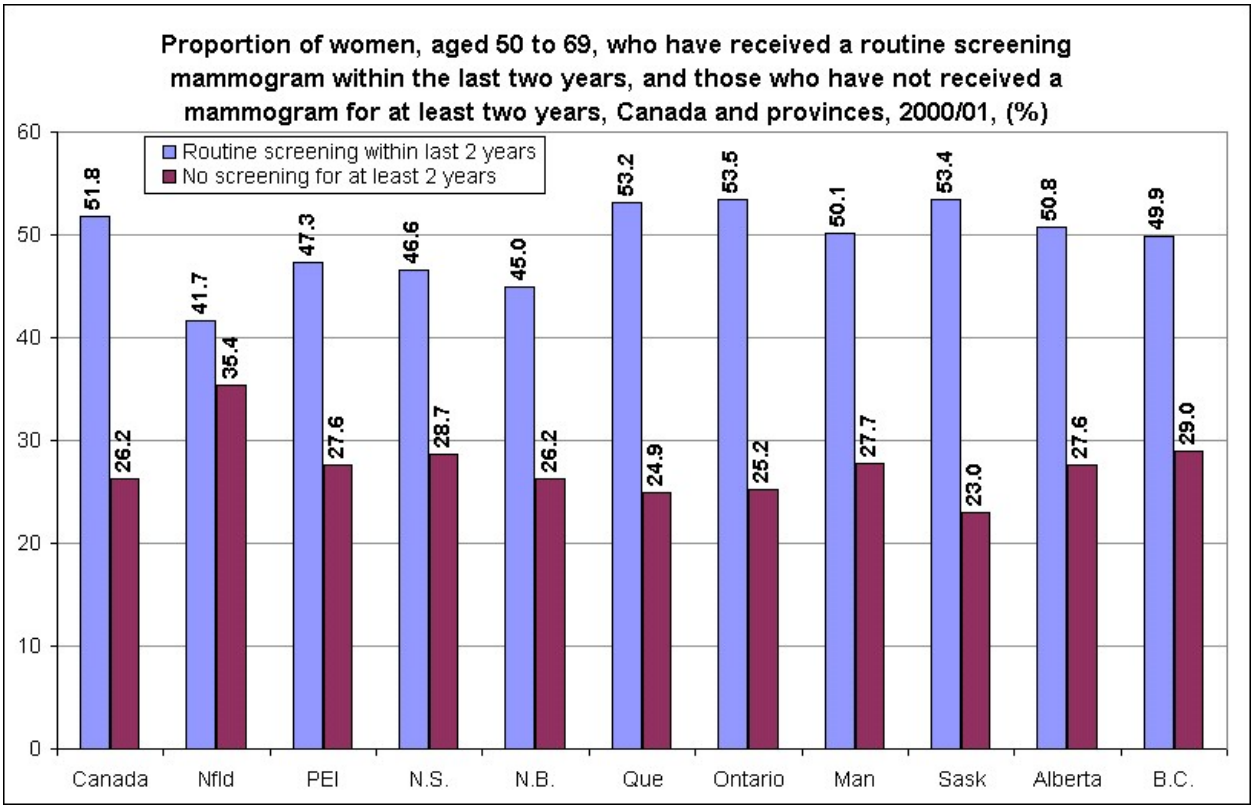
> *"The dramatic increase in mammography use is a positive example of how public education combined with efficient screening practices can make a dramatic difference in the use of proven preventive measures."*[171]

Currently mammography screening is recommended every two years for women aged 50-69, and the likelihood that a woman has had a mammogram increases with age, peaking at age 50-59.[172] Health Canada has set a target that 70% of all Canadian women aged 50-69 will receive a mammogram for screening purposes every two years.[173] Figure 21 shows the rate of women receiving mammograms by province in 2000/01. These data are from Statistics Canada's Canadian Community Health Survey (CCHS) and therefore include mammograms performed at private facilities as well as public facilities.[174] They include only mammograms performed for routine screening purposes and not those performed for other purposes. CCHS results show that 51.8 % of Canadian women in this age group report having had a mammogram in the most recent two-year period. Ontario has the highest rate at 53.5%, followed by Quebec at 53.2% and Saskatchewan at 53.4%. All four Atlantic provinces have lower rates of routine mammogram screening than the rest of Canada. Newfoundland has the lowest rate in the country (41.7%), New Brunswick the second lowest (45%), Nova Scotia the third lowest (46.6%), and Prince Edward Island the fourth lowest (47.3%).

Health Canada also reports on participation in Organised Breast Screening Programs in Canada.[175] This program has grown from a single program in 1989 to nine organized programs in 1998. According to data collected through the programs, the proportion of women aged 50-69 who participated in the programs for routine mammogram screening in 1999 and 2000 ranged from 13.1% in Alberta to 50.6 % in British Columbia. The discrepancy between these figures and those presented in Figure 21 is likely because in some provinces more women use private facilities. Between 1999 and 2001, overall participation in these programs increased by 6.7% nationwide, which is a smaller increase than observed the previous year.[176] It may be that the organized programs are reaching the limits of their capacity to recruit additional women. Expansion of organized breast screening programs and shifting resources to recruit target-aged women among groups with low rates of screening (such as lower-income women) may help to reach the goal of 70% participation.

[171] Health Canada, 1999, *Toward a Healthy Future: Second Report on the Health of Canadians,* Health Canada and Statistics Canada, September, 1999, page 154; Health Canada, *Statistical Report,* pages 82-85.
[172] Health Canada, *Statistical Report,* pages 83- 84.
[173] Health Canada, 2000, *Organized Breast Cancer Screening Programs in Canada 1997 and 1998 Report.*
[174] Statistics Canada, 2002, Canadian Community Health Survey 2000/01.
[175] Health Canada, 2001, Ibid.
[176] Health Canada, 2002, *Organized Breast Cancer Screening Programs in Canada 1999 and 2000 Report*.

Figure 21. Proportion of women, aged 50 to 69, who have received a routine screening mammogram within the last two years, and those who have not received a mammogram for at least two years, Canada and provinces, 2000/01, (%)



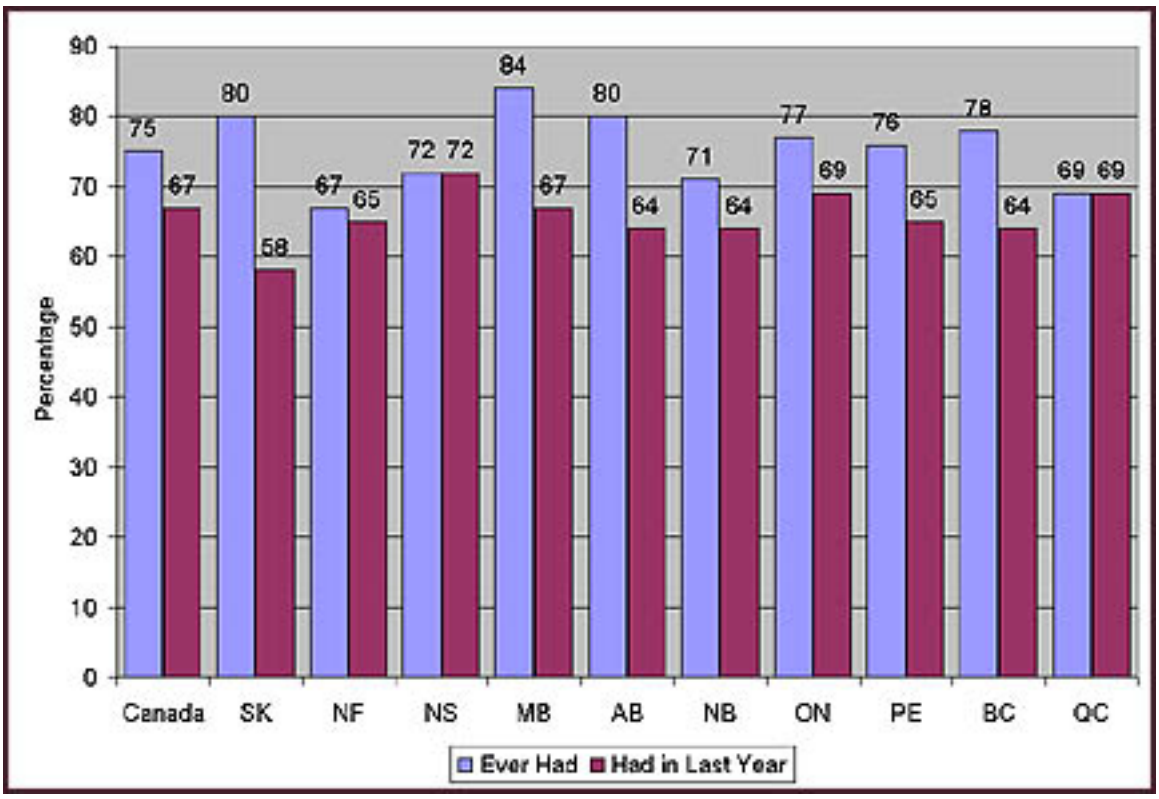
Source: Statistics Canada 2002. Canadian Community Health Survey 2000/01.

A 1999 study for the Atlantic Centre of Excellence for Women's Health found that the Well Women's Clinics in Prince Edward Island are able to combine mammogram and Pap smear testing successfully with health education, including instruction in breast examinations.[177] Among the Atlantic Provinces, in fact, women in PEI have the highest rate of breast examinations by health professionals, just slightly higher than the national average. However, PEI ranked sixth overall with Manitoba leading the way at 84% and Newfoundland last at 67% for women 18 and over who have ever had a breast examination. Among women who have had a breast examination done by a health professional within the last year, Nova Scotia (72%) leads the way with Saskatchewan last (58%).[178]

This successful PEI model noted above indicates a potential strategic investment for other provinces that can save expensive hospital costs, reduce mammogram waiting times, and increase screening rates in an atmosphere conducive to health promotion and public health education.

[177] *PEI Well Women's Clinics: A Case Study of Gender Specific Clinics to Increasing Screening Rates,* Maritime Centre of Excellence for Women's Health, March, Halifax, 1999.
[178] Health Canada, *Statistical Report on the Health of Canadians*, page 86.

Figure 22. Women, 18+, Who Have Ever Had Breast Exam; and Women, 18+, Who Have Had Breast Exam in Last Year, 1996-97 (%)



Source: Health Canada, *Statistical Report on the Health of Canadians*.

Mammogram screening, breast examinations and Pap test rates across the country are highly correlated with education and income. For example, just under two-thirds of university graduates have had a mammogram, compared to 57% of women with less than a high school education. The correlation between education and breast examination is even more positive with four-fifths of university-educated women having had a breast examination compared with 68% of women with less than a high school education. Similarly, 90% of college-educated women have had a Pap smear test, compared to 81% of those with less than a high school education.[179] A clear policy priority is to provide greater access to health care services for marginalized, minority, and low-income women, who currently have lower rates of screening.

2.4.3 Colorectal Cancer Screening

Sigmoidoscopy is an effective tool both for preventing cancer by detecting pre-cancerous polyps, and also for detecting colorectal cancer early, when treatment is most effective. Sigmoidoscopy can detect 65%-75% of polyps and about 50% of colorectal cancers, and is recommended for

[179] Health Canada, *Statistical Report on the Health of Canadians*, pages 79-86.

persons aged 50 and older. Annual fecal occult blood tests have been shown to reduce colorectal cancers by one-third, and are recommended for those 50 and older. Nevertheless, colorectal cancer screening is still generally underused and lags far behind screening for other cancers.[180]

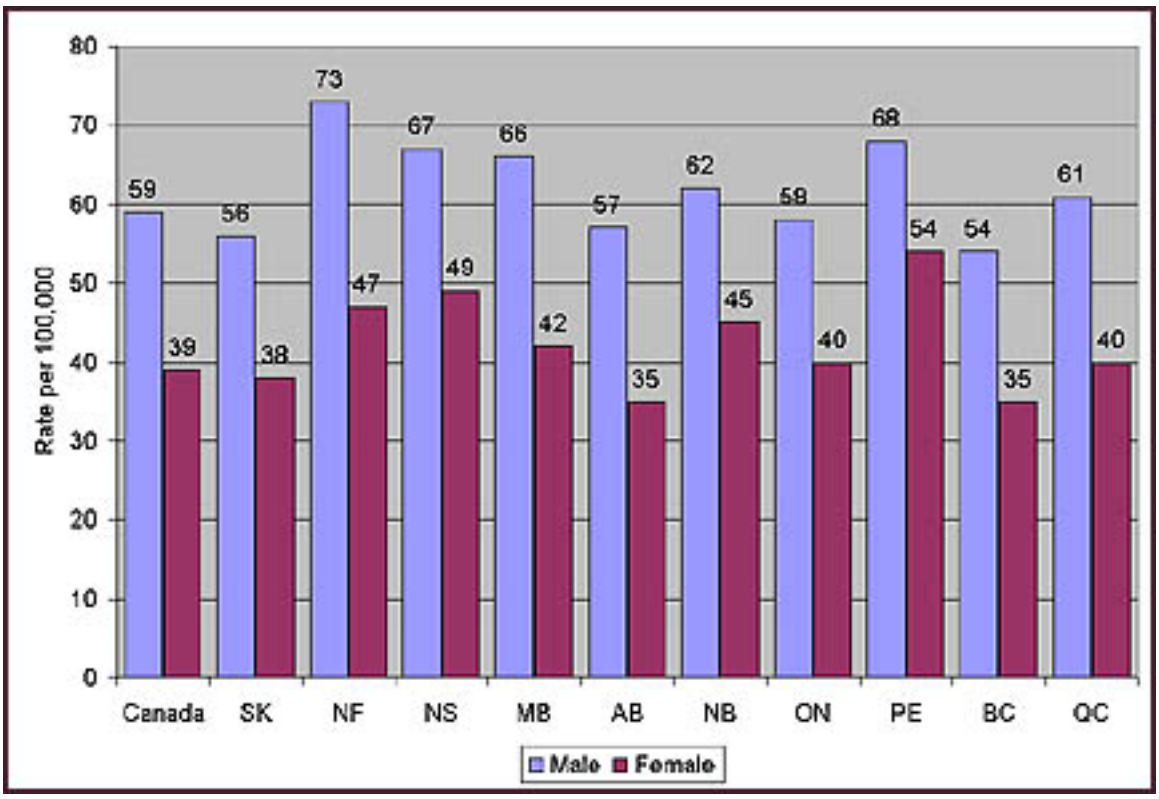
Both the Canadian Task Force on Preventive Health Care[181] and the National Committee on Colorectal Cancer Screening (NCCCS), established in Canada in 1998,[182] have concluded from studies that fecal occult blood screening could reduce colorectal cancer mortality by 15-33% in a targeted population of 50-74 year olds. Over a ten-year period, this could amount to 7,740 lives saved. One concern regarding the fecal occult blood screening is that it is associated with false positive tests, which could lead to unnecessary colonoscopies. Since there is a small risk of perforation and even death with colonoscopy, this is a valid concern. However, over a ten-year period, the risk of deaths due to these procedures has been estimated to total about 75, compared with a potential 7,740 lives saved. Therefore the committee has recommended routine biennial fecal occult blood screening for everyone between 50 and 74 years of age, and that positive tests be followed up with colonoscopy, with options of barium enema and flexible sigmoidoscopy. The cost effectiveness of a biennial screening program is estimated to be $11,907 per year of life gained.[183]

Among men, Newfoundland has the highest incidence of colorectal cancer in Canada, followed by PEI and Nova Scotia (1998-99 actuals).[184] In the 2003 estimates, Nova Scotia is second to Newfoundland, with PEI, New Brunswick, and Manitoba next. Newfoundland also has the highest mortality rate, followed by Quebec and New Brunswick (1998-99 actuals). The 2003 estimates show Newfoundland with the highest mortality rate followed by PEI and Quebec. For women, Newfoundland, Nova Scotia and New Brunswick have the highest incidence rates, followed by Ontario and Manitoba.

Nationally, colorectal cancer rates are 20-per-100,000 lower for women than men. For women, Quebec once again has the highest mortality rates. Despite the lack of a national or provincial colorectal cancer screening program, the mortality rates for men have dropped steadily from 30.6 per 100,000 in 1974 to 27.6 per 100,000 in 2003 (estimate). The results for women have been even more encouraging, with the mortality rates dropping from 27.5 per 100,000 in 1974 to 17.4 per 100,000 in 2000. The fact that casual screening is becoming prevalent may have contributed to these mortality rate reductions.[185] A U.S. study estimated that colon cancer screening for those 55 and older yields $9 in cost savings for every one dollar invested. For the population aged 45-55, the savings are smaller, but still positive[186] (Figure 23).

[180] U.S. Centers for Disease Control, op. cit., pages 67 and 71.
[181] McLeod, R., 2001, Canadian Task Force on Preventive Health Care, *Screening Strategies for Colorectal Cancer: Systematic Review and & Recommendations*, CTFPHC Technical Report #01-2.
[182] *Technical Report for the National Committee on Colorectal Cancer Screening*, May 2002, and *Recommendations for Population-based Colorectal Cancer Screening*, available at: http://www.hc-sc.gc.ca/pphb-dgspsp/publicat/ncccs-cndcc/techrep_e.html.
[183] Op cit., *Technical Report for the National Committee on Colorectal Cancer Screening*, May 2002.
[184] Op. cit., National Cancer Institute of Canada, *Canadian Cancer Statistics 2003*.
[185] National Cancer Institute of Canada, *Canadian Cancer Statistics 2002,* op. cit., pages 26, 28, 43, and 45.
[186] Brown, Allan, 1984, *Costs and Benefits of Preventive Medicine,* Canadian Medical Association, Department of Medical Economics, page 11.

Figure 23. Estimated Age-Standardized Colorectal Cancer Incidence Rates, Gender and Province, Canada, 2002 (rate)



Source: National Cancer Institute of Canada, *Canadian Cancer Statistics 2002.*

2.4.4 Prostate Cancer Screening

Since the early 1990s, blood tests have been used to determine levels of prostate specific antigen (PSA), a protein normally shed by prostate cells. Abnormally high levels can indicate a problem with the prostate, which may or may not be cancer. A biopsy of the prostate gland is the only sure way to detect cancer. Frequently, prostate cancer is limited to the prostate and causes no health problems. Many men with prostate cancer die of other causes.[187]

In 1994, the Canadian Task Force on Preventive Health Care[188] recommended against routine use of PSA as part of periodic health examination, primarily because the test has a substantial rate of false positives, leading to unnecessary health risks, since there is substantial risk associated with the available therapies. The Task Force also recommended against Digital Rectal Exams (DRE) as part of routine health examinations (except for those physicians already using

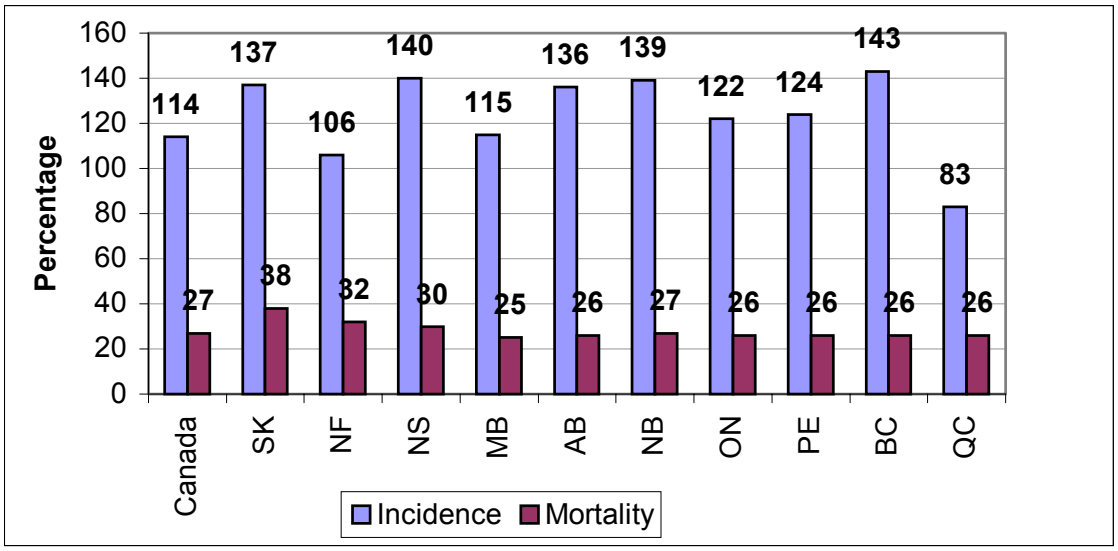
[187] BC Cancer Agency, 2003, *The Pros and Cons of PSA Screening for Prostate Cancer*, available at: www.bccancer.bc.ca accessed Nov. 11, 2003.
[188] Feightner, J.W., "Screening for Prostate Cancer," in *Canadian Task Force on Periodic Health Examination*, Health Canada, 1994, pages 812-23.

the test) because the DRE can detect only 40-50% of cancers. Transrectal ultrasound was also not recommended because it is expensive and has a high rate of false positives.

The Canadian Cancer Society [189]recommends that all men over age 50 discuss with their doctor potential benefits and risks of the PSA and the DRE, and that men at higher risk because of family history and African ancestry should discuss the need for testing at an earlier age. Many physicians recommend that men between 50 and 70 should have a PSA on at least an annual basis.[190]

Prostate cancer incidence rates are the highest among all the cancers, at 114 per 100,000 in 1998. However, the mortality rates at 27 per 100,000 are less than half those of lung cancer. Provincially, the incidence rates vary widely—from a low of 83 per 100,000 in Quebec to a high of 143 per 100,000 in British Columbia. Manitoba has the lowest mortality rates at 25 per 100,000 and Saskatchewan the highest at 36 per 100,000[191] (Figure 24). It is estimated that one in eight men will develop prostate cancer in his lifetime and one in 28 will die of it.[192]

Figure 24. Estimated Age-Standardized Prostate Cancer Incidence and Mortality Rates, Provinces, Canada, 1998 & 1999 (rate per 100,000)



Source: National Cancer Institute of Canada, *Canadian Cancer Statistics, 2003 (1998 and 1999 actuals)*.

[189] Canadian Cancer Society, 2003, *Early detection and screening for prostate cancer*, available at: www.cancer.ca, accessed November 11, 2003.
[190] Mellor, Clare, "Prostate pointers: Two local projects are aimed at providing good information about prostate cancer detection, treatment," *The Chronicle-Herald,* Halifax, 31 October, 2000.
[191] National Cancer Institute of Canada, 2003.op. cit., pages 26 and 28.
[192] Canadian Cancer Society, *Prostate Cancer Stats*, available at www.cancer.ca, accessed November 2003.

2.4.5 Blood Pressure Checkup

High blood pressure is a principal risk factor for coronary heart disease and stroke, and has been estimated to account for 15% of all deaths and 24% of premature deaths.[193] Fortunately, it can be detected with a simple test, and successfully controlled when diagnosed. Blood pressure checkups are recommended at least once a year, yet among Canadians 15 and older only 71% indicate having had their blood pressure checked within the past year, a percentage that has actually gone down since 1985. As well, 7% of those age 12 and up have never had a blood pressure checkup. Provincially, British Columbia shows the lowest number with a blood pressure checkup within the last year at 66% while Ontario and Nova Scotia have the highest at 75%. Surveys indicate that a significant number of people may have undetected high blood pressure, putting them at risk of coronary heart disease and stroke.[194]

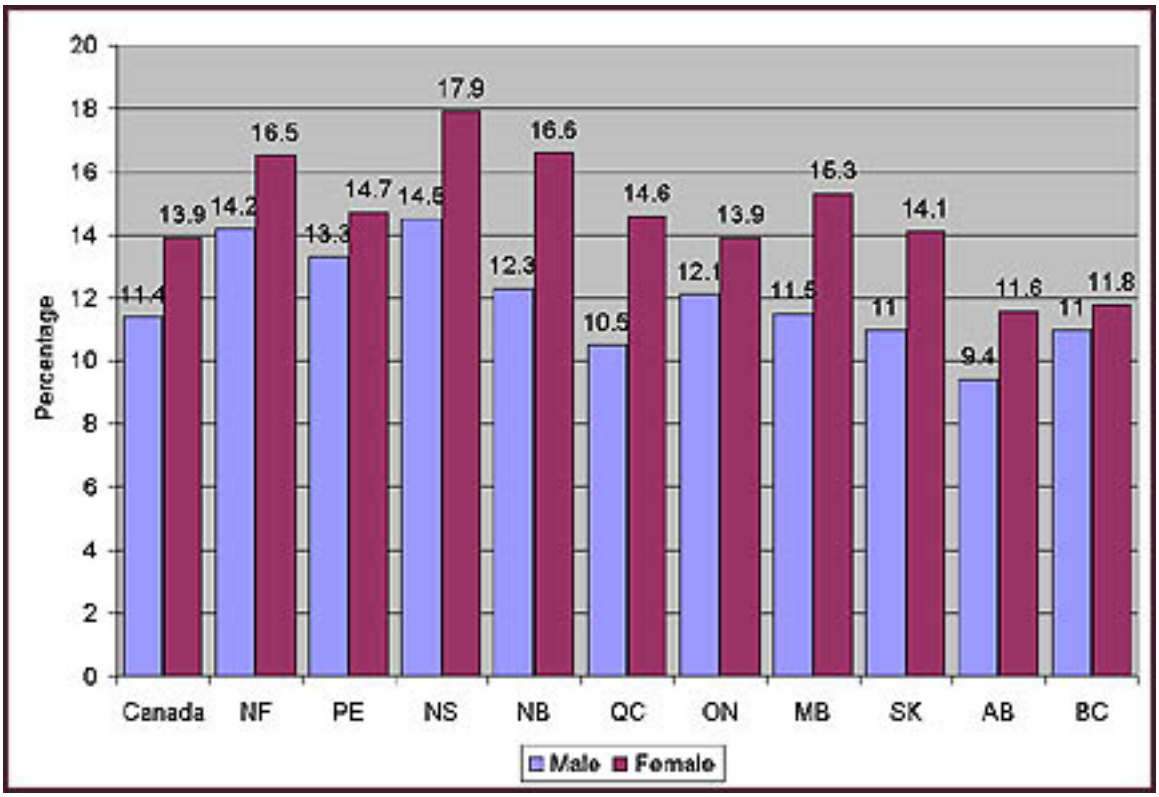
The province consistently recording the highest rates of high blood pressure in Canada for both men and women is Nova Scotia. While Nova Scotia men scored only slightly higher than Newfoundland, the women at 17.9% were more than one percentage point higher than the next province, New Brunswick. In all, 16.2% of Nova Scotians have high blood pressure, a rate 28% higher than the Canadian average.[195]

At the other end of the scale, Alberta shows the lowest high blood pressure rate for both men and women at 9.4% and 11.6% respectively, while British Columbia shows the least variance between male and female rates at 11% and 11.8% respectively (Figure 25).[196]

Fortunately, hypertension can be reduced through weight loss, increased physical activity, reduced salt and alcohol intake, and relaxation.[197] One U.S. study estimated that hypertension accounted for 6% of total illness costs in that country, and that every dollar invested in finding and treating all Americans with hypertension would yield benefits of between $2 and $4 in avoided costs.[198]

[193] Almer, Robert, and Donald Eddins, "Cross-Sectional Analysis: Precursors of Premature Death in the United States," in Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness,* Oxford University Press, New York and Oxford, 1987, page 185.
[194] Health Canada, *Statistical Report,* pages 87 and 89.
[195] Statistics Canada, *Health Indicators, vol. 2002, no. 1, Data tables;* available at: http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/pdf/1266.pdf.
[196] Statistics Canada, *Health Indicators, vol. 2002, no. 1, Data tables;* available at: http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/pdf/1266.pdf.
[197] Goldberg, Robert, "Coronary Heart Disease: Epidemiology and Risk Factors," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 19.
[198] Brown, Allen, *Costs and Benefits of Preventive Medicine,* Canadian Medical Association, Department of Medical Economics, 1984, page 9.

Figure 25. Population Aged 12 and Over with High Blood Pressure, Canada, Provinces, 2000/01 (%)



Source: Statistics Canada, *Health Indicators, vol. 2002, no. 1, Data tables;* available at: http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/pdf/1266.pdf.

PART III
SOCIOECONOMIC DETERMINANTS OF CHRONIC DISEASE

In 1866, Florence Nightingale refused a request to open a new children's hospital on the grounds that it would not remedy high infant mortality. Only improving the conditions in the children's environment would do so.[199] Similarly, deeper analyses of chronic disease today look beyond the conventional treatment options that occupy so much public attention, to the underlying social and economic causes of illness, which provide the milieu and conditions for chronic disease to grow.[200]

Education, income, employment status, environmental exposure, stress, social networks, and other social and economic conditions profoundly influence the lifestyle choices that are the proximate causes of much chronic disease. One analyst notes that man-made carcinogens, highly-refined and high-fat diets, and chemicals added to air, water, and food are both sources of cancer and heart disease, and integral parts of modern industrial production.[201]

According to one recent analysis:

> *"Many of the behaviours that contribute to health conditions, whether good health or ill health, are clearly related to the* ***interdependence*** *between people's lifestyle and their social environment…. In real life, lifestyle is a product of some combination of choice, chance, and resources…. One's socio-cultural environment is a very powerful determinant of health. In fact, Shields (1992) and other sociologists have suggested that lifestyles are essentially artifacts or reflections of culture, individual choice being a less important factor than societal determinants…. A reconstructed definition of lifestyle must incorporate components beyond diet, exercise and alcohol use in order to account for social conditions and processes such as socio-economic status and social relations."*[202]

In 1998, the World Health Organization noted that lifestyle is determined by the interplay between an individual's personal characteristics, social interactions, and socio-economic and environmental living conditions. Because behaviour patterns are continually adjusted in response to changing social and environmental conditions, efforts to improve health must be directed not only at the individual, but also at the social and living conditions that contribute to these behaviours and lifestyles.[203]

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[199] Chernomas, Robert, *The Social and Economic Causes of Disease,* Canadian Centre for Policy Alternatives, March, 1999, page 1.

[200] For evidence on the importance of social determinants of health, see World Health Organization, *Social Determinants of Health: The Solid Facts,* WHO Regional Office for Europe, Copenhagen, 1998; Federal, Provincial, and Territorial Advisory Committee on Population Health, *Strategies for Population Health: Investing in the Health of Canadians,* Ottawa, 1994; Health Canada, *Toward a Healthy Future: Second Report on the Health of Canadians,* Ottawa, September, 1999; Health Canada, *Statistical Report on the Health of Canadians,* Ottawa, September, 1999.

[201] Idem.

[202] Lyons, Renee, and Lynn Langille, *Healthy Lifestyle: Strengthening the Effectiveness of Lifestyle Approaches to Improve Health,* Atlantic Health Promotion Research Centre, Dalhousie University, prepared for Health Canada, Health Promotion and Programs Branch, April, 2000, pages 7, 9 and 10. Reference for Shields (1992) is on page 38 of that report.

[203] Cited in Lyons and Langille, op. cit., page 10.

Education, income, social status, work conditions, and other factors can severely limit personal health choices. For example, poverty and low educational attainment have been linked to high rates of smoking, obesity, and physical inactivity, all of which increase the risk of cardiovascular disease.[204] Statistics Canada reports escalating rates of time stress, and has linked longer work hours with higher rates of smoking and alcohol consumption, unhealthy weight gain, and lack of physical activity.[205] And lack of social support from family, friends and communities is linked to higher rates of cardiovascular disease, premature death, depression, and chronic disability.[206]

A detailed review of the burden of unnecessary illness by Emory University's Carter Center in the United States found socio-economic level to be a more consistent precursor of health problems than any other cause. Specifically, socio-economic level was identified as a precursor of cancer, cardiovascular diseases, arthritis and musculoskeletal disorders, diabetes mellitus, dental diseases, drug dependence and abuse, and infant mortality and morbidity.[207]

Florence Nightingale recognized that major social interventions were required to overcome the infectious diseases that were the primary causes of death and disability in the 19th and early 20th centuries. These interventions included the provision of clean water, sanitation, safe food, decent housing, and better working conditions. Similarly, to overcome the afflictions of chronic disease today, concern for health care funding must be joined with concerns about livelihood security, work stress, food quality, a safe environment, and other social conditions.

[204] Colman, Ronald, *The Cost of Tobacco in Nova Scotia*, GPI Atlantic, Halifax, October, 2000; and *The Cost of Obesity in Nova Scotia*, GPI Atlantic, Halifax, March, 2000; Health Canada, *Toward a Healthy Future: Second Report on the Health of Canadians*, Ottawa, September, 1999; Health Canada, *Statistical Report on the Health of Canadians*, Ottawa, September, 1999; Raphael, Dennis, *Inequality is Bad for our Hearts*, York University, 2001: "Inequality is bad for our hearts: why low income and social exclusion are major causes of heart disease in Canada" can be downloaded from http://depts.washington.edu/eqhlth/paperA15.html; Lyons and Langille, op. cit., page 17.
[205] Statistics Canada, *Overview of the Time Use of Canadians 1998, General Social Survey* Cycle 12, Housing, Family and Social Statistics Division, special tabulation; and Statistics Canada, *The Daily,* November 9, 1998, catalogue no. 11-001E, pages 2-4; Shields, Margot, "Long Working Hours and Health," in Statistics Canada, *Health Reports,* 11 (2): 33-48, Autumn, 1999; Heart and Stroke Foundation, *Annual Report Card on Canadians' Health,* Toronto, 2000.
[206] Lyons and Langille, op. cit., pages 17-19.
[207] Almer, Robert, and Donald Eddins, "Cross-Sectional Analysis: Precursors of Premature Death in the United States," in Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness,* Oxford University Press, New York and Oxford, 1987, table 1, page 183.

3. Costs of Poverty and Inequality

Poverty is recognized as one of the most reliable predictors of poor health, more so than a wide range of medical factors such as high cholesterol and blood pressure levels. No matter which measure of health and cause of death are used, low income Canadians are more likely to have poor health status and to die earlier than other Canadians.[208] Canadians in the lowest income households are four times more likely to report fair or poor health than those in the highest income households, and they are twice as likely to have a long-term activity limitation.[209]

Canadian studies have reported that low income is nearly as important a determinant of health service use as illness, and a recent study in Ontario found that hospital admission rates were twice as high among poor people as among the non-poor. A detailed Statistics Canada profile of hospital users that controlled for a variety of other factors found that men aged 15-39 with inadequate income were 46% more likely to be hospitalized than men with adequate income. Poor women were 62% more likely to be hospitalized than non-poor women. For men and women aged 40-64, the percentages increased to 57% and 92% respectively.[210] As hospitals are the single largest health care expenditure, strategic investments that alleviate poverty are likely to be highly cost effective in the long run.

Poverty and unemployment are also associated with adverse lifestyle factors, including higher tobacco use, higher rates of obesity, poorer nutrition, and less physical exercise. Those in the lowest income bracket are two and a half times more likely to smoke than those in the highest income bracket. Wealthier individuals have a lower incidence of high blood pressure and high blood cholesterol, and they live longer. A study in Alameda County, California, found that those living in poor neighbourhoods had a 50% higher rate of hypertension than those living in affluent neighbourhoods, after controlling for age, race, risk factors, access to medical care, social interaction, and range of other variables.[211] In all these cases, there is a clear gradient by social class.[212]

Not surprisingly, these statistics translate into higher rates of illness in general, and of cardiovascular diseases in particular, since these are highly correlated with the behavioural risk factors described above. A recent study by a York University professor found poor Canadians at

[208] Health Canada, *Toward a Healthy Future: Second Report on the Health of Canadians,* September, 1999, Ottawa, page 31; for a summary of similar data in the U.S., see Blumenthal, Susan (US Assistant Surgeon-General), and Jessica Kagen (US Department of Health and Human Services), "The Effects of Socioeconomic Status on Health in Rural and Urban America," *MS JAMA (Journal of the American Medical Association),* 287, page 109, January 2, 2002.
[209] Ibid., pages 15 and 43.
[210] S.J. Katz, T.P Hofer, W.G. Manning, "Hospital Utilization in Ontario and the United States: The Impact of Socioeconomic Status and Health Status," *Canadian Journal of Public Health,* 1996, volume 87, no. 4, pages 253-6; Kathryn Wilkins and Evelyn Park, "Characteristics of Hospital Users," Statistics Canada, *Health Reports,* Winter 1997, volume 9, no. 3, pages 34-35.
[211] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 304.
[212] Health Canada, *Toward a Healthy Future,* page 119, and Exhibit 5.7; Health Canada, *Statistical Report on the Health of Canadians,* Ottawa, September, 1999, page 267; Chernomas, op. cit., page 9.

higher risk of heart disease. It attributed 6,366 Canadian heart disease deaths a year to poverty, and nearly $4 billion a year in health care costs to poverty-related heart disease.[213] These findings confirm studies conducted in other countries. For example, a Norwegian study found that coronary heart disease risk was 2.5 times higher among those in the lowest income and education class than in the highest.[214]
Across North America, improvements in lifestyle behaviours (eating, drinking, smoking, and exercise patterns), and consequent declines in heart disease incidence and mortality, have occurred at a much lower rate among the less educated, less affluent, strata than among higher socio-economic groups.[215]

A growing body of evidence indicates that the *distribution* of income in a given society may actually be a more important determinant of population health than the total amount of income earned by society members.[216] Above a certain level of wealth, people live longer and have better health not in the wealthiest countries, but in countries like Japan and Sweden, where income inequality is the smallest.[217]

A literature review by a University of Waterloo professor found convincing "statistical evidence that inequalities in health have grown in parallel with inequalities in income" and concluded that "relative economic disadvantage has negative health implications."[218]

If growing inequality is bad for health, then the trends of the 1990s are cause for concern. In 1990, the richest 20% of Albertan households had 7.4 as much disposable income as the poorest 20%, the highest ratio in Canada at the time. By 1998, they had 10.4 times as much. In 1990, Newfoundland had the lowest ratio with the richest 20% having 5.8 times as much disposable

[213] Raphael, Dennis, *Inequality is Bad for our Hearts,* York University, 2001 : "Inequality is bad for our hearts: why low income and social exclusion are major causes of heart disease in Canada" can now be read and downloaded from http://depts.washington.edu/eqhlth/paperA15.html; and see "Having Healthy Heart is Often a Question of Income," *The Toronto Star,* 9 November, 2001, page F02.
[214] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 304.
[215] Stamler, Jeremiah and Rose, preface to Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown and Company, Boston, 1992, page xiv.
[216] Health Canada, *Toward a Healthy Future*, page 41; Mel Bartley, David Blane and Scott Montgomery, "Health and the Life Course: Why Safety Nets Matter," *British Medical Journal,* 314, 1997, pages 1194-96; George Kaplan, et al., "Inequality in Income and Mortality in the United States," *British Medical Journal,* 312, 1996, pages 999-1003; Helen Roberts, "Children, Inequalities and Health," *British Medical Journal,* 314, 1997, pages 1122-1125; Richard Wilkinson, "Health Inequalities: Relative or Absolute Material Standards?", *British Medical Journal* 314, 1997, pages 591-595; Douglas Black, Margaret Whitehead, et al., *Inequalities in Health,* Penguin, 1992; Douglas Carroll. George Davey Smith and Paul Bennett, "Some Observations on Health and Socio-economic Status, " *Journal of Health Psychology,* 1, 1996, pages 23-39; Margo Wilson and John Daly, "Life Expectancy, Economic Inequality, Homicide, and Reproductive Timing in Chicago Neighbourhoods," *British Medical Journal,* 314, 1997, pages 1271-74; Robert A. Hahn, "Poverty and Death in the United States - 1973 and 1991," *Epidemiology,* 6, 1995, pages 490-97; George Davey Smith, David Blane and Mel Bartley, "Explanations for Socioeconomic Differentials in Mortality," *European Journal of Public Health,* 4, 1994, pages 131-44; C. McCord and H. Freeman, "Excess Mortality in Harlem," *New England Journal of Medicine,* 322, 1990, pages 173-77.
[217] Chernomas, op. cit., page 10; Kickbusch, Ilona, "There is Something Else Out There: Health Policy and Determinants of Health," *American Journal of Health Promotion,* 3 (1), March-April, 2000.
[218] Ted Schrecker, "Money Matters: Incomes tell a story about environmental dangers and human health," *Alternatives Journal,* 25:3, Summer, 1999, page 16.

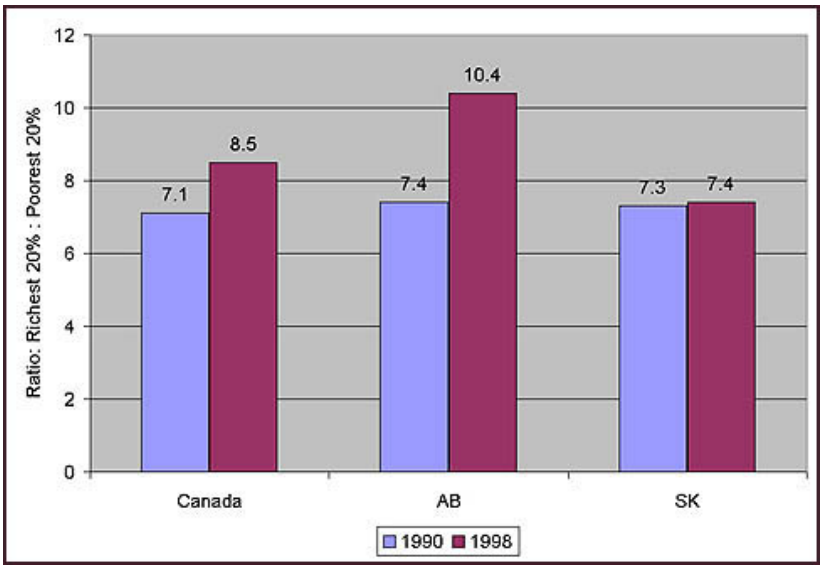
income as the poorest 20%; by 1998, the smallest disparity was in PEI, with a 6.7 income ratio[219] (Table 4 and Figure 26).

Table 4. Average Disposable Household Income Ratios, Canada, Provinces, 1980-1998.[220]

	Richest 20% : Poorest 20%			Richest 40% : Poorest 40%		
	1980	1990	1998	1980	1990	1998
Canada	8.2	7.1	8.5	3.9	3.8	4.2
Newfoundland	7.6	5.8	7.3	3.9	3.3	3.9
Prince Edward Island	7.4	6.2	6.7	3.9	3.4	3.7
Nova Scotia	7.1	6.2	8.5	3.6	3.5	4.2
New Brunswick	6.7	6.1	7.0	3.5	3.4	3.7
Quebec	7.6	6.9	7.9	3.9	3.8	4.0
Ontario	7.8	7.1	8.3	3.8	3.7	4.1
Manitoba	8.8	6.7	7.6	4.2	3.7	4.0
Saskatchewan	8.1	7.3	7.4	4.1	3.8	3.9
Alberta	9.1	7.4	10.4	4.3	3.8	4.5
British Columbia	9.3	7.6	8.0	4.1	3.9	4.1

Source: Statistics Canada, *Income in Canada* Cat No. 75-202, Table 7.2.

Figure 26. Average Disposable Household Income: Ratio of Top Quintile to Bottom Quintile, Canada, Provinces with Largest and Least Difference, 1990-1998.[221]



Source: Statistics Canada, *Income in Canada* Cat No. 75-202, Table 7.2.

[219] Calculated from average after tax income shares in *Income in Canada,* Statistics Canada Cat. No. 75-202, Table 7.2, p. 94, 99, 104, 109, 114, 119, 124, 129, 134, 139, 144.
[220] Calculated from average after tax income shares in *Income in Canada,* Statistics Canada Cat. No. 75-202, Table 7.2, p. 94, 99, 104, 109, 114, 119, 124, 129, 134, 139, 144.
[221] Calculated from average after tax income shares in *Income in Canada,* Statistics Canada Cat No. 75-202, Table 7.2, p. 109.

3.1 Poverty among Children and Single Mothers

Child poverty is related to a wide array of physical, psychological, emotional, and behavioural problems, including higher rates of respiratory illnesses and infections, sudden infant death syndrome, obesity, high blood lead levels, iron deficiency anaemia, chronic ear infections, mental retardation, fetal alcohol syndrome, and dental problems.[222] Low-income children are more likely to have low birth weights, poor health, less nutritious foods, higher rates of hyperactivity, delayed vocabulary development, and poorer employment prospects.[223]

Although they engage in fewer organized sports, poor children have higher injury rates, and twice the risk of death due to injury than children who are not poor.[224] A detailed analysis of both the National Longitudinal Survey on Children and Youth and the National Population Health Survey found that some 31 different indicators all showed that as family income falls, children are more likely to experience problems.[225]

Unfortunately, the relationship between low income and poor diet in Canada may be deepening. A 1997 survey conducted by the Ottawa-based National Institute of Nutrition concluded that: "A hectic lifestyle emerges as the main obstacle to healthy eating. Increasingly, limited income constitutes another barrier: 20% of households with incomes under $25,000 believe their household does not have enough money for a healthy diet, up from 14% in 1994."[226]

Evidence shows child poverty has health consequences, and while there has been a downward trend in child poverty since 1996, there is still cause for concern. For example, in 2000, the target date set by the House of Commons to eliminate child poverty, 16.5% of Canadian children still lived below Statistics Canada's low income cut off (LICO). This compares to 14.9% in 1989, the year the House of Commons passed its unanimous resolution. Of children living in poverty, nearly 50% are in single mother families.[227]

Once again, the good news is that the percentage of children in single mother families living below the LICO is lower now than in 1996, when it reached more than 60%. However, a child who lives with a single mother is still more than four times as likely to be poor as a child living with both parents.[228] Across the country, 20% of all families with children are headed by single mothers.[229]

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[222] "Stunning Statistics Reveal Toll of Poverty on Children," *Vancouver Sun,* 28 December, 1990; cited in Province of British Columbia (1996), page 5.
[223] Health Canada, *Toward a Healthy Future,* page 85, and chapter 3.
[224] Barbara Morrongiello, "Preventing Unintentional Injuries Among Children," *Determinants of Health: Children and Youth,* in *Canada's Health Action: Building on the Legacy, Volume 1*, National Forum on Health, 1998.
[225] David Ross, "Rethinking Child Poverty," *Insight, Perception,* 22:1, Canadian Council on Social Development, Ottawa, 1998, pages 9-11.
[226] National Institute of Nutrition, *Tracking Nutrition Trends 1989 - 1994 – 1997*, 10 November, 1997, available at: http://www.nin.ca/Media/Archives/newsnov10_97.html.
[227] Statistics Canada, *Persons in Low Income Before Tax*, available at: http://www.statcan.ca/english/Pgdb/famil41e.htm.
[228] Ibid.
[229] Statistics Canada, *Census Families in Private Households by Family Structure and Presence of Children*, available at: http://www.statcan.ca/english/Pgdb/famil54a.htm.

The high poverty rates of single mothers translate into health costs for these women and their children. A Statistics Canada analysis of both the 1994/95 and 1996/97 National Population Health Surveys found that "lone mothers reported consistently worse health status than did mothers in two-parent families," and that longer-term single mothers had particularly bad health. Single mothers scored lower on two scales of "self-perceived health" and "happiness," and substantially higher on a "distress" scale. They had higher rates of chronic illness, disability days and activity restrictions than married mothers, and were three times as likely to consult a health care practitioner for mental and emotional health reasons.[230]

3.2 Health Care Costs of Poverty

The poorer health status of low income Canadians translates into increased use of health services and higher health care costs. For example, in a study conducted in Nova Scotia, a clear and substantial inverse association has been shown between socio-economic status (measured by education and income) and use of physician services. In fact, there is a clear gradient in both measures: the lower the status, the more services used. Those with no high school diploma use 49% more physician services than do those with a B.A., and those with a high school diploma use 12% more. Lower income groups use 43% more services than upper income groups, and lower-middle income groups use 33% more.[231]

Using the hospital and physician claims of 48,000 Manitobans, a study conducted for the Manitoba Centre for Health Policy was able to combine the effects of both education and income so that it could measure the effects of both at once. With respect to ambulatory physician care, the study found that, while the lowest income population always cost more per capita regardless of education level (broken down into quartiles from lowest to highest), the lowest income population within the third quartile (Q3) education level actually cost the most. As for short-term hospital stays (less than 60 days), the same pattern occurred—with the lowest-income population making most use of short term hospital stays in terms of actual days and those with the lowest income and within the third quartile in education spending the most days.[232]

Since socio-economic status is modifiable, the excess use of health care services by low income groups is as avoidable as that incurred through unhealthy lifestyles. Improving the status of lower socio-economic groups and closing the income gap between rich and poor can therefore lead to improved health outcomes and substantial cost savings to the health care system.

Kephart and his colleagues at Dalhousie University calculated that excess use of physician services associated with educational inequality in Nova Scotia amounts to 17.4% of total

[230] Claudio Perez and Marie Beaudet, "The Health of Lone Mothers," Statistics Canada, *Health Reports,* volume 11, no. 2, Autumn 1999, catalogue no. 82-003-XPB, pages 21-32.
[231] Kephart, George, Vince Salazar Thomas, and David MacLean, "Socioeconomic Differences in the Use of Physician Services in Nova Scotia," *American Journal of Public Health,* 88 (5): 800-803, May, 1998.
[232] Mustard, Cam, Derksen, Shelley, Berthelot, Jean-Marie, Wolfson, Michael, Roos, Leslie L, and Carierre, KC, *Socioeconomic Gradients in Mortality and the Use of Health Care Services at Different Stages in the Life Course*, Manitoba Centre for Health Policy, December 1995. Summary available at: www.umanitoba.ca/centres/mchp/reports.

expenditures, or $42.2 million per year out of a total of $242.4 million.[233] Extrapolating from these percentages and using Canadian physician cost numbers, the cost of excess physician use would be over $2 billion out of a total physician care cost of $12.8 billion (C$2002).[234] Excess use of physician services associated with income inequality is estimated at 11.3%, or $27.5 million annually for Nova Scotia.[235] Based again on this percentage and the total physician care costs in Canada, that translates into $1.4 billion annually. These are the amounts that would be saved in avoided physician services if all Canadians were as healthy as those with university degrees and higher incomes.

Yet these savings represent just a fraction of the total savings that would accrue to the health care system from improving the socio-economic and health status of low income, poorly educated Canadians. Physician costs amount to just 14% of total direct health care expenditures.[236] Although separate estimates on excess hospitalization have not been calculated, the Ontario and Canadian data noted above indicate that excess use of hospital services due to income inequality is likely even greater than excess use of physician services. If all health care expenditures are considered, it is clear that very substantial savings would accrue by narrowing the current socio-economic gap and by reducing income and educational inequality in the country. In health care, as in justice, poverty and poor education are clearly costly.

3.3 Costs of Homelessness

Even among the poor, whose health is generally worse than the norm, the homeless face particular health problems and challenges. A study published in *The New England Journal of Medicine (NEJM)* found significantly higher rates of trauma and lung problems among the homeless, along with extremely high rates of mental illness, substance abuse, skin disorders, and parasites. The last two ailments result from lack of a clean, dry place to sleep and wash.[237] Following illness or emergency room treatment, there is little opportunity for recovery, use of medications, and follow-up treatment.

The *NEJM* study found that the homeless stay in hospital an average of 4.1 days longer than low-income patients with homes, and cost nearly $4,000 more per hospital stay. Those treated for psychiatric problems cost $6,200 more per stay than other low-income patients because doctors are less likely to release a homeless person onto the streets in the absence of family or neighbourly support systems that can speed recovery.[238]

In short, homelessness is costly to society. In New York, the cost of a single hospital admission for a homeless person was found to be as much as a year's welfare rental allowance. And a

[233] According to EBIC 1998, total physician costs for NS were $319 million. Therefore the excess use of physician services associated with educational inequality in Nova Scotia in 1998, based on the EBIC 1998 figures would be $55.5 million. Kephart and his colleagues based their estimates on actual physician use data in the administrative databases housed at the Population Health Research Unit at Dalhousie University.
[234] Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.
[235] Kephart et al. page 802.
[236] Health Canada, *Economic Burden of Illness in Canada 1998,* 2002.
[237] Cited in Perreten, Dan, "Healing the Homeless," *Poverty and Health* 10, Chicago, July-August, 1999.
[238] Idem. (2002 $Can 3,972 = 1999 $US 2,500; 2002 $Can = 6,200 1999 $US 4,000).

Minnesota study found that provision of housing and social services to 180 homeless people saved the state $9,600 for each person in avoided hospital and corrections costs.[239]

3.4 Costs of Social Exclusion and Vulnerability

The evidence clearly indicates that lower socio-economic groups suffer from a cluster of disadvantages that reinforce each other and prevent full participation in the larger society. The concept of exclusion goes beyond conventional measures of poverty and low income, and incorporates lack of education, poor health and nutrition, lack of decent housing, higher rates and longer duration of unemployment, political powerlessness, and more frequent contact with the law. It also includes psychological dimensions such as vulnerability, fear, voicelessness, and a pervasive sense that one is not a valued and respected member of the community. Certain groups are particularly vulnerable to exclusion. These include single mothers and their children, youth, aboriginal people, racial and cultural minorities, the disabled, the unemployed, and the homeless.[240]

The various dimensions of social exclusion are closely related to adverse health outcomes. Aboriginal people have far higher rates of chronic disease than other Canadians; unemployment is linked to stress and poor health; single mothers and youth suffer higher rates of mental distress and depression; and poor education is linked to a range of risk behaviours, including smoking, obesity, poor nutrition, and lack of physical activity. For example, those with less than a high school education are 64% more likely to be overweight than those with a university degree.[241]

A recent study at York University found three groups of Canadians at particularly high risk for poverty and increased heart disease – women (particularly the elderly and single parents), new immigrants, and members of visible minorities. Visible minorities "experience a persistent income gap, above average levels of living on low income, higher levels of unemployment and underemployment, and under-representation in higher paid jobs."[242]

Twice as many elderly Canadian women (one in four) live below the low-income cut-off (LICO) line as elderly men, as do 45% of unattached elderly women, and 56% of families headed by single mothers. For Canadian single mothers, the average "depth of poverty" (income deficiency between family income and the LICO) is more than $10,000 annually.[243]

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[239] Idem.
[240] "Social Inclusion," *Health Promotion Atlantic,* 7 (1), Spring, 2001, pages 10-12.
[241] Health Canada, *Statistical Report on the Health of Canadians,* page 267.
[242] Raphael, Dennis, *Inequality is Bad for our Hearts,* York University, 2001: "Inequality is bad for our hearts: why low income and social exclusion are major causes of heart disease in Canada" can now be read and downloaded from http://depts.washington.edu/eqhlth/paperA15.html; and see "Having Healthy Heart is Often a Question of Income," *The Toronto Star,* 9 November, 2001, page F02.
[243] Raphael, op. cit., Statistics Canada, *Low Income Persons;* Health Canada, *Statistical Report on the Health of Canadians,* pages 38 and 41; Health Canada, *Toward a Healthy Future,* exhibit 2.3, page 45; and "The Gender Gap," appendix in Dodds, Colin, and Ronald Colman, *Income Distribution in Nova Scotia,* GPI Atlantic, Halifax, July, 2001, pages 40-41.

For these and other groups, clusters of variables contribute to social exclusion and powerlessness, with low income just the most material and measurable manifestation of a wider range of disadvantages. For example, a detailed Statistics Canada study on the gender wage gap found that women earn substantially less than men even when they have identical work experience, education, and job tenure, and when they perform the same job duties in the same occupations and industries for the same weekly hours. The study found that about 50% of the gender wage gap could not be explained by any of 14 different factors, and could therefore be seen as "gender based labour market discrimination."[244] In short, there is an element of gender-based "social exclusion" that underlies and goes beyond income issues.

The concept of "vulnerability" is even broader than that of social exclusion. One analysis includes the following examples of vulnerability: low income; food insecurity; lack of family, friends, and social support systems; illiteracy and poor education; inadequate or insecure housing; migrant status and language difficulties; working or living in dangerous, isolated, or stressful places; being born with a chronic disease or disability; lack of health knowledge; inability to cope with problems; difficult childhood or birth; lack of access to health services. Many of these vulnerabilities are experienced as a lack of control over one's life.[245]

Most aspects of vulnerability and social exclusion are modifiable, or can at least be attenuated through social policy. According to the analysis cited above:

> *"Preventing and reducing vulnerability is as important as dealing with the effects of vulnerability…. Dealing with the causes of vulnerability is less costly than dealing with the serious effects of vulnerability. Reduced vulnerability has long-term economic and social gains."*[246]

In sum, there is a tendency in an analysis such as this to assess the cost and cost-effectiveness of different health afflictions and preventive interventions as if they stood alone. The concept of exclusion warns against this.

[244] Drolet, Marie, *The Persistent Gap: New Evidence on the Canadian Wage Gap*, Income Statistics Division, Statistics Canada, December, 1999, catalogue no. 75F0002MIE-99008, page 13, and table 3.
[245] Alberta Association of Registered Nurses, *Position Paper on Vulnerability,* Edmonton, September, 1998, page 1, available by contacting aarn@nurses.ab.ca.
[246] Ibid., page 2.

4. Cost Effectiveness of Socioeconomic Interventions

Unfortunately, conventional behavioural interventions aimed at healthier lifestyles have proved remarkably ineffective in alleviating the deeper influences of poverty and social disadvantage. Even more broadly, analysts have noted that "health promotion strategies focused purely at individual health behaviours are yielding limited success."[247]

Evidence indicates that those who are marginalized do not attend smoking cessation and nutrition classes, do aerobics, join gymnasiums, or shop for healthy foods. A comprehensive $1.5 million 5-year cardiovascular disease prevention and lifestyle intervention program in St. Henri, a Montreal neighbourhood where 45% of families live below the poverty line, attracted only 2% participation. The only significant result, compared to a control group, was that more people had their blood cholesterol levels measured.[248] The researchers concluded:

> *"…unless or until basic living needs are ensured, persons living in low-income circumstances will be unlikely or unable to view CVD [cardio-vascular disease] prevention as a priority."*[249]

Because lifestyle interventions have been most successful in changing the behaviour of those with higher levels of education and income, and least effective for disadvantaged populations who have fewer options and less control over their lives, they have had the unintended effect of deepening health inequalities between socio-economic levels.[250]

More effective interventions to alleviate the negative impacts of poverty on health range from social programs directed towards low-income individuals to wider-ranging social reforms.

Supplemental feeding assistance for children from low-income households that are unable to provide adequate nutritious food can improve health and social outcomes. School lunch and breakfast programs have been shown to produce hunger relief, improved nutritional status, enhanced cognitive functioning, improved behaviour, and increased social support for children with inadequate dietary intake at home.[251]

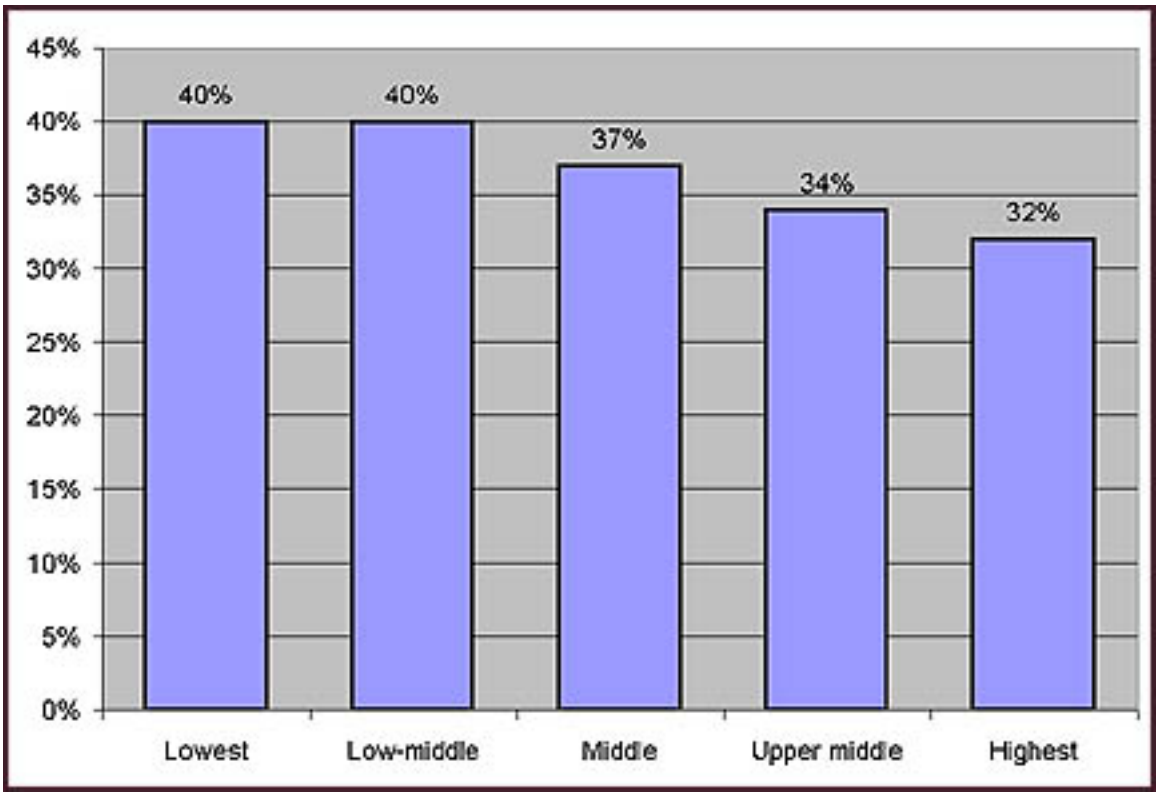
Low income Canadians are more likely to be overweight and to have poorer diets than those with higher incomes, which may be due, in part, to cheaper pricing of poor-nutrient fast foods compared to higher quality healthy foods. For example, 40% of low-income Canadians believe

[247] Lyons and Langille, op. cit., page 7.
[248] Raphael, Dennis, *Inequality is Bad for our Hearts,* York University, 2001. "Inequality is bad for our hearts: why low income and social exclusion are major causes of heart disease in Canada" can now be read and downloaded from http://depts.washington.edu/eqhlth/paperA15.html; and see "Having Healthy Heart is Often a Question of Income," *The Toronto Star,* 9 November, 2001, page F02.
[249] Cited in Lyons and Langille, op. cit., page 22.
[250] Ibid., pages 23-25.
[251] McIntyre et al., "School-Based Feeding Programs: A Summary of the Literature," *A Special Report of the Canadian School Boards Association,* July, 1992, cited in Province of British Columbia (1996) op. cit., page 6,

that low-fat products are expensive, and 27% believe that grain products are expensive, compared to 32% and 8% respectively of those with high incomes (Figure 27).[252]

However, the disparity here may be related to education, strategy, and policy as much as to income. One study found that simple substitution of healthy alternatives for equivalent foods in the "average" diet, increased food costs by 11-14%, which can help explain why low-income earners have poorer diets. However, *restructuring* the diet to include more cereals, whole grains, fruits, and vegetables (rather than simply *substituting* healthier equivalents such as leaner meat), reduced food costs per megajoule of energy. The researchers concluded that healthful eating is not necessarily more expensive and that restructuring the diet is more cost effective than substitution.[253]

Figure 27. Percentage of Canadians Who Believe Low-Fat Foods Are Expensive, by Income Quintile, 1994-1995 (%)



Source: Statistics Canada, *National Population Health Survey*, 1994-95.

[252] Health Canada, *Statistical Report on the Health of Canadians,* Ottawa, September, 1999, page 267.
[253] McAllister, Marian et al., "Financial Costs of Healthful Eating: A Comparison of Three Different Approaches," *Journal of Nutritional Education* 25 (3): 131-139, May-June, 1994, cited in Province of British Columbia (1996), op. cit., page 12.

5. Social Networks and Social Supports

Social networks and social supports have substantial benefits for health, including strengthening immunity, increasing compliance with behaviours that promote health, and enhancing adaptation and recovery from disease. Lack of adequate social supports may be as great a risk to health as poor diet, lack of physical activity, or smoking.[254]

According to Health Canada:

> *"Families and friends provide needed emotional support in times of stress, and help provide the basic prerequisites of health such as food, housing and clothing. The caring and respect that occur in social networks, as well as the resulting sense of well-being, seem to act as a buffer against social problems. Indeed, some experts in the field believe that the health effect of social relationships may be as important as established risk factors such as smoking and high blood pressure.*[255]

It has been argued that social support and social cohesion are stronger influences on cardiovascular disease than individual medical care.[256] Social relations, and support from family, friends, and communities have been shown to contribute to health; to reduce the incidence of premature death, depression, mental illness, and chronic disability; to reduce adverse responses to stress; and to improve medical outcomes in high-risk populations.[257]In fact, less than half of coronary heart disease incidence in the United States has been explained by the combined effect of all traditional risk factors. Although more difficult to isolate and quantify, stressors like poverty, high emotional arousal, and disruption of social ties have been identified as key factors affecting heart disease risk and premature mortality. According to one analyst:

> *"Psychosocial factors influence not only the risk of CHD but of overall morbidity and mortality across a wide range of disorders."*[258]

In attempting to explain why white American males are five times as likely to die of coronary heart disease as Japanese men, comparative studies have pointed to greater social support and cohesion as a likely explanatory factor:

> *"The evidence from the Japanese acculturation studies certainly suggests that strong social ties and meaningful social interconnectedness/cohesiveness might be a source of significant protective benefits … and thus be an important factor in the prevention of CHD."*[259]

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[254] "The Role of Nutrition in Health Promotion and Disease Prevention Programs – Position of ADA," *Journal of the American Dietetic Association,* 98: 205-208, 1998; Karch, Bob, "Social Factors in Health Promotion," *American Journal of Health Promotion,* 3 (1), March-April, 2000.
[255] Health Canada, *Toward a Healthy Future,* page 60.
[256] Lyons and Langille, op. cit., page 17.
[257] Ibid., page 18; and Health Canada. *Statistical Report,* page 131.
[258] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 317.
[259] Ibid, pages 301-302.

A study in Alameda County, California, constructed a social network index combining four types of social connections (marriage, extended families, church membership, and other group affiliations). Those who scored low on the index were twice as likely to die of heart disease and of all-cause mortality in the succeeding nine years as those who scored high, after controlling for age, race, socio-economic status, self-reported health status, and a range of risk factors. Many other studies have produced similar findings that indicate the protective role of social supports and social cohesion.[260]

According to one analysis:

> *"Social support provides…an emotional and practical resource for coping and for enhancing quality of life. Belonging to a social group makes people feel cared for, loved, and valued. It provides social status and a sense of control, two elements that have powerful protective effects on health."*[261]

5.1 Family and Shared Households

Family and household members can not only provide vital requisites of good health but also be a central pillar of support in times of illness. Divorce rates are one indicator of family instability and breakdown. Newfoundland has the highest marriage rate and the lowest divorce rate in the country, with Prince Edward Island and New Brunswick also registering divorce rates well below the national average.[262] Newfoundland's strong family and social networks may help explain why that province registers the highest levels of self-reported and functional health status and psychological well-being in the country, and the lowest rates of new cancer cases, asthma, allergies, stress, and suicide, despite higher unemployment and lower income than the rest of Canada.[263]

A double caveat must be added here: In some cases family is not a safe place. Family violence can have a devastating effect on the health and well-being of women and children in both the short and long term, and divorce can be a healthy alternative to spousal abuse.[264] There are also alternative shared household models that provide strong social support, aside from the traditional family.

The National Population Health Survey tested social support levels by questions such as whether respondents had someone to confide in, count on in a crisis, count on for advice, and make them feel loved and cared for. Among household types, single parents had the lowest levels of social support in answer to these questions. Among the provinces, Alberta, Saskatchewan and

[260] Ibid., page 303.
[261] Lyons and Langille, op. cit., page 18.
[262] Health Canada, *Statistical Report,* page 21.
[263] Statistics Canada, *Health Statistics 1999,* Tables 00060139.IVT, and 00060150.IVT; Health Canada, *Statistical Report,* pages 51, 219, 225, 231, 270, 287, and 315.
[264] Health Canada, *Toward a Healthy Future,* pages 60-61.

Newfoundland have the lowest proportions of single-parent families, and thus fewer individuals in this low-support group, while Nova Scotia and Quebec have the highest percentage.[265]

Family structure and function today is changing in significant ways, due both to an aging population and to the de-institutionalization of the health care system. The sick, elderly and disabled are depending more than ever on informal family caregivers, mostly women. This massive social change can save governments money, enhance healing and social support for those in need, and strengthen families. But it can also lead to serious stresses on overburdened caregivers, if sufficient respite and other supports are not provided.[266]

Early research on this emerging trend indicates that informal caregivers are becoming increasingly time stressed, suffer significant job disruptions to care for family members in need, often face difficult financial circumstances, and require better access to information in order to provide care effectively. Most disturbingly, a significant proportion of caregivers are suffering adverse health consequences as a direct result of the increased burden of caregiving.

One analyst warned that "women's 'double day' of paid work and unpaid domestic labour" has led to an emerging "crisis of care-giving, a direct result of the 'time crunch' that now characterizes the female life course."[267]

The tremendous growth in informal family caregiving holds great promise. But if it is not accompanied by some transfer of resources, support, information, respite, and assistance, the potential benefits may turn into liabilities, and the caregivers themselves may not only be unable to provide the needed care to their aging spouses and parents but be in need of it themselves.[268]

5.2 Social Health

The Advisory Committee on Population Health points out that:

> *The importance of social support also extends to the broader community. Civic vitality refers to the strength of social networks within a community, region, province or country. It is reflected in the institutions, organizations and informal giving practices that people create to share resources and build attachments with others.*

Evidence is strong that these types of networks are still more vibrant in Atlantic Canada than in other parts of the country, as evidenced by the high rate of voluntary work in the region (see

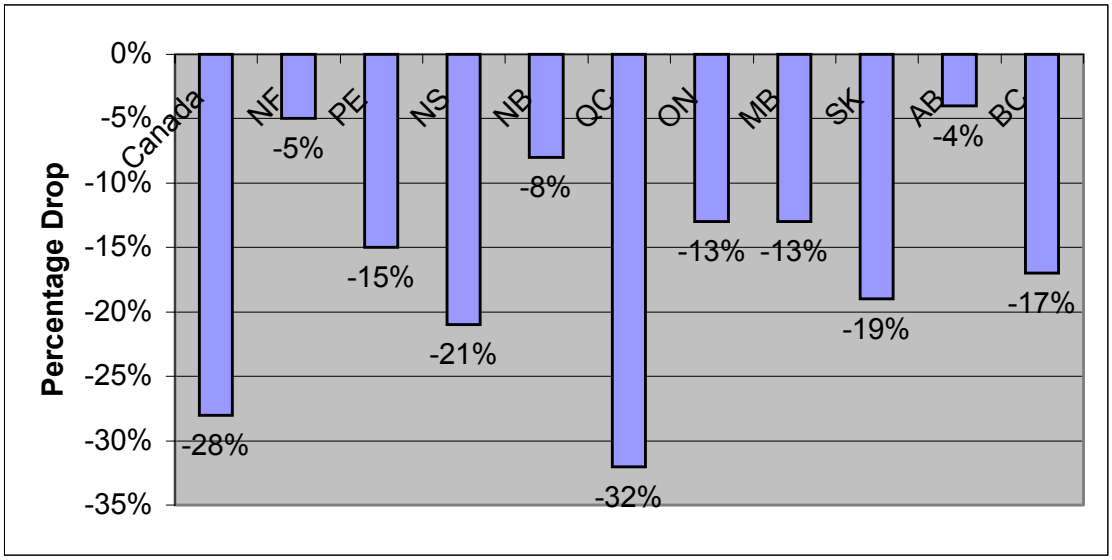
[265] Ibid., page 60; and Health Canada, *Statistical Report,* page 22.
[266] Joan Campbell, Gail Bruhm, Susan Lilley, *Caregivers' Support Needs: Insights from the Experiences of Women Providing Care in Rural Nova Scotia,* November 1998; Colleen Flood, *Unpacking the Shift to Home Care,* March 1999, both papers prepared for the Atlantic Centre of Excellence for Women's Health, Halifax.
[267] John Myles, "Women, the Welfare State and Care-Giving," *Canadian Journal on Aging,* volume 10, no. 2, 1991, cited in Judith Frederick, *As Time Goes By…Time Use of Canadians,* Statistics Canada, catalogue no. 89-544E, page 7.
[268] For further information on the needs of caregivers, see the Atlantic Centre of Excellence for Women's Health *Gender and Heatlh Policy Discussion Series*, Halifax, Paper no. 1, March 1998.

below).[269] The social inclusion project of the Atlantic Centre of Excellence for Women's Health has specifically identified support groups in the four Atlantic provinces that are playing a major role in strengthening these community networks.[270]

However, the evidence is equally strong that these support networks cannot be taken for granted and may well be in decline—no matter which part of the country is being discussed. One indicator is the "Index of Social Health" developed by Human Resources Development Canada (HRDC) in conjunction with Statistics Canada. The 15 components of the index include trends in rates of poverty, child abuse, infant mortality, teen suicides, drug abuse, high school dropouts, crime, alcohol-related fatalities, access to affordable housing, and other factors.

HRDC found that, except for a brief recovery in the late 1980s, Canada has experienced a decline in its social health indicators since the early 1980s. In fact, the index has declined to about the same level as 1975 and Canada has experienced a decline of 28% from its peak rating.

Figure 28. Percentage Drop in Social Health Indicators, Canada, Provinces, 1970 to 1995 (%)



Source: Health Canada, *Statistical Report on the Health of Canadians*, pages 58-60.

Among the provinces, Quebec has experienced the steepest decline from its peak (32%), followed by Nova Scotia (21%) and Saskatchewan (19%). At 4% and 5% respectively, Alberta

[269] Colman, Ronald, *The Economic Value of Civic and Voluntary Work in Nova Scotia,* GPI Atlantic, Halifax, 1998, with updates in 1999 and 2000.
[270] Susan Williams, *Social Inclusion: On the Path to Social Development,* A Foundation Paper prepared by a Working Group of the Government of Newfoundland and Labrador Strategic Social Plan for Health Canada and the Atlantic Centre of Excellence for Women's Health; "Social Investment: It's Time to Invest in New Brunswick's Children, Families and Communities, *Gender and Health Policy Discussion Series,* Paper No. 4, MCEWH, November, 1999; *Health is Everybody's Business: Collaboration and Social Inclusion in Nova Scotia and P.E.I.,* unpublished paper prepared for the Atlantic Centre of Excellence for Women's Health, Halifax, January 2000.

and Newfoundland registered the lowest declines (Figure 28). Children seem to be bearing the brunt of this decline, with 1995 rates 52% lower than their peaks in 1980. This is followed by the elderly at a 38% decline.[271]

There has thus been a disjunction between Canada's economic performance as measured by its GDP and its social health. This decline is reflected in the different rankings Canada received in 1998 in two United Nations indices: Canada ranked first in the Human Development Index, but only 10th out of 17 developed countries on the new Human Poverty Index.[272] This nationwide decline in social health documented by HRDC may indicate an erosion of important social networks that can eventually undermine health.

5.3 Volunteers

Many volunteers work specifically in health, caregiving and social service networks, volunteering in hospitals, palliative care and hospice units, nursing homes and mental health associations.

Other volunteers contribute to population health in the broader sense by coaching neighbourhood sports teams, working for groups like the Children's Aid Society, Big Brothers and Sisters, and Easter Seals, counselling victims, helping out in schools, literacy programs and youth groups, protecting the environment, organizing church camps, fighting fires, helping in search and rescue operations, and promoting occupational health and work safety.[273]

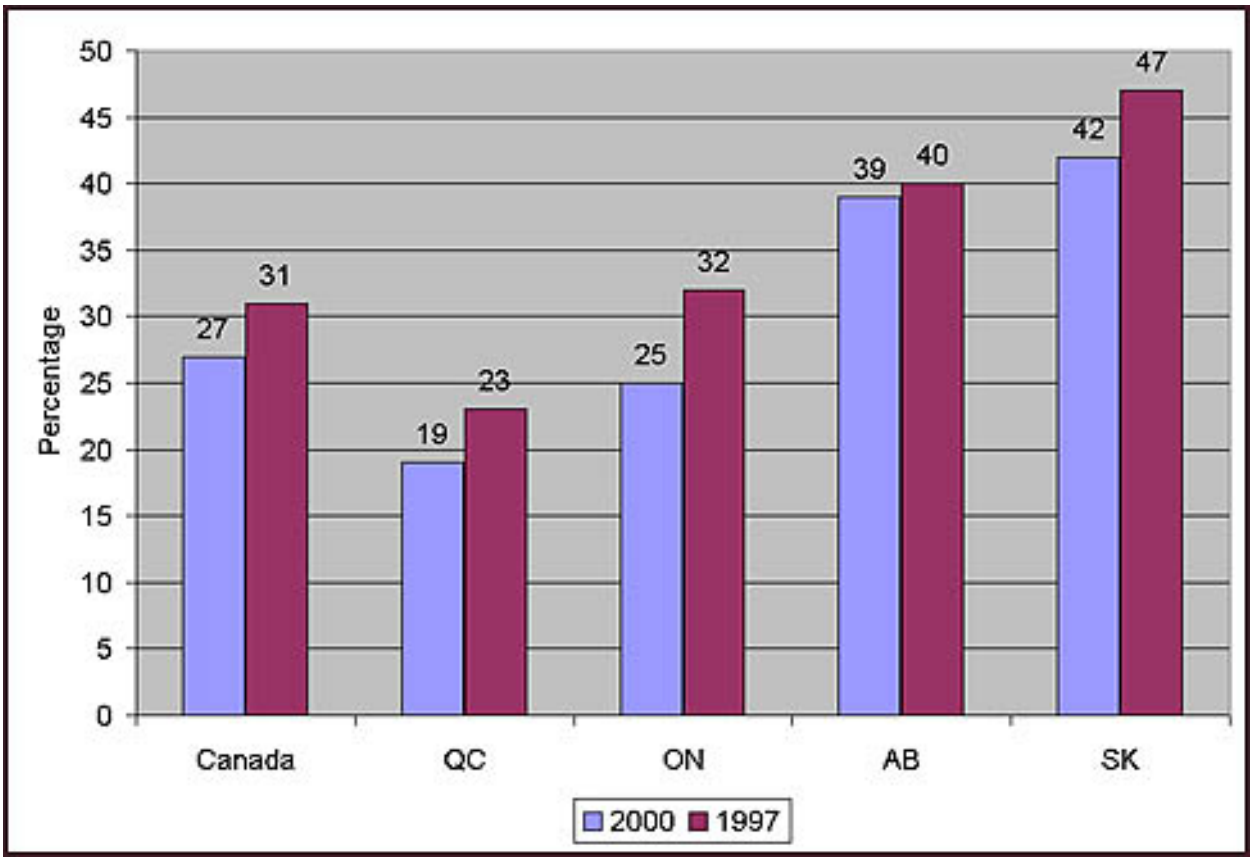
It is estimated that if formal volunteer services, offered through organizations, were replaced for pay, they would contribute about $14.5 billion a year of services to the Canadian economy in 2000. When volunteers' out-of-pocket expenses are added, the voluntary sector contributes services equivalent to 1.5% of the total value of the Gross Domestic Product in the country.[274] This estimate does not count the contribution of "informal" volunteers, who provide services directly to individuals, not through any organization.

In all, 6.5 million Canadians reported having done some volunteer work in 2000, putting in more than one billion hours per year, the equivalent of 549,000 full-time jobs.[275] While Saskatchewan and Alberta show higher rates of participation, Atlantic Canadians offer by far the highest annual hours of volunteering in the country, with residents of all four provinces contributing far more

[271] Health Canada, *Statistical Report,* pages 58-60.
[272] Ibid.
[273] Statistics Canada, *Caring Canadians, Involved Canadians,* catalogue no. 71-542-XPE, 1998; Colman, Ronald, *The Economic Value of Civic and Voluntary Work in Nova Scotia,* GPI Atlantic, Halifax, 1998 with updates in 1999 and 2000, pages 10-11.
[274] Statistics Canada, "Highlights from the 2000 National Survey of Giving, Volunteering and Participating," *Caring Canadians, Involved Canadians*. Economic valuations use Statistics Canada's calculations of equivalent market values for the different types of voluntary work, as given in Statistics Canada, *Households' Unpaid Work: Measurement and Valuation,* Studies in National Accounting, catalogue no. 13-603E, #3, December, 1995.
[275] Statistics Canada, "Highlights from the 2000 National Survey of Giving, Volunteering and Participating", *Caring Canadians, Involved Canadians*, page 32.

voluntary hours per capita than other Canadians, and with Newfoundland leading the way (Figures 29 and 30).

Figure 29. Volunteer Participation Rate Comparison, Canada, Selected Provinces, 2000/1997 (%)



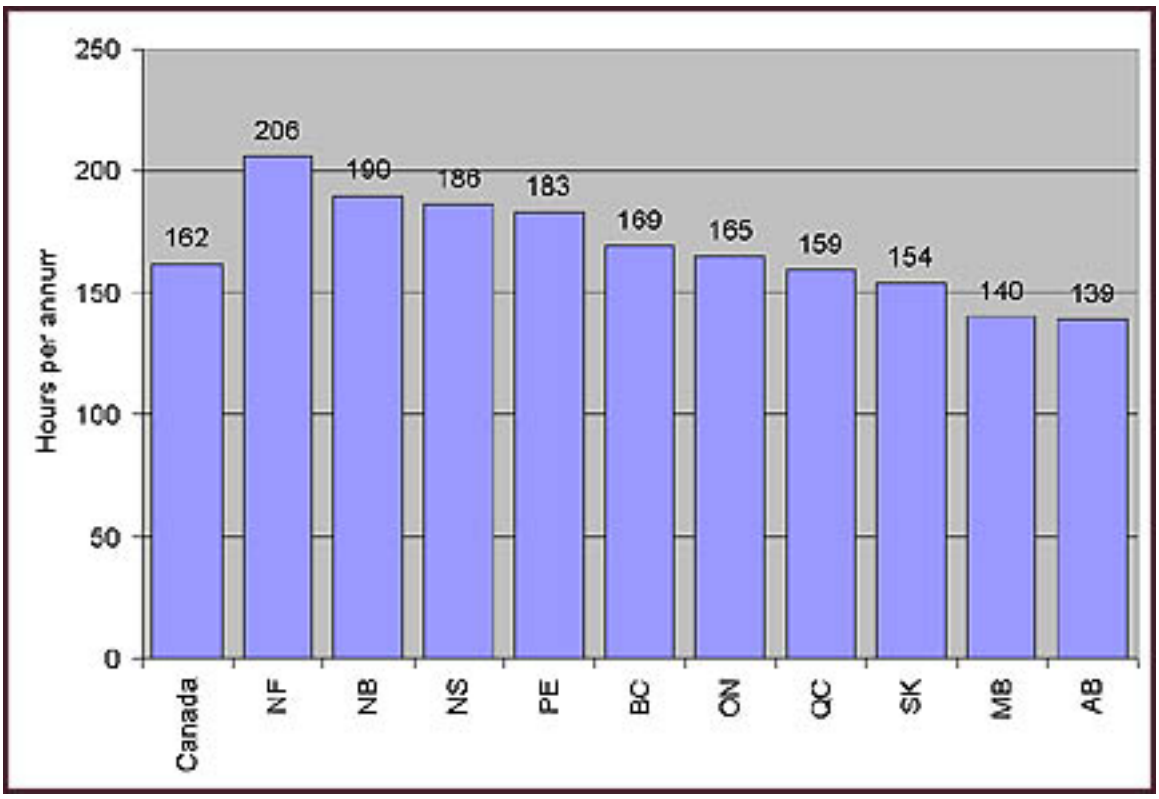
Source: Statistics Canada, *Caring Canadians, Involved Canadians*, National Survey on Giving, Volunteering and Participating 2000.

It should be noted that, while the annual hours in Figure 30 indicate the number that each volunteer gives over the year, not all volunteers contribute equal amounts of time. In fact, 25% of the volunteers (representing 7% of all Canadians) contributed 73% of all volunteer hours in 2000.[276]

The enormous contribution that those in the Atlantic provinces and across the country are making to population health through their voluntary activities cannot be taken for granted, as funding cuts and inadequate resources put increasing strains on volunteer and non-profit social and community service groups.

[276] Ibid.

Figure 30. Annual Volunteer Hours per Volunteer, Canada, Provinces, 2000



Source: Statistics Canada, *Caring Canadians, Involved Canadians*, National Survey on Giving, Volunteering and Participating 2000.

In fact, comparisons between the results of the 2000 National Survey on Giving, Volunteering and Participating and the survey from 1997 showed an overall decline of those who volunteered from 31% to 27%. However, the average number of hours annually contributed per volunteer went up from 149 to 162. There was also a general decline in voluntary participation rates in all the provinces other than Prince Edward Island.

The shift from formal to informal volunteer work appears related to changes in the health care system, and reductions in hospital services and government social service expenditures, which have necessitated an increase in informal caregiving. In many cases non-profit organizations report increasing difficulties in recruiting volunteers for leadership positions that demand substantial time commitments, and in meeting increased demands with fewer staff and financial resources. Volunteer burnout is widely reported.[277]

The troubling trend appears to be related to labour market developments. Restructuring and downsizing of firms and government agencies has led to longer hours and higher rates of unpaid

[277] Captain William Spry Community Centre, *Under Siege: A Study of Non-Profit, Community-Based Agencies in an Era of Cuts,* Halifax, Nova Scotia, January 1998, and *More Crises, Less Resources: The Impact of Cuts to Community Agencies,* Halifax, December, 1996, reporting on the six-year period 1990-1996.

overtime for highly skilled and educated staff retained and required to maintain and exceed previous production levels with fewer staff. The highly educated, who are putting in longer paid work hours, also have a far higher rate of volunteering than groups with less education, leading to a serious time squeeze on the voluntary sector.[278]

As well, declining real wages in the 1990s may be leading many families to work longer hours to make ends meet. In addition, Statistics Canada has identified working mothers as the most time stressed demographic group, contributing an average of 75 hours per week in paid and unpaid work, as they juggle job and family responsibilities.[279] It is significant that earlier volunteer surveys found married women to have the highest rate of volunteer participation of any household type.[280] In short, time pressures are seriously threatening and leading to a documented decline in the web of voluntary social networks. This trend may have serious implications for population health.

[278] Overtime participation rates by educational qualification: Statistics Canada, *Perspectives on Labour and Income,* catalogue no. 75-001-XPE, Winter 1997; formal volunteer participation rates by educational level: Doreen Duchesne, *Giving Freely: Volunteers in Canada,* Statistics Canada, catalogue no. 71-535 #4, August 1989; Janis Wood Catano, *Volunteers in Nova Scotia: A Profile of Volunteers based on the 1987 National Survey on Volunteer Activity,* Profile No. 28, Voluntary Action Directorate, Multiculturalism and Citizenship Canada, Department of the Secretary of State, 1989; Maryanne Webber, *Volunteers in Sports and Recreation,* Labour and Household Surveys Division, Statistics Canada, presentation to the 16th annual conference and general meeting of the Recreation Association of Nova Scotia, November 16-19, 1989; Statistics Canada, *Caring Canadians, Involved Canadians,* catalogue no. 71-542-XPE, 1998; and Colman, op. cit., July 1998, pages 33-34.

[279] Statistics Canada, *Overview of the Time Use of Canadians 1998, General Social Survey* Cycle 12, Housing, Family and Social Statistics Division, special tabulation; and *The Daily,* November 9, 1998, catalogue no. 11-001E, pages 2-4; Shields, Margot, "Long Working Hours and Health," Statistics Canada, *Health Reports,* 11 (2): 33-48, Autumn, 1999; Heart and Stroke Foundation, *Annual Report Card on Canadians' Health,* Toronto, 2000.

[280] Webber, op. cit., page 12.

PART IV
COSTS OF MENTAL ILLNESS

6. Costs of Mental Illness

Data on the cost of mental illness in Canada are sparse. In *A Report on Mental Illness in Canada*, 2002, Health Canada offers two estimates of direct medical costs and indirect costs, such as sick days, disability, and premature death.[281] Both are acknowledged to be low because large numbers of Canadians with mental health problems are treated outside the medical system. The first estimate, in 1993, used administrative and survey data, including physician billing data, hospitalization data, and data on self reported activity restriction to estimate the cost of mental illnesses at $7.3 billion in 1993 dollars ($8.6 billion in C$2002).[282] Some costs, such as loss of productivity by those too ill to complete surveys, could not be captured through the available data.

A later study drew upon the same data as well as data from the 1996/97 National Population Health Survey questions regarding depression, distress and self-reported use of health services. This result, also described as an under-estimate by its authors, estimated the annual economic impact of mental health problems in Canada at $14.4 billion ($15.8 billion in C$2002).[283]

In 1999, 3.8% of all admissions to general hospitals (amounting to 1.5 million hospital days) were due to anxiety disorders, bipolar disorders, schizophrenia, major depression, personality disorders, eating disorders and suicidal behaviour.[284]

In 2000/2001 individuals with mental illnesses used 10,387,936 hospital days in Canada, a 15.2% increase over 1999/2000. The average length of stay was 53 days, compared to 45 days in the previous year. Canadian hospitals reported 196,861 separations (discharges from hospital) due to mental illness in 2000/2001, down from 199,308 the previous year.[285]

In health promotion efforts, mental illness and its associated costs receive far less attention than lifestyle factors. Yet mental illness accounts for some of the highest costs. Of seven modifiable risk factors examined in a major study of 46,000 U.S. employees, depression and stress accounted for higher medical costs than any other risk factors. Depressed workers had 70% higher medical costs and highly stressed workers had 46% higher costs than those who did not

[281] Health Canada, 2002, *A Report on Mental Illnessess in Canada*, Ottawa.
[282] Moore R, Mao Y, Zhang J, Clarke K., *Economic Burden of Illness in Canada*, 1993, Ottawa, Health Canada, 1997.
[283] Stephens T, Joubert N. "The economic burden of mental health problems in Canada," in *Chronic Diseases in Canada* 2001.
[284] Centre for Chronic Disease Prevention and Control, cited in *A Report on Mental Illnesses in Canada*, Health Canada, Ottawa, Oct. 2002, p. 19.
[285] Canadian Institute for Health Information, 2003. Data Announcement: Hospital Mental Health Statistics, 2000/2001, available at: http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=media_04feb2003_e.

suffer from depression and high stress.[286] In addition, mental health problems can lead to a range of causes of premature death, including violence, substance abuse, and suicide.[287]

Substantial research has found that stress negatively affects health, weakens the immune system, and increases susceptibility to a wide range of illnesses.[288] According to Richard Surwit of Duke University Medical Centre:

> *"Experiencing stress is associated with the release of hormones that lead to energy mobilization – known as the 'fight or flight' response. Key to this energy mobilization is the transport of glucose into the bloodstream, resulting in elevated glucose levels, which is a health threat for people with diabetes."*[289]

A study in Detroit, Michigan, found that those living in dangerous and high-stress neighbourhoods had higher hypertension levels than those living in low-stress neighbourhoods.[290]

In a wide-ranging review of the literature, the *American Journal of Health Promotion* found stress to be the most costly of all modifiable risk factors.[291]

In addition to depression and stress, certain emotional states and personality types have been identified as risk factors for hypertension, heart disease, and other chronic illnesses. In particular, hostility, aggression, cynicism, and isolation have been related to heart disease risk; suppressed anger has been linked to cancer and high blood pressure; and repressed emotionality has been found to predict both cancer and heart disease. Conversely, studies have found that confidence, optimism, self-efficacy, and a sense of coherence and control can buffer and moderate the effects of stress, and protect against illness. Reviewing the evidence, Jon Kabat-Zinn hypothesizes that:

> *"[P]articular patterns of emotional expression (or suppression) can contribute to the development of chronic disease…. Coping effectively with the full range of emotions we feel as human beings may be of great importance for our health…. [A] middle path in the self-regulation of emotional expression, at least regarding anger and hostility, may be the avenue of choice in terms of improving health."*[292]

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[286] Goetzel, Ron, David Anderson, R. William Whitmer, Ronald Ozminkowski, Rodney Dunn, Jeffrey Wasserman, and HERO Research Committee, "The Relationship Between Modifiable Health Risks and Health Care Expenditures: An Analysis of the Multi-Employer HERO Health Risk and Cost Database," *Journal of Occupational and Environmental Medicine* 40 (10): 843-854, October, 1998.

[287] Foege, William, Robert Amler, and Craig White, "Closing the Gap," *Journal of the American Medical Association* 1985; 254: 1355-1358, in Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness,* Oxford University Press, New York and Oxford, 1987, page 207.

[288] Chrousos, G.P, and P.W. Gold, 1992, "The concepts of stress and stress system disorders: Overview of physical and behavioral homeostasis," *Journal of the American Medical Association* 267: 1244-1252.

[289] Surwit, Richard, et al. "Stress Management Improves Long-Term Glycemic Control in Type 2 Diabetes," *Diabetes Care,* 2002, 25: 30-34, cited at: http://www.healthjourneys.com/hotresearch.asp.

[290] Kabat-Zinn, John, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 304.

[291] Goetzel, Ron (ed), "The Financial Impact of Health Promotion," *American Journal of Health Promotion* 15 (5), May/June 2001.

[292] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 308-312.

Just as mental distress is frequently the precursor of physical illness, a healthy state of mind is also recognized as the most important element in healing and restoring health after illness or injury. There is also strong evidence that mental health is important in coping successfully with stressors in general, and the stress of illness in particular, and for maintaining good physical health and healthy life practices.[293] The World Health Organization's definition of health as "a state of complete physical, mental, spiritual, and social well-being, and not merely the absence of disease," clearly recognizes the centrality of mental health.

Given the importance of mental well-being, it is perhaps surprising how little data are available on the subject, and how hidden the evidence remains compared to measures of physical health. Nevertheless, from the scattered evidence, some interesting trends are discernible, particularly from a gender perspective.[294]

In 1985, across the country, women registered *lower* levels of stress than men, by 6% nationwide. By 1991, female stress levels in Canada had increased markedly. In Nova Scotia, the jump in female stress levels was particularly dramatic, rising from 12% *below* the male level in 1985 to 29% *above* the male level in 1991, and with nearly a third more Nova Scotia women reporting high stress levels in 1991 than in 1985.[295]

By 1994-95, female levels of chronic stress had become *markedly* higher than male levels right across the country, by more than 20%.[296] And in 1998, female levels of time stress in Canada were more than 30% higher than male levels.[297] While these different questionnaires are not strictly comparable, there does seem to be a clear trend of steadily higher stress levels for women. It is only in the latest Canadian Community Health Survey that the high stress level gap between men and women has been narrowed to 1.5% (for further discussion, see Section 7 below).[298]

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[293] Health Canada, *Statistical Report on the Health of Canadians, 1999,* Health Canada and Statistics Canada, September, 1999, catalogue no. H39-467/1999E, page 220; T. Stephens, *Population Mental Health in Canada,* report prepared for the Mental Health Promotion Unit, Health Canada, May 1998.

[294] Population health questionnaires in 1985 and 1991 and 1994-95 tested the degree to which individuals felt their stress levels to be high, moderate or low, using up to 18 different questions. At publication time, the author had not ascertained the degree to which the 1994-95 questions are comparable to those in the earlier two studies, which *are* comparable. For that reason, no general interpretations of trends over time are made here and only *relative* inter-provincial and male/female trends over time are assessed. The 1998 General Social Survey used ten questions to assess "time stress" among Canadians. In addition, the 1994-95 National Population Health Survey for the first time included about 25 questions to assess psychological well-being according to three criteria – "self-esteem," "mastery" (the extent to which people feel their life circumstances are under their control), and "sense of coherence" (the view that events are comprehensible, challenges are manageable, and life is meaningful.) The scaling system was based on a maximum score of 78 for coherence, 24 for self-esteem, and 28 for mastery. (See Federal, Provincial and Territorial Advisory Committee on Population Health, *Statistical Report on the Health of Canadians, 1999,* September 1999, Health Canada and Statistics Canada, pages 49 and 220-221.)

[295] Statistics Canada, *Health Statistics, 1999,* CD-ROM, Table 00060139.IVT: "Level of Stress."

[296] Health Canada, *Statistical Report,* page 51.

[297] Statistics Canada, *General Social Survey,* 1998, special tabulation for Table 2W; also Statistics Canada, *The Daily,* November 9, 1999, catalogue no. 11-001E, page 2.

[298] Statistics Canada, *Canadian Community Health Survey 2000/01*, available at: http://www.statcan.ca/english/freepub/82-221-XIE/01002/tables/pdf/2336.pdf.

In all the previous five surveys examined, Newfoundlanders have significantly higher levels of mental health than other Canadians, and consistently report the lowest stress levels and the highest level of psychological wellbeing in the country.[299] Newfoundlanders were 30% more likely than other Canadians to report a high level of psychological wellbeing. In the 2000-01 Canadian Community Health Survey, which asked participants about the degree of stress they experienced on most days of their lives, 26% of Canadians said they experience quite a lot of stress on most days. People in Newfoundland (15.4%) and PEI (17.9%) experienced the least number of stressful days, while the highest stress rate was reported in Quebec at 30%, followed by Alberta and Ontario (26%).[300]

This high mental health status may explain why, despite higher levels of unemployment and lower income and schooling levels, Newfoundlanders report far fewer chronic illnesses than other Canadians in certain key categories. They have the lowest rate of new cancer cases, asthma, allergies, and back problems in the country. They also have the lowest rates of suicide and sexually transmitted diseases in Canada, outcomes that are clearly linked to mental health status. They are more likely to report their own health as "excellent" or "very good" than any other Canadians, and they have the highest level of functional health status in the country. Interestingly, despite the province's chronic economic and employment problems, Newfoundlanders even report higher levels of work satisfaction than the national average.[301]

Prince Edward Islanders also have a high level of mental health. In the 2000/01 Canadian Community Health Survey, 8% fewer Islanders recorded high levels of life stress than the Canadian average.[302] Not surprisingly, Islanders were also the second most likely in the country to rate their own health as excellent or very good, a designation widely accepted as a reliable predictor of health problems and health-care utilization.[303] As for the other provinces, most are either just slightly below or above the national average—with the exception of Quebec with is considerably higher when it comes to chronic stress levels.

When psychiatric hospitals are included, mental disorders account for more hospital days in Canada than any other illness – over 15 million patient days in 1993-94 – more than the *combined* total for all circulatory and heart diseases, nervous system disorders, cancers, and injuries (the next four most common causes of hospitalization.) Even in normal (non-psychiatric)

[299] Statistics Canada, *Health Statistics 1999* Tables 00060139.IVT, and 00060150.IVT*;* ACPH, *Statistical Report,* p. 51.
[300] Statistics Canada, *Canadian Community Health Survey 2000/01*, available at: http://www.statcan.ca/english/freepub/82-221-XIE/01002/tables/pdf/2336.pdf.
[301] These outcomes are taken from the various statistical tables in Health Canada, *Statistical Report,* including pages 219, 225, 231, 270, 287, 315, and elsewhere. "Functional health status" is based on the Comprehensive Health Status Measurement System which combines two components: a) a description of eight functional health attributes -- vision, hearing, speech, mobility, dexterity, cognition, emotion, and pain/discomfort; and b) a McMaster University survey asking individuals to rank various health conditions in order of the severity of their effects on health. These two components are combined to produce an overall score for each respondent (ibid., page 230).
[302] Health Canada, *Statistical Report,* page 51; Statistics Canada, *Health Statistics 1999,* table 00060150.IVT; Statistics Canada, *Canadian Community Health Survey 2000/01*, Health Indicators, Catalogue No. 82-221-XIE.
[303] Health Canada, *Toward a Healthy Future,* page 14; ACPH, *Statistical Report,* page 219.

hospitals, mental disorders account for nearly six million hospital days a year, and are the second leading cause of hospitalization after cardiovascular diseases.[304]

Bucking the national trend toward shorter hospital stays, there has been an upward trend in the average length of hospital stay for treatment of mental disorders, with an overall *increase* in patient days in both acute-care and psychiatric hospitals. While there was a 15% decline in total hospital patient days in the early 1990s, there was a parallel 33% increase in patient days for mental disorders. Affective psychoses, including manic-depressive disorders, accounted for 23% of psychiatric separations, more than any other single category. Interestingly, the increase in patient days has occurred despite a decline in the number of discharges. This indicates a clear trend toward longer hospital stays for fewer patients. More serious cases are hospitalized, while less serious ones are being treated in the community.[305]

A gender breakdown is useful. Women have a 14% higher rate of psychiatric hospitalization overall than men. Across all ages, female rates of separation from psychiatric institutions are markedly higher than male rates for neurotic disorders (ratio of 1.9:1), depressive disorders (1.8:1), affective psychoses (1.7:1) and adjustment reaction (1.4:1), while men have higher rates for alcohol and drug dependence (2.4:1) and schizophrenia (1.4:1). In general hospitals, women have a 21% higher rate of admission for mental disorders than men.[306]

If the contribution of stress to serious illnesses were included, then it is clear that psychological distress is by far the most expensive component of our health care costs. Yet this is far and away the most neglected element of our health care paradigm with significant data gaps even for the most basic information. For example, despite these dramatic hospitalization figures, most mental health care is actually delivered in the community. But the absence of a national database for community mental health services makes it difficult to examine the efficacy of mental health service delivery and its implications for population health.

We have calculated the costs of mental illness in Canada, as in Table 2, from Health Canada's *Economic Burden of Illness in Canada*, using the additional direct costs as 0.624% of the total costs of physician, hospital and drugs. Figure 31 shows the largest expenses (77%) from three categories: hospital costs, disability costs, and other direct costs, which include facilities for psychiatric patients.

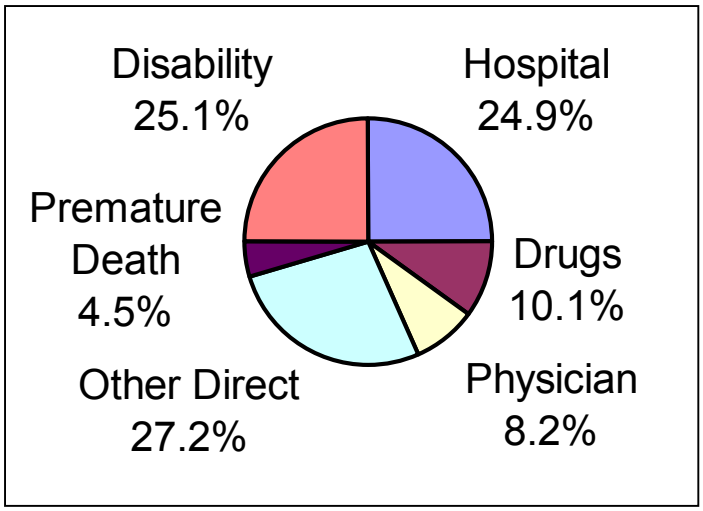
As a percentage of the total provincial economic burden of illness, mental illness costs are highest in Nova Scotia and Quebec, and lowest in Saskatchewan and British Columbia (Figure 32).

[304] Statistics Canada, *Mental Health Statistics, 1993-94,* catalogue no. 83-245-XPB, 1996; Canadian Institute for Health Information, *Hospital Morbidity Database, 1994-95,* and *1995-96;* Health Canada, *Toward a Healthy Future,* pages 142-143; ACPH, *Statistical Report,* pages 296-301; Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.
[305] Statistics Canada, *Mental Health Statistics,* op. cit.; CIHI, *Hospital Morbidity Database;* Health Canada, *Toward a Healthy Future,* pages 142-143; Health Canada, *Statistical Report,* pp. 296-298 and 301.
[306] Health Canada, *Statistical Report,* pages 296 and 301.

In sum, a determined commitment to improve mental well-being is probably the most strategic and cost-effective intervention that health departments can make. This is easier said than done, as the roots of stress and psychological distress run deep.

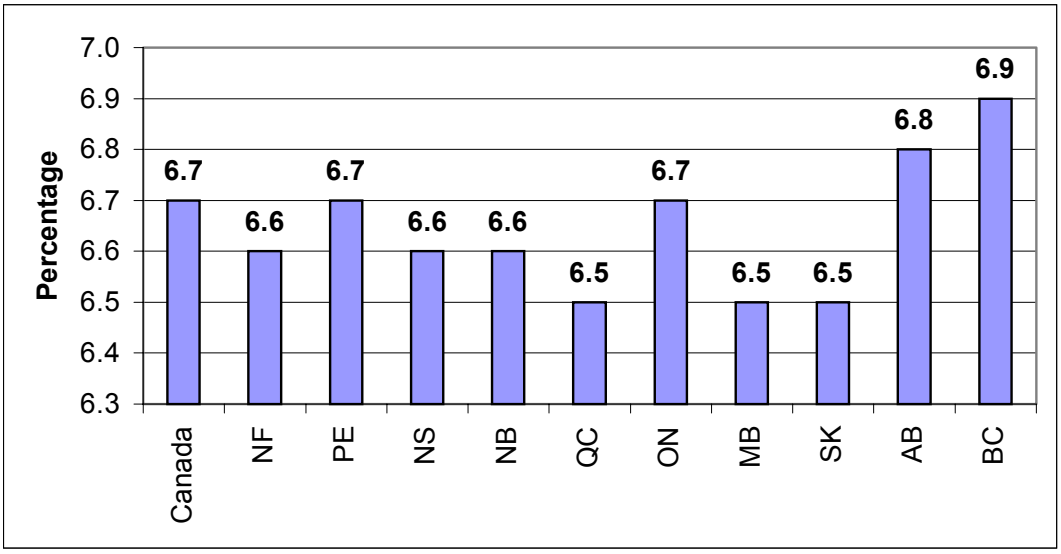
Given the seriousness and magnitude of this challenge, it is clearly essential to identify practical and cost-effective interventions to improve the population's mental well-being. Given the high rates of female stress, depression, and hospital admissions for mental disorders, this issue is also a vital plank of any women's health strategy.

Figure 31. Distribution of Mental Illness Costs, Canada, 1998 (%)



Source: Health Canada, *Economic Burden of Illness in Canada 1998*, 2002.

Figure 32. Mental Health Costs as Percentage of Total Economic Burden of Illness, Canada, Provinces, 1998, (%)



Source: Health Canada, *The Burden of Illness in Canada 1998*, 2002.

7. Stress and Chronic Disease

Stress is described here as a separate social-psychological determinant of health, but it can clearly flow from any of the economic and social determinants of health described in the previous sections – poverty, unemployment, job insecurity, overwork, lack of control at work, family violence, lack of social support, and so on. As with all determinants of health, the issue is not to identify a separate causal link to health or illness for any one determinant, but to indicate the dynamic interplay and synergy of multiple health determinants, and to identify intervening processes that may exacerbate or ameliorate particular health outcomes.

Stress is is both an outcome of other health determinants and a key influence on mental and physical health in its own right. As women report higher levels than men of both chronic stress in general and time stress in particular, it is a particularly important indicator of women's health. Ground-breaking research in the last ten years has identified several of the biological mechanisms by which stress has an impact on health.

Abundant evidence exists that stress is an independent risk factor for several chronic illnesses. However, more recent research has uncovered evidence on the physiological pathways between psychosocial stress, emotional arousal, and disease. Two stress-related neuro-endocrine pathways can adversely affect the heart – the pituitary adrenal system, activated when there is depression, withdrawal, or loss of control, and the sympathetic adrenal medullary system, activated in response to the "fight or flight" syndrome.

According to one analysis:

> *"[R]epeated sympathetic hyperactivity and chronic oversecretion of stress hormones such as epinephrine, norepinephrine, and cortisol over a long span of time might lead, via mechanisms such as endothelial injury to the coronary arteries, to increased CHD risk in type A individuals compared to type B individuals."*[307]

Other pathophysiological pathways between mental and physical illness have been identified in adverse effects on the heart from the excretion of higher levels of testosterone by hostile and cynical individuals, and in depressive effects on the immune system due to isolation, negativity, and lack of trust. Depressed immunity, in turn, has been linked to a reduced ability to identify and reject tumour cells at an early stage.[308]

Work stress, which may derive from time pressures, work overload, high levels of responsibility, lack of control, and non-supportive superiors, has been particularly identified in many studies as

[307] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 312-313. Type A, or coronary-prone behaviour has been described as "keen and ambitious" with an "engine…always set at full speed ahead." It is characterized by "a sense of time urgency, impatience, competitiveness, drive, and intense desire to achieve." See Goldberg, Robert, "Coronary Heart Disease: Epidemiology and Risk Factors," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* page 27.
[308] Kabat-Zinn, op. cit., page 314.

an important predictor of hypertension and coronary heart disease. Male U.S workers with the highest levels of job strain were found to have four times the risk of heart attack as those with the lowest levels of strain, indicating a risk level equal to that of smoking and high blood cholesterol. And a large, prospective, six-year Swedish study similarly concluded that job strain predicted future heart disease independently of other risk factors in a population sample free of symptoms.[309]

In a wide-ranging review of the literature, the *American Journal of Health Promotion* found stress to be the most costly of all modifiable risk factors.[310] While there are many accepted methods of individual stress reduction, the evidence indicates that underlying social causes must be addressed if this important cause of disease is to be countered effectively. As an indicator of women's health, any reduction in stress levels is clearly a sign of progress with positive implications for health.

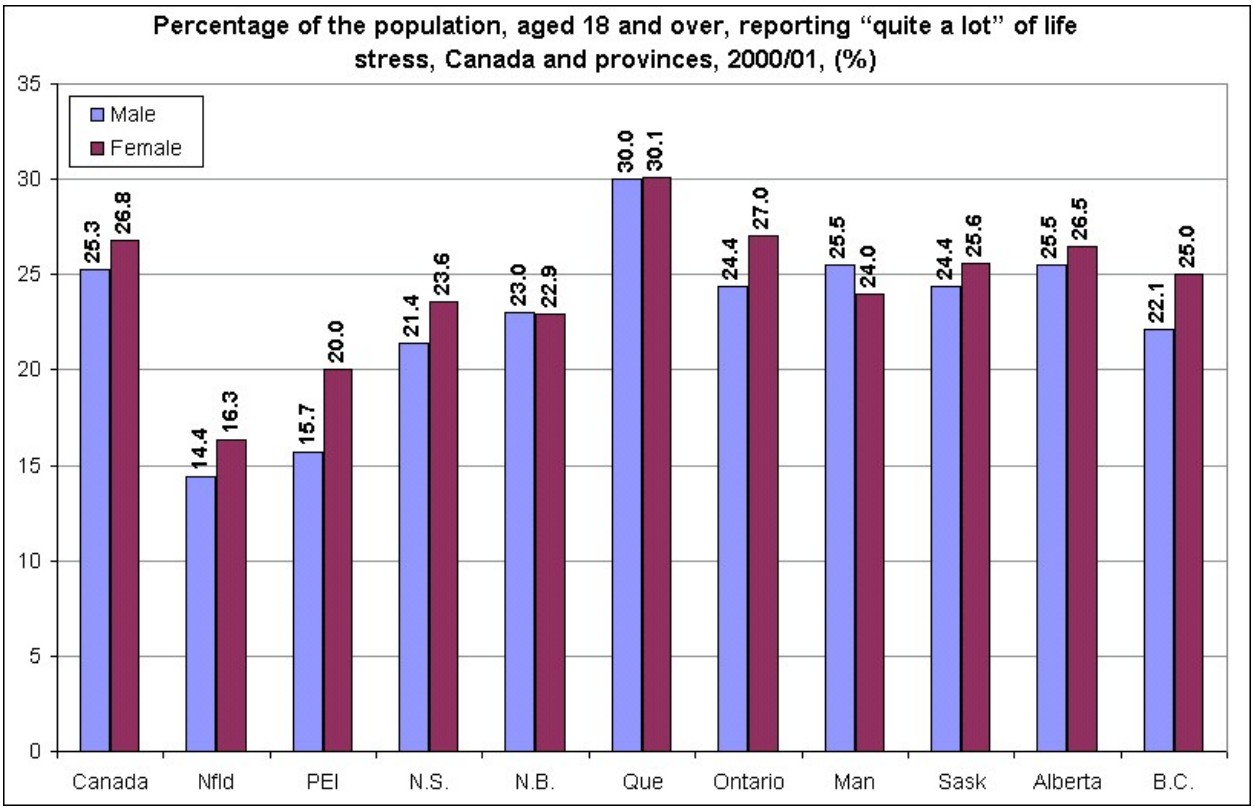
More than one in four Canadians experiences "quite a lot" of life stress, with more women experiencing high levels of stress than men (26.8% compared to 25.3%). Atlantic Canadians have the lowest levels of stress in the country, and residents of Quebec experience the highest levels (30%). In the 2000/01 Canadian Community Health Survey, as in previous population health surveys, Newfoundlanders in 2000/01 registered the lowest stress levels in the country (15%), with Prince Edward Islanders recording the second lowest levels (18%). There are more than twice as many Quebecois living with high stress as Newfoundlanders (Figure 33).

While there are many accepted methods of individual stress reduction, the evidence indicates that underlying social causes must be addressed if this important cause of disease is to be countered effectively. The correlation between high stress and smoking is well documented. For example, among Canadians reporting very low stress rates, just 21% of women and 27% of men are smokers. Among those reporting high stress rates, 45% of women and 46% of men are smokers, with an almost direct linear relationship between stress level and smoking prevalence for both sexes.[311]

There has been less systematic exploration of the relationship between poor dietary habits, and stress. Rising stress levels, higher rates of teenage smoking, and increased rates of obesity in Canada are all well documented. But at this stage the connections between stress and obesity remain circumstantial. Certainly they are worthy of further exploration. One of the most important areas for research is the possibility that the disturbing increase in stress levels and overweight may be related to an increase in unhealthy lifestyles due to changing employment patterns and overwork.

[309] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 305.
[310] Goetzel, Ron (ed), "The Financial Impact of Health Promotion," *American Journal of Health Promotion* 15 (5), May/June 2001.
[311] Statistics Canada, *National Population Health Survey Overview, 1994-95,*catalogue no. 82-567, pages 10-11. See also Colman, Ronald, *The Cost of Tobacco in Nova Scotia,* GPI Atlantic and Cancer Care Nova Scotia, Halifax, October 1990, Figure 3, page 9.

Figure 33. Percentage of the population, aged 18 and over, reporting "quite a lot" of life stress, Canada and provinces, 2000/01, (%)



Source: Statistics Canada, Canadian Community Health Survey, 2000/01, health file.

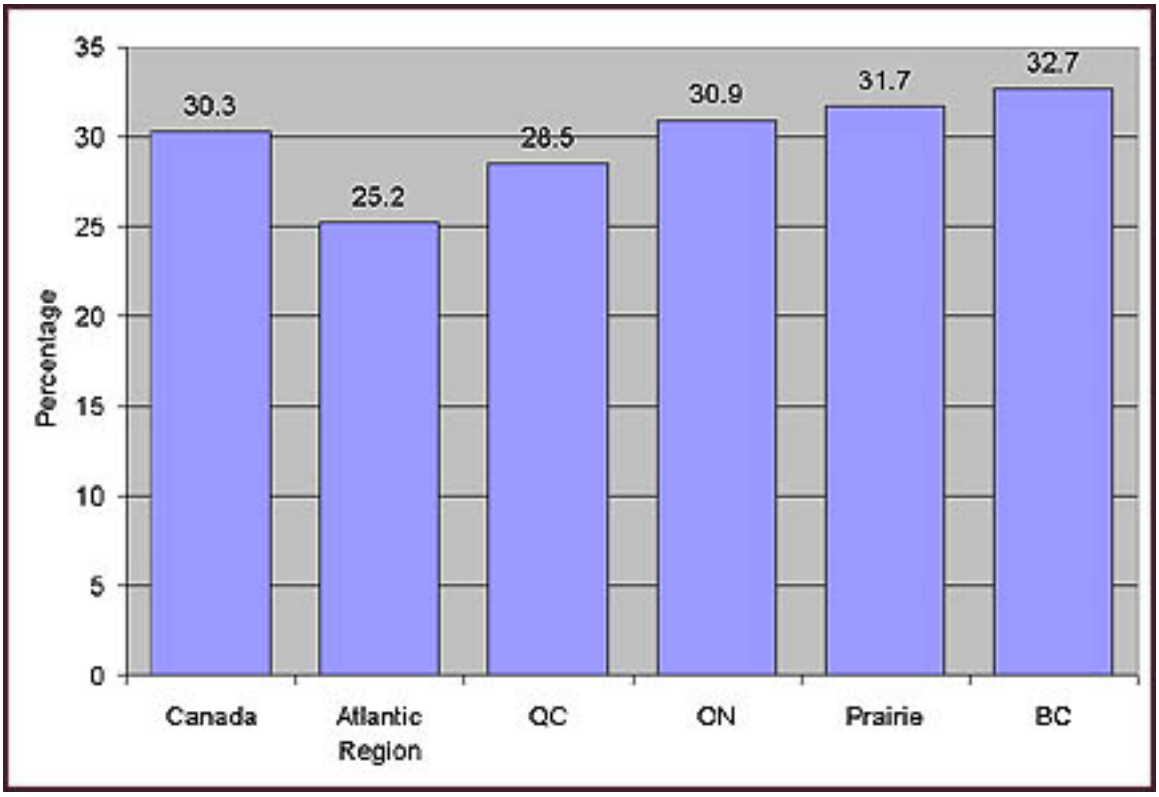
Seventy percent of families are now dual-earners, and the combined burden of paid and unpaid work time is increasing across the country. Canadian women have doubled their share of participation in the paid labour force in the last 40 years. Working mothers now put in an average 75-hour week of paid and unpaid work, and working parents have an increasingly difficult time juggling the combined pressures of job and household responsibilities. Not surprisingly, Statistics Canada ranks 38% of working mothers as "severely time stressed" based on a 10-question time stress survey.[312]

Work pressures may be squeezing out time that was once spent cooking and preparing food at home, and lending impetus instead to the spread of fast food restaurants. Statistics Canada's time use surveys show a dramatic decline in time spent cooking, preparing meals and washing dishes. At the same time, the proportion of the average household food budget spent eating out has steadily increased, reaching more than 30% of the weekly household food budget in 2001, with British Columbians spending the largest percentage eating out (at 33 cents to the dollar) and the

[312] For details, see GPI Atlantic, *Women's Health in Atlantic Canada: A Statistical Portrait,* Halifax, February, 2000, Maritime Centre of Excellence for Women's Health.

Atlantic Region the least (25 cents to the dollar). Country-wide, this reflects an increase of five percentage points from 1982.[313] (Figure 34).

Figure 34. Average Weekly Restaurant Expenditures as Percent of Average Weekly Household Food Expenditure 2001 (%)



Source: Statistics Canada, "Average Weekly Food Expenditure per household, 2001"; available at http://www.statcan.ca/english/Pgdb/famil27a.htm.

It is likely that healthy diets have suffered in the transition from home cooking to greater reliance on prepared fast food. A Harvard University study of 16,000 children found that the more frequently families ate together, the more fruits and vegetables and the less fried food they consumed. The study, released in 2000, showed that children who ate regular family meals had a far higher intake of important nutrients, such as calcium, fibre, folate, iron, and vitamins B and E. They also had healthier diets at other times of day, compared with children who rarely ate family meals.[314]

Again, though increasing time stress is a trend across the country, some European countries have demonstrated viable alternatives to the current North American tendency to work longer hours.

[313] Statistics Canada, *Family Expenditure in Canada, 1982* and *1992,* catalogue no. 82-555; Statistics Canada, *Family Food Expenditure in Canada, 1996,* catalogue no. 82-554; Statistics Canada, "Average Weekly Food Expenditure per household, 2001"; available at: http://www.statcan.ca/english/Pgdb/famil27a.htm.
[314] Randi Hutter Epstein, "Linking Children's Health to Family Meals: Study shows families who eat together have better eating habits," *The New York Time,* reprinted in *The Chronicle-Herald,* Halifax, 29 March, 2000.

The Netherlands, for example, has reduced its unemployment rate from 12.2% to 2.7% by reducing and redistributing work hours, to allow workers to balance their jobs and household responsibilities more successfully. The Dutch now have the shortest work hours of any industrial country – 1,370 hours a year, compared to 1,732 hours in Canada. France reduced its work-week to 35 hours, and international time use surveys indicate that Danish citizens have an average of 11 hours more free time each week than Canadians.[315]

A Statistics Canada study found that women working longer hours were 40% more likely to decrease their level of physical activity and 2.2 times more likely to experience major depressive episodes than women working standard or short hours. Women with high levels of job strain were 1.8 times more likely to experience an unhealthy weight gain compared to women with low job strain; while women who reduced their work hours had only half the odds of a weight gain compared to those who continued to work standard hours.[316]

These findings are very significant in understanding the relation between long work hours and the rise in rates of obesity. They are the first direct evidence in Canada linking work stress and long work hours with weight gain. While the mechanisms linking the two factors are not yet well understood, it is likely both that meal preparation time is getting squeezed out and replaced with unhealthier fast food, and that the stress itself may produce more nervous snacking. In addition, longer work hours are also squeezing out exercise and physical activity.

In short, healthy diets and healthy weights may depend on an honest re-examination of our work culture, and on ways of balancing job and household responsibilities more effectively.

[315] For an excellent account of shorter work time initiatives in Europe, see Hayden, Anders, *Sharing the Work, Sparing the Planet: Work Time, Consumption, and Ecology,* Between the Lines, Toronto, 1999. For Danish figures and comparative free time estimates among nations, see Harvey, Andrew, "Canadian Time Use in a Cross-National Perspective," *Statistics in Transition,* November, 1995, volume 2, no. 4, pages 595-610, especially Table 3, page 603.

[316] Margot Shields, "Long Working Hours and Health," Statistics Canada, *Health Reports,* volume 11, no. 2, autumn 1999, pages 33-48.

8. Psychosocial Interventions to Overcome Mental Illness

Just as mental illness increases the susceptibility to a range of chronic physical conditions, evidence indicates that psychosocial stresses can be modified by psychosocial interventions to reduce heart disease and other chronic disease risks. While earlier sections of this report have mentioned social interventions that can reduce disease, including alleviation of poverty, inequality, and work stress, this section focuses on individual interventions such as may be applicable in a physician-patient interaction.

At the individual level, effective methods of stress reduction frequently use the mind to promote healing. Relaxation and breathing exercises, meditation, cognitive behavioural therapy, guided imagery, prayer, self-esteem techniques, hypnotherapy, and similar methods have been shown to reduce blood glucose levels and associated diabetic risk, asthma attacks, psychological distress (including depression and anxiety), and a wide range of medical symptoms.[317] In particular, such stress management techniques have been shown to be most effective when integrated with a regime of regular, moderate physical activity, smoking cessation, low-fat vegetarian diets, and a strengthening of social supports.[318]

These methods have improved immune function and sleep, and helped smokers to quit. They have also proven effective in secondary and tertiary prevention, assisting in the rehabilitation of stroke victims and patients undergoing chemotherapy, and in the treatment of irritable bowel syndrome, chronic fatigue syndrome, end stage renal disease, and other chronic conditions.[319] Research into the efficacy of these methods is only in its infancy, and further large cohort and prospective studies are necessary to provide more evidence.

According to Dr. Lewis Mehl-Madrona, the healing traditions of indigenous peoples in North America can also contribute to disease prevention and health promotion through their incorporation of the spiritual and emotional dimensions of health:

> *"It has been shown over and over in research that, if you take care of people's emotional and spiritual needs when they are in crisis, their consumption of medical services goes down. Society benefits because less work is lost, and the patient benefits because they spend less time in the sick room."*[320]

[317] Studies on the efficacy of these methods, from several respectable journals, including *Lancet, Journal of the American Medical Association, American Journal of Psychiatry, American Journal of Health Promotion,* and others, are summarized at: www.healthjourneys.com/hotresearch.asp.
[318] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 316.
[319] Idem.
[320] Interview text available at: www.garynull.com.

PART V
THE IMPACT OF AGING ON MEDICAL COSTS

9. Delaying Diseases Associated with Old Age

It is sometimes argued that disease prevention and health promotion efforts do not save money, because the avoidance of premature death simply postpones health care expenditures to older ages when the vast majority of medical expenses occur. One study, for example, concludes that "smoking cessation would lead to increased health care costs," because the premature deaths of smokers save money in the long run by avoiding increased health care usage by the elderly.[321]

This issue highlights a fundamental limitation of cost-benefit analysis. The decisions to value life itself and to care for elderly citizens in their old age represent fundamental social values and goals that may be worthy of a financial investment whether or not they save money. If saving money were the only goal, then all old people should be killed before they become costly to the health care system. The argument that premature deaths save money would not apply only to smokers. Thus it is valid to compare a smoker's total costs to the health care system over his or her lifetime with the costs accrued by a non-smoker over the *same* period of time. But cost-benefit analysis cannot be used to compare the costs of dead smokers with those of live non-smokers, and then to claim the former as "savings" or "benefits."[322]

But leaving ethical and theoretical issues aside for a moment, is it true that health promotion efforts that prevent disease and save lives may increase the demand for medical services by an aging population that lives longer? For that argument to be true, longer life spans would inevitably be accompanied by longer lifetime periods of disability and/or longer lifetime demand for medical services.

A growing body of evidence now challenges this argument on financial grounds, noting that *lifetime* health care costs are actually lower for those with fewer modifiable risk factors, i.e. those who take care to reduce those risk factors that are under their control. For example, those who exercise regularly have much less overall lifetime morbidity than those who are sedentary, indicating that avoided medical costs may be saved absolutely rather than simply deferred to older ages.[323] Physical activity helps prevent falls and hip fractures, and can preserve independence in old age, thereby avoiding costly nursing home and other institutional care.[324]

Thus, an issue in costing is not only primary prevention of disease, but also the postponement of disease to older ages, the reduction of lifetime disability and dependence, and the consequent reduction in health care costs.[325] A study by the American Federation for Aging Research (AFAR) estimated that a 5-year population-wide delay in onset of cardiovascular disease would

[321] Barendregt, Jan, Luc Bonneux, and Paul van der Maas, "The Health Care Costs of Smoking," *The New England Journal of Medicine,* 1997 (337): 1052-1057.
[322] Colman, Ronald, *The Cost of Tobacco in Nova Scotia,* GPI Atlantic, Halifax, November, 2000, pages 21-22.
[323] Fries, James, Everett Koop, Jacque Sokolov, Carson Beadle, and Daniel Wright, "Beyond Health Promotion: Reducing the Need and Demand for Medical Care, *Health Affairs* 17 (2), page 71.
[324] Colman, Ronald, *The Cost of Physical Inactivity in Nova Scotia,* GPI Atlantic, Halifax, May, 2002, page 8 and references in footnote 14.
[325] The Institute of Medicine, *Extending Life, Enhancing Life: A National Research Agenda on Aging,* National Academy Press, Washington DC, 1991.

save the U.S. $102 billion (C$2002) annually. A 5-year delay in occurrence of hip fracture could cut the number of events by 140,000 annually, saving $7.5 billion (C$2002) a year.[326] Extrapolated to Canada in proportion to population (Canadian population is about 11% that of the U.S.), the savings amount to about $11.2 billion a year for cardiovascular disease and more than $825 million a year for hip fractures, with 15,400 such fractures avoided annually in the country.

This compression of morbidity hypothesis is at the root of challenges to the widely held assumption that an aging population inevitably produces escalating health care costs, and it demonstrates that health promotion can save money as well as lives.

9.1 The Compression of Morbidity

The hypothesis that lifetime sickness can be compressed into an ever-shorter period just prior to death was advanced by James Fries, MD, in a seminal article published in *The New England Journal of Medicine* in 1980. Fries predicts:

> *"[T]hat the number of very old persons will not increase, that the average period of diminished physical vigour will decrease, that chronic disease will occupy a smaller proportion of the typical life span, and that the need for medical care in later life will decrease. In forecasting health, the interaction between two sets of observations has gone unnoticed. The first set demonstrates that the length of the human life is fixed – that man is mortal and that natural death may occur without disease. The second set indicates that chronic disease can be postponed and that many of he 'markers' of aging may be modified. If these two premises are granted, it follows that the time between birth and first permanent infirmity must increase and that the average period of infirmity must decrease."*[327]

To verify the first premise, Fries examines a century of demographic data to demonstrate that the dramatic increase in life expectancy in the 20th century is due almost entirely to the elimination of premature death, particularly neonatal mortality. For persons 40 years and older, life expectancy increased relatively little; for those 75 years old, the change was barely perceptible, suggesting a natural limit to the life span. If all premature death were eliminated, "statistics suggest that under ideal societal conditions mean age at death is not far from 85 years."[328]

Thus, while life expectancy at birth has increased dramatically (by 30 years) since 1900, life expectancy at age 65 has increased by less than 6 years since 1900. In 1900, a 65-year-old man could expect to live another 11.5 years. At the end of the 20th century, a 65-year old man could expect to live another 16 years. For 65-year-old women, the corresponding figures are 12 years

[326] American Federation for Aging Research (AFAR), *Putting Age on Hold,* Alliance for Aging Research, 1996, page 5. (C$2002 $102 billion = US$1996 $69 billion; C$2002 $7.5 billion = US$1996 $5 billion).
[327] Fries, James, "Aging, Natural Death, and the Compression of Morbidity," *The New England Journal of Medicine,* 303 (3): 130-135, July 17, 1980, page 130.
[328] Ibid., page 131. See also Chernomas, Robert, *The Social and Economic Causes of Disease,* Canadian Centre for Policy Alternatives, March, 1999, page 2.

in 1900 and 19 years at the end of the 20th century. [329] Thus, the huge leap in average life expectancy at birth is due almost entirely to the sharp drop in infant and child mortality rather than to an increase in the length of old age. The sharp decline in premature death resulted from the prevention of infectious diseases that took their greatest toll in the first year of life.[330]

The second premise is verified by epidemiological evidence demonstrating that behaviours like non-smoking, exercise, good diet, and healthy weight, as well as social conditions, greatly delay the onset of many chronic diseases, modify the aging process, and support vitality and independence in old age.

> *"The amount of disability can decrease as morbidity is compressed into the shorter span between the increasing age at onset of disability and the fixed occurrence of death. The end of the period of adult vigour will come later than it used to."*[331]

The assumption that chronic disease is an inevitable by-product of aging has been challenged most strongly in the accumulated evidence on coronary heart disease:

> *"The evidence overwhelmingly demonstrates that CHD is not an inevitable consequence of aging, but rather a disease process based on physiologic mechanisms related to abnormal concentrations of blood lipids, and is accelerated by a number of other risk factors, most of which are related to the diet and lifestyle associated with an industrialized, urban society. It is also clear that the pace of the atherosclerotic process can be modified by alteration of risk factors, even when significant arterial disease is already present."*[332]

This "compression of senescence" suggests a profound shift in health policy, spending priorities, and attitudes towards aging and death:

> *"[T]he practical focus on health improvement over the next decades must be on chronic instead of acute disease, on morbidity not mortality, on quality of life rather than its duration, and on postponement rather than cure…. The older person requires opportunity for expression and experience and autonomy and accomplishment, not support and care and feeding and sympathy. High-level medical technology applied at the end of a natural life span epitomizes the absurd. The hospice becomes more attractive than the hospital. Human interaction, rather than respirators and dialysis and other mechanical support for failing organs, is indicated at the time of the 'terminal drop.'"*[333]

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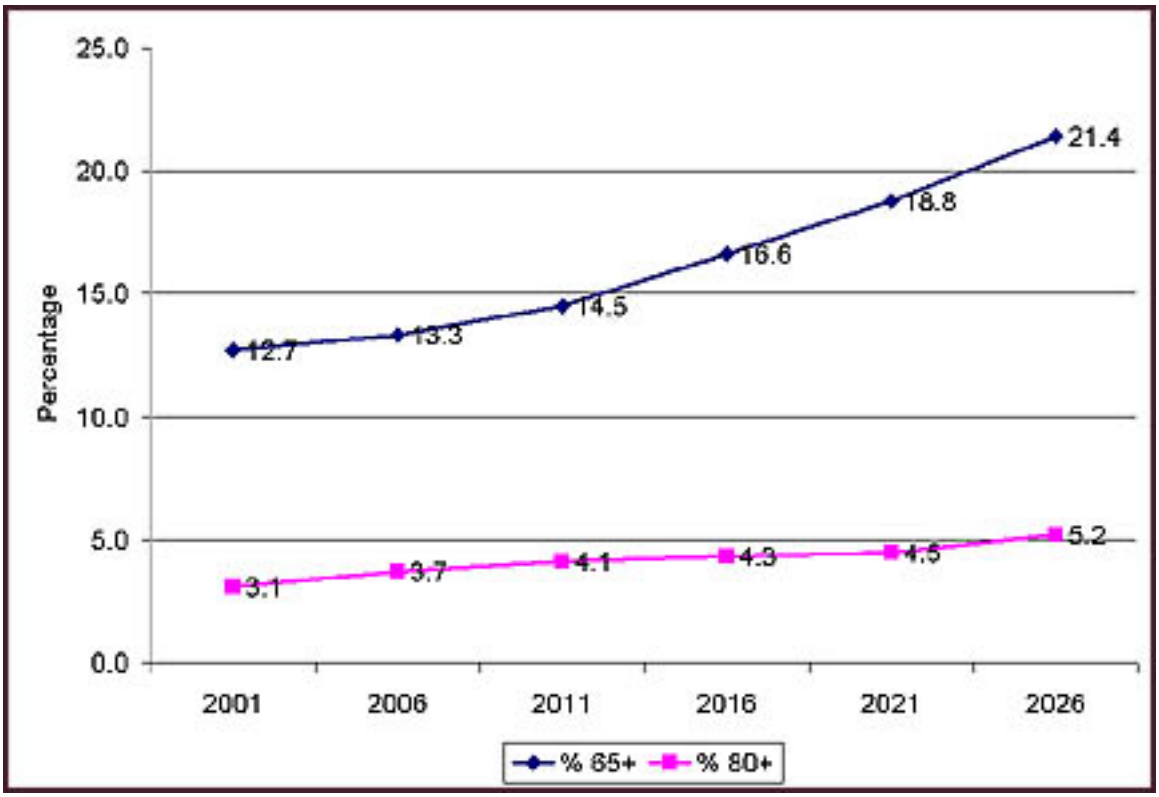
[329] Life expectancy averages 1900-1997 are available at: http://www.efmoody.com/estate/lifeexpectancy.html. Although these figures are for the U.S., they may be used as an approximate indicator for Canada as well.
[330] Brown, Allan, *Costs and Benefits of Preventive Medicine,* Canadian Medical Association, Department of Medical Economics, 1984, page 1.
[331] Ibid., page 133.
[332] Ockene, Ira, "The Rationale for Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 120.
[333] Ibid., pages 134-135.

9.2 Reducing Illness among the Elderly

According to the 2001 Census results, 13% of Canada's population is now 65 or older.[334] By 2011, nearly 15% of Canadians will be 65 and older, and by 2026 this will rise to more than 21%. Between 2001 and 2011, the number of those over 80 will reach 1.35 million. By 2026, there will be nearly twice as many 80 and over as there were in 2001[335] (Figure 35).

Figure 35. Projected Percentage of Canadians 65+, 80+, 2001-2026, (%)



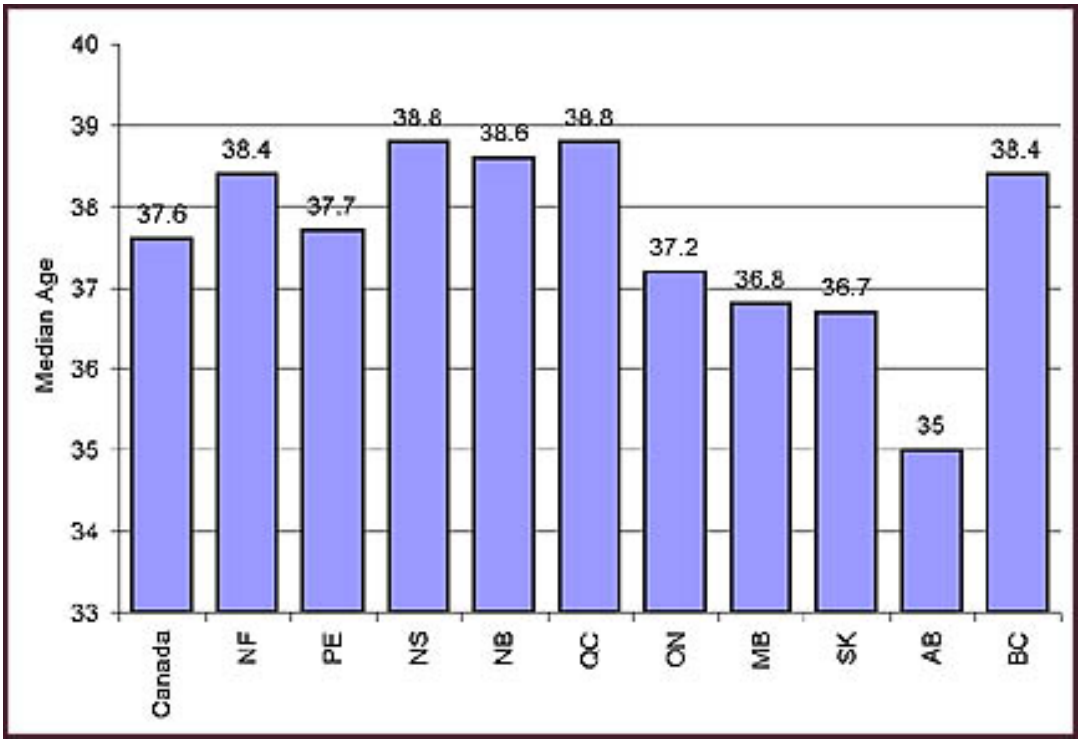
Source: Statistics Canada, "Population Projections … to 2026"; available at http://www.statcan.ca/english/Pgdb/demo23c.htm.

As of May 15, 2001, Canada has a median age of 37.6, up 2.3 years from the 1996 figures, the biggest census-to-census increase in a century.[336] Among the provinces, Nova Scotia and Quebec tie for the highest median age of 38.8 while Alberta has the lowest at 35. This is part of an east-

[334] *The National Post,* 17 July, 2002, page A9; Statistics Canada, *Median age reaches all-time high*, available at: http://www12.statcan.ca/english/census01/Products/Analytic/companion/age/canada.cfm#median_age.
[335] Statistics Canada, *Population gain fastest among the oldest*, available at: http://www12.statcan.ca/english/census01/products/analytic/companion/age/canada.cfm#fastest_population_growth; Lilley, Susan, and Joan Campbell, *Shifting Sands: The Changing Shape of Atlantic Canada: Economic and Demographic Trends and their Impacts on Seniors,* Health Canada, March, 1999, page 6, table 2.
[336] *The National Post,* 17 July, 2002, page A9; Statistics Canada, "Median age reaches all-time high," available at http://www12.statcan.ca/english/census01/Products/Analytic/companion/age/canada.cfm#median_age.

west trend, with the Atlantic provinces and Quebec showing populations older than the Canadian average and Ontario and the western provinces with populations younger than the average. The exception to this trend is British Columbia, due to the migration of older Canadians[337] (Figure 36).

Figure 36. Median Age, Canada, Provinces, 2001



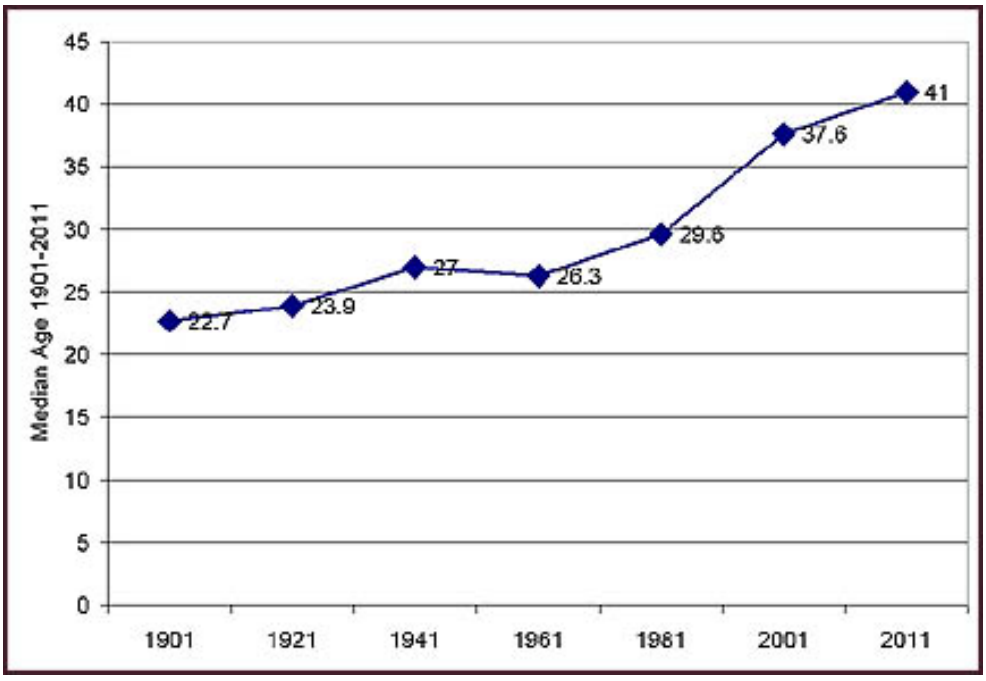
Source: Statistics Canada, "East-west split in aging patterns," available at http://www12.statcan.ca/english/census01/Products/Analytic/companion/age/provs.cfm.

Canada's median age has gone up dramatically in the last century: from 22.7 in 1901 to a predicted 41 in 2011. This is after experiencing a dip between 1941 and 1961. The biggest jump has been between 1981 and the present (from 29.6 to 37.6) (Figure 37).

Under conventional scenarios, these demographic trends are projected to stretch health care resources beyond the breaking point. Twenty-five years ago, with just 11% of the population, the elderly already occupied one-third of all hospital beds and consumed one-quarter of total health care expenditures. As their proportion in the population increases, according to traditional analyses, this disproportionate consumption of health services could escalate.[338]

[337] Statistics Canada, *East-west split in aging patterns*, available at: http://www12.statcan.ca/english/census01/Products/Analytic/companion/age/provs.cfm.
[338] Wolinsky et al., "Health Services Utilization among the Noninstitutionalized Elderly," *Journal of Health and Social Behavior,* 24: 325-337, 1983, cited in Province of British Columbia (1996), op. cit., page 29.

Figure 37. Median Age, Canada, 1901-2011



Source: Statistics Canada, available at: http://www12.statcan.ca/english/census01/Products/Analytic/companion/age/canada.cfm#median_age.

But if Fries is correct, as more recent evidence indicates, this escalation of health care expenditures is not inevitable and can be prevented by concerted health promotion efforts now. Because they have the country's oldest populations, Nova Scotia and Quebec could make highly suitable laboratories and testing grounds for such efforts, particularly those aimed at what has been termed "successful aging."

Given these dramatic statistics, it is not surprising that, among the elderly, nutritional risk has been found to be the single best predictor of physician and emergency room visits, hospitalization, and hospital readmission, all of which represent the most expensive aspects of health care utilization. One U.S. study found that nearly 60% of elderly patients with hip fractures were in a protein-depleted state during hospitalization, producing more complications, longer hospital stays, lower likelihood of return to preoperative function level, and lower possibility of survival one year after fracture, than well-nourished patients. These data indicate that nutritional interventions among the elderly can be highly cost-effective.[339]

[339] "Nutrition Screening Improves Care and Saves Money," *Nutrition Screening Initiatives,* Issue 16, page 5, fall, 1995; "Employers and Managed Care Plans Agree: Nutrition Care Matters," *Nutrition Screening Initiatives,* Issue 16, fall, 1995; Wolinsky et al., "Health Services Utilization among the Noninstitutionalized Elderly," *Journal of Health and Social Behavior,* 24: 325-337, 1983; Sullivan, Dennis, "Risk Factors for Early Hospital Readmission in a Select Population of Geriatric Rehabilitation Patients: The Significance of Nutritional Status," *Journal of the American Geriatrics Society,* 1992; Patterson, Brendan et al., "Protein Depletion and Metabolic Stress in Elderly Patients who have a Fracture of the Hip," *The Journal of Bone and Joint Injury,* 74-A (2): 251-260, February, 1992; Gallagher-Allred, Charlette, et al., "Malnutrition and Clinical Outcomes: The Case for Medical Nutrition Therapy,"

Certainly malnutrition is less expensive to prevent than to treat. Malnourished patients stay in health care institutions two-thirds longer than well-nourished patients.[340]

As well, under-nutrition leads to poor wound healing, with nursing home residents at particular risk. It has been estimated that the average cost of treating pressure sores in Canada is $16,856(C$2002). To avoid these costs, weight loss monitoring of nursing home residents has been recommended, along with provision of adequate protein and calories to speed recovery if sores occur.[341]

Summarizing 1,600 U.S. case studies, and the substantial evidence on malnutrition among elderly hospital patients, one group of researchers concludes:

- Malnutrition is associated with negative health outcomes and increased use of resources;
- Nutrition support to malnourished patients across a range of medical conditions reduces complications, morbidity, length of hospital stay, mortality, and overall use of resources;
- Nutrition therapies provided by dieticians result in substantial cost savings.[342]

Nutritional intervention can also reduce drug use among seniors, and thus save money. For example, dietary fibre supplementation has been shown to reduce and virtually eliminate the need for laxative drugs, suppositories, and enemas in treating constipation in geriatric and nursing home settings, producing dramatic cost savings. In one six-month study, a daily one-ounce bran-applesauce-prune juice mixture reduced laxative use to 14% of baseline.[343]

One analyst concludes that "geriatric assessment is not complete unless it includes a nutritional assessment," and that nutritional assessment and intervention represents the cornerstone of preventive medicine for the elderly. He recommends that "a full time dietician should be available for each 100-200 patients in a nursing home."[344] These conclusions are supported by other analysts who recommend that all elderly long-stay patients should have a comprehensive nutritional assessment to correct any dietary deficiencies.[345]

Journal of the American Dietetic Association, 96 (4): 361-369, April, 1996; all cited in Province of British Columbia (1996), op. cit., pages 28, 29, 36-38, 42-43.

[340] Gallagher-Allred, Charlette, and Sherry Bockus, "Specialized Nutritional Support in Long-Term Care," *Journal of Long Term Care Administrators,* Summer, 1990; cited in Province of British Columbia (1996), op. cit., page 43.

[341] Poduch, Carol, "The Dietitian as a Cost Efficient Agent," *Canadian Nursing Home,* 7 (1): 5-7, February-March, 1996, cited in Province of British Columbia (1996), op. cit., page 44. (C$2002 $16,856 = C$1996 $15,000).

[342] Gallagher-Allred, Charlette, et al., "Malnutrition and Clinical Outcomes: The Case for Medical Nutrition Therapy," *Journal of the American Dietetic Association,* 96 (4): 361-369, April, 1996; cited in Province of British Columbia (1996), op. cit., page 42.

[343] Hull, Christine, et al., "Alleviation of Constipation in the Elderly by Dietary Fiber Supplementation," *Journal of the American Geriatrics Society* 28 (9): 410-414; Mathiesen Behm, Roberta, "A Special Recipe to Banish Constipation," *Geriatric Nursing,* July-August, 1985: 216-217; Poduch, Carol, "The Dietitian as a Cost Efficient Agent," *Canadian Nursing Home,* 7 (1): 5-7, February-March, 1996; all cited in Province of British Columbia (1996), op. cit., pages 43-44.

[344] Morley, John, "Why Do Physicians Fail to Recognize and Treat Malnutrition in Older Persons?" *JAGS* 39: 1139-1140, November, 1991; Morley John, "Nutritional Status of the Elderly," *Supplement to Journal of the American Dietetic Association,* 61: 679-695, October, 1986; Morley, John, "Death by Starvation. A Modern American Problem?" *Journal of the American Geriatrics Society* 37 (2): 184-185, February, 1989; all cited in Province of British Columbia (1996), op. cit., pages 29-30, 44.

[345] Lipski, Peter, et al., "A Study of Nutritional Deficits of Long-Stay Geriatric Patients," *Age and Aging,* 22: 244-255, 1993, cited in Province of British Columbia (1996), op. cit., page 44.

PART VI
THE VALUE OF HEALTH PROMOTION

10. Effectiveness and Cost-Effectiveness of Prevention

Health Canada's *Healthy Living Strategy* is designed to find ways to reduce both the disparities in health care across the nation and to bring down the high cost levels that chronic illness inflicts on the health care system. In the announcement, the Honourable Anne McLennan acknowledged what many health care researchers had been saying all along:

> *"Along with smoking, physical inactivity and poor nutrition are the leading preventable causes of chronic diseases such as cancer, heart disease and Type II diabetes. The* ***Healthy Living Strategy*** *will provide the support Canadians need to improve their health and reduce personal suffering and costs to the health care system associated with these chronic diseases."*[346]

Accompanying the initiative is a Web site where those interested can access background information as well as participate by filling out a Consultation Workbook, either online or by downloading a printable copy. The *Healthy Living Strategy* boasts an integrated approach based on four key elements:

- the targeting of common risk factors for chronic disease;
- the recognition and addressing of the relationship between personal lifestyle choices and societal and environmental conditions;
- co-ordinating promotion and prevention in natural settings;
- and working across jurisdictions, both within the health care system and in other sectors, to mobilize and engage partners for an integrated and sustained effort.[347]

10.1 The Challenge of Demonstrating Cost Savings

Only time will tell if the *Healthy Living Strategy* will eventually bear fruit and produce the ambitious results it has set out to achieve. There are those who maintain a healthy scepticism. It must be remembered that the realization that health promotion can be cost-effective is not new in this country. In 1974, the Lalonde report, *A New Perspective on the Health of Canadians,* noted that modifying lifestyle and nutritional habits could reduce excessive mortality and sickness. In 1984 the Canadian Medical Association translated this finding into an economic analysis of the costs and benefits of preventive medicine. That document, authored by Allan Brown of Carleton University, noted that we may already "have reached a point of diminishing marginal returns to curative medicine; behavioural and environmental factors have become relatively more important as determinants of health."

[346] Health Canada, *Federal, Provincial and Territorial Health Ministers move ahead with the development of a Healthy Living Strategy and National Symposium*, available at http://www.hc-sc.gc.ca.
[347] "Healthy Living" Web site, available at http://www.healthyliving-viesaine.ca/; *Taking Action on Healthy Living: Background Information on the Integrated Pan-Canadian Healthy Living Strategy*, available at: http://www.healthyliving-viesaine.ca/english/.

Brown's report cited the 1981 Task Force on Fiscal Federalism in Canada:

> *"[A]dded investment in the acute care system will yield low marginal improvements in health. Small improvement at large cost is likely to remain the rule until some new breakthrough appears, for example, in the treatment of cancer and heart disease. It now seems that the next great advances must be made through better nutrition, more healthful lifestyles, cleaning up the environment, greater safety in the workplace and measures to reduce automobile accidents."*[348]

This understanding is not just a matter of description or analysis, but of policy. Canada currently devotes less than 2% of its health care budget to prevention, down from above 2% in 1997-98. That figure itself is down from almost 3% in 1992-93.

But if curative treatment is producing diminishing returns and if prevention is more cost-effective, then efficient use of society's limited health care resources requires a reallocation of some expenditures from acute care to preventive measures. While this may seem obvious, there are significant obstacles to such a reallocation that have hitherto prevented any major shift in public spending priorities. These obstacles might be classified as political, economic, and methodological.

Politically, the cost savings to be realized through prevention are difficult to sell, partly because preventive health care is a long-term investment in which costs are realized sooner than benefits. Current investments in nutritional education, smoking cessation, access to recreational facilities, alleviation of poverty, and other preventive actions will produce their highest returns 15, 20 or more years hence, and certainly beyond the tenure of a current government.[349] Secondly, for policy-makers eager to demonstrate results, successful curative interventions such as coronary bypass surgery produce immediate, tangible, and obvious outcomes – recovery from illness – whereas the mark of successful health promotion is that nothing dramatic happens. As one analyst has noted, when someone exercises, eats healthily, and does not smoke, and then 20 years later does not develop heart disease, diabetes, hypertension, or lung cancer, "the medical community does not rejoice at this accomplishment because from their perspective *nothing* happened."[350]

There are also practical economic obstacles to realizing cost savings to the health care system from successful preventive interventions. First, it must be demonstrated that averting an illness now does not increase the need for subsequent and more costly interventions later. The evidence presented in the last chapter on compression of morbidity, and on lower *lifetime* morbidity for those who exercise regularly for example, is therefore essential to demonstrate long-term net cost savings. Secondly, successful prevention and reduced chronic disease incidence will only produce cost savings if health care resources are actually reallocated to other social priorities, rather than reallocated to other curative sectors within the health care system. In other words, the

[348] Brown, Allan, *Costs and Benefits of Preventive Medicine,* Canadian Medical Association, Department of Medical Economics, 1984, page 1.
[349] Brown (1984), op. cit., page 4.
[350] Goetzel, Ron, "The Financial Impact of Health Promotion and Disease Prevention Programs – Why is it so Hard to Prove Value?" Introduction to special issue of the *American Journal of Health Promotion* 2001; 15 (5): 277-280, May/June, 2001, page 278.

fact that an intervention prevents an illness at a particular point in time does not automatically translate into net savings to the health care system. It may well be that such net economic savings will only be realized when we stop devoting massive resources to prolonging the life of dying individuals. Yet it may be politically suicidal to reduce the current level of expenditure on curative methods. [351]

There are also methodological obstacles to demonstrating the cost savings that may derive from prevention. First, there are different types of analysis. Cost-effectiveness analysis is concerned to identify how a given goal (usually years of life or disability-free life years gained) can be attained using minimal resources. The costs associated with alternative techniques can then be compared through economic analysis. Cost-benefit analysis goes a step further and applies economic criteria to the goal as well as to the means of achieving the goal, by asking whether the goal is worth the cost. While cost-effectiveness analysis quantifies only the costs in dollar terms, cost-benefit analysis quantifies the benefits in dollar terms as well, and compares them with costs. Thus, even if an intervention is cost-effective compared to acute-care intervention, it may be deemed inefficient from the perspective of cost-benefit analysis if the benefits do not outweigh the costs.[352]

By confusing these two kinds of analyses, investment in prevention may be held to a different economic standard than acute care interventions. While preventive interventions are frequently expected to pay for themselves over time, or to produce net cost savings through benefits outweighing costs, expensive medical technologies are rarely justified on the grounds of cost-benefit analysis. Critics argue that preventive interventions should be justified on the same grounds as acute care interventions – that they provide health benefits – and that they should be compared with acute care interventions on grounds of cost-effectiveness in achieving a given health outcome.

Further difficulties arise due to different time frames, with 1-5 year evaluations typical for cost-effectiveness assessments, and much longer time frames (3-20 years) for cost-benefit analysis. Because of the length of time between an intervention – say to increase physical activity, reduce dietary fat intake, or improve literacy or income adequacy – and health outcomes, few proper control studies exist that are capable of evaluating benefits and costs over a sufficiently long time frame.[353]

In cost-benefit analysis particularly, some variables are very difficult to quantify, such as the cost of pain and suffering, or costs to the individual in adopting a healthy regimen. Painful illnesses such as migraines, which have minor impacts on mortality and morbidity rates, may be undervalued in cost-benefit studies. Putting a dollar value on human life is also fraught with difficulties, with the human capital approach valuing economically productive work, but undervaluing the cost of illness or the benefits or prevention among the elderly or retired. Though widely used, this method does not count net productivity gains to the economy when the beneficiaries of interventions are unemployed or elderly. There are many other methodological

[351] Brown (1984), op. cit., pages 5 and 18.
[352] Brown (1984), op. cit., page 4.
[353] Brown (1984), op. cit., page 16.

difficulties, due to lack of data, conceptual problems, and uncertainties (such as the difficulty of accounting for the costs of false-positives and false-negatives in screening.)[354]

These and other difficulties have presented major challenges to reallocating resources from acute care to health promotion. Where possible, this report does refer to evidence on cost savings, because such evidence is arguably the most effective tool in today's policy environment in influencing policy and highlighting the potential benefits of prevention. But we always view such evidence as a secondary rather than primary justification, with impacts on health the more important criterion. Whether cost-effectiveness analysis or cost-benefit analysis is used, the first requirement is always to assess what types of preventive strategies can actually be effective in promoting and maintaining health in practice. Such prior efficacy analysis must take precedence over any economic valuation.

10.2 Key Elements of an Effective Health Promotion Strategy

Evidence indicates that the most effective health promotion strategy is a comprehensive one, embracing interventions over the life-cycle, including prenatal counselling, school-based programs, community-based public health initiatives, worksite programs, media campaigns, physician advice in clinical settings, and programs for the elderly. Community approaches, such as public smoking bans and worksite interventions, have the potential to reach large numbers of people, while clinical programs can be highly efficacious in promoting behaviour change among high-risk individuals.[355]

Successful health promotion also sees behaviour change in the context of social, economic, and cultural conditions rather than as an isolated task controlled by an individual. It facilitates social and environmental change, enhances social networks and social supports, and ensures access to healthful foods, recreational facilities, and health care for disadvantaged groups.[356]

Health promotion is not, therefore, the exclusive concern of government health departments, but requires the close cooperation of many sectors of government, community, business, educational institutions, and the media. As a publication of the Canadian Medical Association noted nearly 20 years ago: "Health is the responsibility not just of the Ministry of Health but also of all the ministries."[357]

[354] Brown (1984), op. cit., pages 4-9 detail some of the difficulties in realizing and demonstrating the cost savings of prevention.
[355] Thompson, Beti, and Michael Pertschuk, "Community Intervention and Advocacy," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 494-495.
[356] See for example the position statement of the American Dietetic Association: "The Role of Nutrition in Health Promotion and Disease Prevention Programs – Position of the ADA," *Journal of the American Dietetic Association,* 98: 205-208, 1998.
[357] Brown, Allan, *Costs and Benefits of Preventive Medicine,* Canadian Medical Association, Department of Medical Economics, 1984, page 16.

Another analysis has noted that health behaviours respond to social and environmental stimuli:

> *"Changing the environment in which people act involves changing the rules about acceptable behavior. For example, smoking prevalence is steadily decreasing as increasingly more public areas ban or restrict smoking."*[358]

Thus, safe workplaces, improved mass transit, taxation and social assistance policies, municipal water supply inspections, and a wide range of other policies – the purview of many different government departments – can all be considered aspects of "health policy."

An effective strategy will also be targeted both at high-risk groups that are socio-economically and medically at risk, and at the general population. It will combine policy changes (taxes, budget allocations, and regulations like food and cigarette labels and smoke-free public places) with incentives to individual action and changes in insurance coverage to include preventive services like nutrition counselling and smoking cessation programs. Expanded insurance coverage will encourage clinic-based prevention as a vital adjunct to population-based approaches.

Finally, a successful health promotion strategy must have a long-term view, since current investments will realize their most substantial savings and returns 20 and 30 years hence. Since the proportion of Canada's population over 65 will nearly double in the next 30 years, the time to implement such a strategy is clearly the present if health care costs are not to spiral out of control. Fortunately the country does not have to re-invent the wheel, but can base its strategy on best practices and successful models implemented elsewhere.

Despite the challenges of crafting and implementing such a comprehensive health promotion strategy, the evidence indicates that, in addition to its health benefits, it can *also* be highly cost-effective in avoiding both direct medical costs and indirect productivity losses. Many of the components of an effective health promotion strategy have been identified earlier in this report, and this concluding section therefore focuses on just a few elements not previously discussed.

A Note on the Precautionary Principle

The Genuine Progress Index adopts the *precautionary principle* as the basis of its approach and economic assessments. The principle basically holds that when there is substantial evidence of potentially serious or irreversible risks, the lack of conclusive scientific certainty should not justify inaction to avert those risks. The principle is generally applied to environmental risks like climate change, but it can equally be applied to the field of health promotion and disease prevention, since failure to act can cause substantial avoidable death and disability, as well as spiralling public health care costs as the population ages.

For example, even though there is strong and consistent observational evidence from case-control and cohort studies demonstrating an association between dietary and lifestyle factors and

[358] Thompson, Beti, and Michael Pertschuk, "Community Intervention and Advocacy," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 496.

colorectal cancer, there are few long-term intervention trials proving that dietary modification can reduce colorectal cancer incidence. In cases like this, researchers have applied the precautionary principle:

> *"In the interim, we believe that our uncertainty about the precise relationship between diet and colorectal cancer is no excuse for failure to promote the conclusions that can be drawn from the observational studies. It seems justifiable to promote a whole food diet high in fresh fruit and vegetables, high in wheat fibre, and low in fat, particularly saturated fat, combined with regular exercise and the avoidance of obesity."*[359]

In short, a successful and effective health promotion strategy must be based on the best available evidence, rather than await final scientific certainty. It took many years to establish definitively that tobacco causes cancer and heart disease. It took many more years to establish links between these diseases and second-hand smoke. Evidence on the health impacts of diet, physical activity, socio-economic conditions, and psychosocial factors is gradually becoming available. An effective and evidence-based health promotion strategy must be dynamic and flexible enough to assess new information as it becomes available, and to respond accordingly.

[359] Robertson, Iain, Rona Bound, and Leonie Segal, "Colorectal Cancer, Diet and Lifestyle Factors: Opportunities for Prevention," *Health Promotion International* 13 (2): 141-150, 1998, page 147.

11. Worksite Health Promotion

Because so much of people's lives and time are spent in the work place, it has tremendous potential for health promotion and risk behaviour modification. Non-smoking policies, healthy food served in company cafeterias, screening and fitness programs, and other worksite interventions can affect social norms and influence the behaviour of large segments of the population. One study of heart disease prevention concluded:

> *"Even a small intervention effect in this large segment of the population has the potential to produce substantial changes in health behaviours associated with increased risk of CHD in the employed population."*[360]

Employers have found that such interventions can save them money, especially in the United States, where the employer rather than the state often provide health insurance. Numerous studies of employee medical claims have demonstrated that medical costs are directly related to health risks and health behaviours: Workers with fewer risk factors incur lower medical costs.[361]

One major study of 46,000 U.S. employees found that seven modifiable health risks were associated with significantly higher health expenditures. Compared to lower-risk workers, depressed workers had 70% higher medical costs and highly stressed workers had 46% higher costs. Those with high blood sugar had 35% higher costs; those with unhealthy weights had 21% higher costs; smokers had 14-20% higher costs; workers with high blood pressure had 12% higher costs; and physical inactivity incurred 10% higher costs. Multiple risk factors increased medical costs sharply for heart disease, psychosocial problems, and stroke.[362]

An assessment of nearly 46,000 DuPont employees in the U.S. found that those with behavioural risk factors had significantly higher absenteeism and illness costs than those without risks. Smoking cost $1,651 (C$2002) a year in excess illness costs; overweight cost $690; excess alcohol $670; elevated cholesterol $637; high blood pressure $607; and lack of exercise $224, per person at risk. Projected to the total company workforce, preventable illness was estimated to cost DuPont more than $121 million a year, a conservative estimate because it excluded spouses, dependants, and retirees who receive company paid health care.[363]

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[360] Sorenson, Glorian, and Jay Himmelstein, "Worksite Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 518.

[361] Edington, Dee, Louis Tze-ching, and Pamela Witting, "The Financial Impact of Changes in Personal Health Practices," *Journal of Occupational and Environmental Medicine* 39 (11): 1037-1046, November, 1997, pages 1037-8, and endnotes 23-33.

[362] Goetzel, Ron, David Anderson, R. William Whitmer, Ronald Ozminkowski, Rodney Dunn, Jeffrey Wasserman, and HERO Research Committee, "The Relationship Between Modifiable Health Risks and Health Care Expenditures: An Analysis of the Multi-Employer HERO Health Risk and Cost Database," *Journal of Occupational and Environmental Medicine* 40 (10): 843-854, October, 1998.

[363] Bertera, Robert, "The Effects of Behavioural Risks on Absenteeism and Health-Care Costs in the Workplace," *Journal of Occupational Medicine,* 33 (11): 1119-1124, November, 1991; both cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography,* Prevention and Health Promotion Branch, Ministry of Health, B.C., July, 1996, page 26. (C$2002 $1,651 = US$1991 $960; C$2002 $690 = US$1991 $401; C$2002 $670 = US$1991 $389; C$2002 $637 = US$1991 $370; C$2002 $608 = US$1991 $353; C$2002 $224 = US$1991 $130; C$2002 $120.4 million = US$1991 $70 million.)

There is abundant evidence that worksite health promotion programs are successful in reducing personal health risk factors and associated medical costs.[364] They have also demonstrated indirect benefits in attracting and retaining key personnel; reducing absenteeism, training costs and accidents; enhancing productivity; and improving public image, morale, and allegiance to the company by employees.[365]

Workplace health actions that include smoking cessation and weight loss programs, provision of healthy cafeteria and vending machine choices, onsite blood pressure monitoring, and counselling, have been shown to save an average of $2 in reduced operational costs and productivity gains for every $1 invested.[366]

For example, the DuPont intervention, designed to reduce the health costs described above, produced a 14% decline in disability days, and a return of $2.05 at the end of two years for every $1 invested in the program. Because chronic disease disability produces long-term costs, these benefits and returns can be expected to accumulate and increase over time. Johnson and Johnson's "Live for Life Program" also produced unintended side-benefits in higher worker morale and improved attitudes about the organization, supervisors, work conditions, job security and benefits, in addition to lowered health care costs for the company.[367]

Worksite nutrition and physical activity programs have proved inexpensive and effective in educating workers, reducing weight and fat intake, lowering blood cholesterol levels, and reducing the risks of cardiovascular disease and diabetes.[368] Trends are encouraging: In the U.S., the number of worksites with more than 50 employees offering nutrition or weight management programs more than doubled, from 15% in 1985 to 37% in 1992.[369]

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[364] Edington et al., op. cit., page 1037 and endnotes 5-13.

[365] Pelletier, Kenneth, "A Review and Analysis of the Health and Cost-Effective Outcome Studies of Comprehensive Health Promotion and Disease Prevention Programs at the Worksite: 1991-1993 Update," *American Journal of Health Promotion* 8 (1): 50-73, September-October, 1993.

[366] Hyatt, Joshua, "Healthy Returns, *INC,* April, 1987; Bertera, Robert, "The Effects of Behavioural Risks on Absenteeism and Health-Care Costs in the Workplace," *Journal of Occupational Medicine,* 33 (11): 1119-1124, November, 1991; both cited in Province of British Columbia (1996), *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography,* Prevention and Health Promotion Branch, Ministry of Health, B.C., July, 1996, p. 26.

[367] Sorenson, Glorian, and Jay Himmelstein, "Worksite Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 519.

[368] Hartman, Terryl, et al., "Use of Eating-Pattern Messages to Evaluate Changes in Eating Behaviours in a Worksite Cholesterol Education Program," *Journal of the American Dietetic Association,* 93 (10): 1119-1123, October, 1993; Himburg, Susan, and Michele Keane, "Cost-Benefit Analysis as an Evaluation Technique in Nutrition Education Prorgrams," *Journal of Nutrition Education* 26: 51B, 1994; Briley, Margaret, and Deanna Montgomery, "Worksite Nutrition Education Can Lower Total Cholesterol Levels and Promote Weight Loss among Police Department Employees," *Journal of the American Dietetic Association,* 92 (11), November, 1992; Engotti, Catherine, and Marshal Levin, "Review of 5 Years of a Combined Dietary and Physical Fitness Intervention for Control of Serum Cholesterol," *Journal of the American Dietetic Association,* 94 (6): 634-638, June, 1994; Shannon, Barbara, et al., "A Comprehensive Evaluation of a Worksite Nutrition and Weight-Control Program," *Journal of Nutrition Education,* 19 (3): 109-116, 1987; Byers, Tim, et al., "The Costs and Effects of A Nutritional Educational Program following Work-Site Cholesterol Screening," *American Journal of Public Health,* 85 (5): 650-655, May, 1995; all cited in Province of British Columbia (1996), op. cit., pages 27-28.

[369] "The Role of Nutrition in Health Promotion and Disease Prevention – Position of the ADA," *Journal of the American Dietetic Association,* 98: 205-208, 1998.

The evidence also indicates that worksite health promotion programs must be geared both to high-risk and low-risk workers if they are to yield the maximum financial benefits. Since 10% of employees account for as much as two-thirds of medical costs, it is clearly prudent to target high-risk workers.[370]

However, an important longitudinal study indicates that the population of high-risk workers is not static. Employees who moved from high-risk to low-risk status over a 6-year period significantly reduced their average medical costs, while employees moving from low-risk to high-risk status over the same period incurred a significant increase in average medical costs.[371] The authors conclude:

> *"First, the study shows that personal health risk management is associated with significant financial benefits in the employees' medical claims costs. Second, the study indicates that specific attention must be given to both low- and high-risk populations. Facilitating the individuals' risk change from high- to low-risk and preventing the individuals' risk change from low- to high-risk are two key components for a successful strategy…. [P]romoting worksite health and wellness should be a sound investment for the nation's well-being, vitality, and health care cost containment."*[372]

It was noted in Part IV of this report that various patterns of work stress, including high demands, excessive time pressures, and low control or autonomy, have been shown to increase the risk of heart disease. Yet most worksite interventions are aimed entirely at individual risk reduction and individual behaviour change. According to one analyst:

> *"A major obstacle to the success of programs aimed exclusively at the individual is their lack of attention to conditions in the work environment and in the structure of work that are also associated with increased CHD risk…. An exclusive focus on individual lifestyle factors runs the risk of deflecting attention away from potentially serious health hazards and effects of the work environment…. A focus on individual behavior change may also lead to blaming the victim and may take on a moralistic tone.*
>
> *Efforts that target individual behavior change must [therefore] be integrated with changes in the worksite environment and in the structure of work to maximize the potential for CHD risk reduction in the worksite. Environmental and organizational changes underline the fact that employer actions are an integral part of a comprehensive approach to worksite health."*[373]

An effective worksite health promotion strategy will therefore attempt to redesign jobs and restructure the work organization to increase job control and reduce job strain and heart disease risk.

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[370] Edington et al., op. cit., page 1044.
[371] Edington et al., op. cit., pages 1037 and 1043.
[372] Edington et al, page 1045.
[373] Sorenson, Glorian, and Jay Himmelstein, "Worksite Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 518-520, 532, 535.

12. School-Based and Childhood Interventions

It is now well accepted that the lifestyle behaviours that either prevent or promote chronic diseases are established in childhood, and that they are increasingly difficult to change once the patterns are set. Most adult smokers begin smoking in their teenage years, poor eating habits are acquired early in life, and physical activity in adulthood often has its roots in childhood. One U.S. study has found that by age 12, at least one modifiable heart disease risk factor exists in 36-60% of U.S. children.[374] In fact, there is evidence that the atherosclerotic process itself begins in childhood.[375]

One study summarized the prevailing wisdom among health researchers that:

> *"[P]sychosocial conditions of childhood contribute to behaviors that are associated later with adult behavioral risk factors and may ultimately lead to cardiovascular disease morbidity and mortality…. The logic for intervention in the school is even clearer than that for the worksite, because habits developed here last for a lifetime."*[376]

School provides the greatest opportunity to reach large numbers of children for several hours a day, five days a week, 36 weeks a year, for many years. School health services, including effective risk factor screening and opportunities for individual counselling; health instruction, including regular physical activity; and a healthy school environment, including nutritious food services, all contribute to the development of skills, knowledge, and behaviour that can last into adulthood. In fact, these elements are profoundly interrelated:

> *"It is unrealistic to expect school health education programs to achieve their objectives of smoking prevention and improved nutrition if the school environment sends out conflicting messages."*[377]

The cost-effectiveness of school-based smoking prevention curricula has been described above, with field trials demonstrating a $15 saving in avoided health care costs and economic losses for every $1 invested. School-based physical activity, nutritional education programs, and healthy school lunches have also been noted as crucial in establishing effective preventive behaviours in adulthood.

There have been some notable successes that can be used by Canada as models of best practices. California has reduced its rate of teenage smoking to less than 7%. An earlier GPI Atlantic report on the cost of obesity described healthy lunch programs in Berkeley, California, and a successful

[374] Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 543 and 545.
[375] Williams, Christine, "Intervention in Childhood," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 433-434.
[376] Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 543, and page 541 (editor's introduction).
[377] Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 542-543.

school-based nutrition and physical activity program in Singapore that reduced teenage obesity rates by 30-50%.[378]

However, population trends, including a doubling of the childhood obesity rate since the 1980s, and the fact that teenage smoking rates in Canada have not declined at the same rate as the general population, raise serious concerns. There is, as yet, little evidence of widespread and concerted school-based and childhood health promotion and disease prevention interventions either in Canada as a whole or on the provincial level.

The obstacles to effective school-based disease prevention and health promotion are considerable. There are generally insufficient funds and resources for high-quality school health education; curricula are already overcrowded; and teachers are often overwhelmed by existing responsibilities and lack proper training.[379] Additional in-service training is clearly needed, but may be resisted. In addition, teachers and school officials are battling against dominant social patterns that threaten to undo their best efforts.

For example, current work patterns militate against effective nutritional interventions in the home. Throughout Canada there has been a very rapid growth in the employment of women with children. 54% of mothers with infants under 3 years old are now employed, more than double the rate 40 years ago. 60% of those with children aged 3-5, and nearly 70% of those with children aged 6 and over are employed.[380]

As noted above, Statistics Canada time use surveys indicate that the average working mother puts in 75 hours a week of paid plus unpaid work, with 38% of working mothers classified as "severely time stressed." In these circumstances, fast foods, often high in saturated fat, may well be the dinner of choice.

Similar disturbing evidence abounds with regard to physical inactivity, with fewer children walking or bicycling to school, cuts in physical education classes in many schools, and more time spent playing video and computer games or watching TV. Statistics Canada's 1998 time use survey indicates that Canadians watch an average of 2.2 hours of television per day, not counting the time when the TV is turned on and they are doing other activities such as eating. This brings the time to about 3 hours daily.[381]

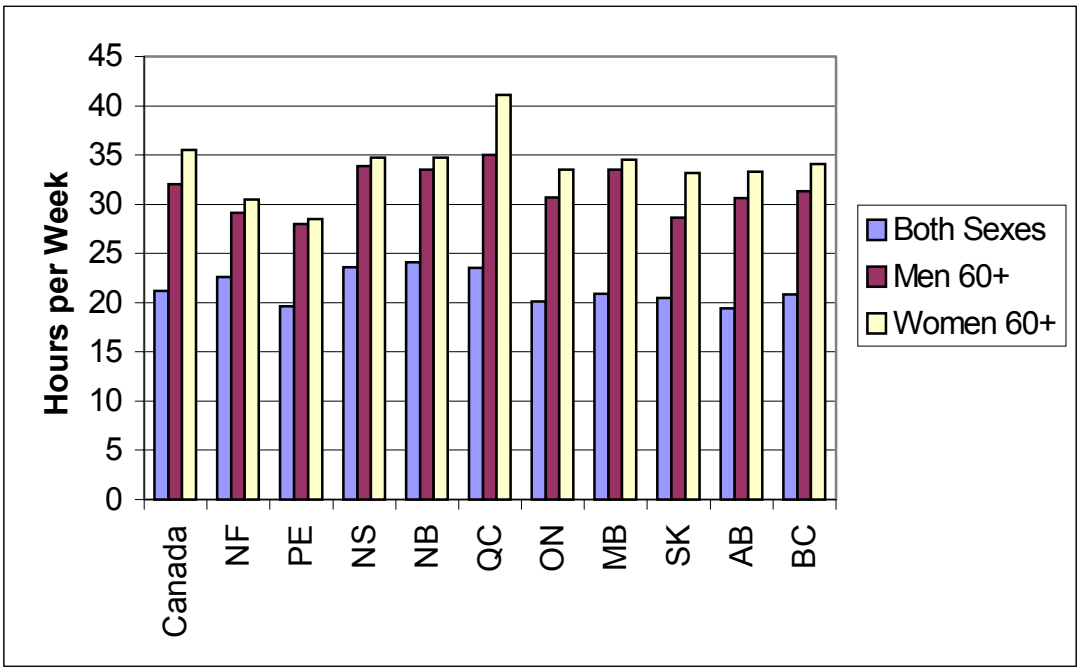
However, the Culture Statistics Program's Television Project reported some encouraging statistics from their 2001 survey: The project found that, despite increased access to both cable and satellite transmission, the amount of time Canadians spend watching TV (21.1 hours a week in the fall of 2001) has stayed the same in the three intervening years. As well, TV viewing

[378] Colman, Ronald, *The Cost of Obesity in Nova Scotia,* GPI Atlantic, Halifax, NS, 2000.
[379] Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 547-548.
[380] Statistics Canada, *Women in the Workplace,* 2nd edition, catalogue no. 71-543E.
[381] Statistics Canada, *General Social Survey: Overview of the Time Use of Canadians in 1998,* Table 1: Canada, regions and provinces, special tabulation, November, 1999.

among teens has actually gone down by more than two hours a week and one hour for children.[382]

New Brunswick showed the highest average number of hours of TV watching per week among all ages at 24.1 while Alberta (at 19.4 hrs.) and PEI (at 19.6) had the lowest. The segment of the population that watches the most TV per week is the 60 and up group, with men watching an average of 32 hours per week and women 35.5. For both men and women over 60, Quebec has the highest number of hours per week at 35 and 41.1 respectively, while Prince Edward Island has the lowest for both at 28 and 28.5 hours respectively[383] (Figure 38).

Figure 38. Average Hours/Wk of TV Watching, Canada, Provinces, Both Sexes (All Ages), and Men/Women (60+), Fall 2001



Source: Statistics Canada, The Daily 2 December 2002, "Television viewing," available at http://www.statcan.ca/Daily/English/021202/d021202a.htm.

The American Academy of Pediatrics reports that "increased television use is documented to be a significant factor leading to obesity,"[384] and may help explain why 25% of U.S. children today are overweight or obese. Another study, published in the Journal of the American Medical Association, found that children lost weight if they simply watched less television.[385]

[382] [382] Statistics Canada, "Television viewing," *The Daily*, 2 December 2002, available at: http://www.statcan.ca/Daily/English/021202/d021202a.htm.
[383] Op. Cit. Statistics Canada, *The Daily*, 2 December 2002.
[384] "Media Education," *Pediatrics,* volume 104, no. 2, August 1999, pages 341-343, available at www.aap.org/policy/RE9911.html.
[385] Thomas N.Robinson, "Reducing Children's Television Viewing to Prevent Obesity; A Randomized Controlled Trial," *Journal of the American Medical Association,* volume 282, no. 16, October 27, 1999, pages 1530-1538.

What kind of interventions can effectively counter these disturbing social trends? In Halifax, a teacher made a pact with her students not to watch television for a full week, and asked them to keep a journal of what they did in the extra time. After a couple of nervous days in which the children did not know what to do with their time, they became acutely conscious of just *how much* time they actually spent watching TV. In the next days, however, they began to enjoy walks with their families, to play in the park, and engage in higher levels of physical activity that became increasingly enjoyable to them as the week progressed. This is an experiment worth replicating on a wider scale throughout the country.[386]

On a more systemic level, daily school-based physical activity, provision of healthy lunches in school cafeterias, nutritional education, and the adoption of some type of smoking cessation curriculum could help reduce childhood risk factors for chronic disease.

School-based prevention programs will be effective to the degree that they are appropriate to the age, culture, and circumstances. For example, field trials indicate that no-smoking policies in schools (including for teachers and administrators), and programs emphasizing social influences, refusal skills (to resist peer pressure), and short-term physiological effects, may be more successful in reducing teenage smoking rates than the longer-term chronic disease warnings that are more appropriate to adult programs (such as the warnings on cigarette packaging, for example). In general, it has been demonstrated that curricula based on skills will be more effective than curricula based on knowledge alone.[387]

As noted, changes in the school environment may also be necessary. A shift is required from the current emphasis in many schools on sports competition among the best athletes to more regular physical activity and health-related fitness for all students. As well, school food services can be changed to help train children's palates at a young age to enjoy foods low in total and saturated fats, salt, and sugar, and high in whole grains, fruits, and vegetables. One experiment found that training school food-service workers in food-buying and preparation helped reduce saturated fat intake among students by 20% and sodium intake by 15-20% even without a corresponding educational component.[388]

In some cases school-based health promotion programs may be in consonance with prevailing public norms and attitudes (such as the desirability of smoking cessation and physical activity.) In other cases, teacher training may be required to challenge such norms. For example, a 1992 National Institute of Nutrition study found that food labels are widely misunderstood and misinterpreted, with little comprehension of ingredient lists and nutrition panels, and widespread confusion about the validity of food claims on labels.[389] One analyst has commented:

[386] Colman, R. 2002. The cost of Chronic Disease in Nova Scotia, available at www.gpiatlantic.org.
[387] Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 543.
[388] Study cited in Colman, Ronald, *The Cost of Obesity in Nova Scotia,* GPI Atlantic, Halifax, March, 2000; Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 543-545.
[389] Nova Scotia Heart Health Program, *Report of the Nova Scotia Nutrition Survey,* March 1993, page 32.

> *"Unfortunately the vagaries of current food-labeling practices often leave consumers confused or with inadequate information."*[390]

Few teachers have the training to take a class of school children on a supermarket tour that explains the health and nutritional benefits and costs of different types of foods.

Despite the obstacles they face, school-based programs have been shown to be successful, essential, and cost-effective in reducing chronic disease risks that begin in childhood and are generally carried through to adulthood. It has been suggested that health care providers and health professionals in school clinics can play a pivotal role in designing, promoting, and coordinating school-based preventive activities. These health professionals also have a unique opportunity to complement school-based programs with family and home-based interventions.[391]

In order to further influence childhood behaviour in the home, it has also been recommended that physicians assess risk factors for families as a whole, since lifestyle patterns are commonly shared. For example, one study found that 90% of children with cholesterol levels of 200 mg/dl or more have at least one parent with hypercholesterolemia. Family treatment and family counselling by physicians may therefore be an effective means of preventing illness and reducing chronic disease risk factors in children.[392]

[390] Thompson, Beti, and Michael Pertschuk, "Community Intervention and Advocacy," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 499.
[391] Eriksen, op. cit., page 548.
[392] Williams, Christine, "Intervention in Childhood," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 445 and 463.

13. Clinical Preventive Services

Brief advice from a physician has been shown to be highly effective in preventing disease and promoting health, because the general public regards physicians as the most reliable and credible source of health information. Eighty percent of Canadian adults see a doctor an average of four times a year. Physicians have the opportunity to take advantage of "teachable" moments when these patients are concerned about their health.[393]

According to one analysis:

> *"Physicians and other members of the health care team are uniquely and powerfully situated in their routine office practices to educate patients about the relationship of certain behaviors to CHD and to help them develop the skills required to make behavioral changes. Thus, they play a pivotal role in the prevention of CHD…. Physicians are perceived by the general public as the most reliable and credible source of health information and advice. Patients generally prefer to receive as much information as possible from physicians, who often do not appreciate this desire and underestimate how much information patients actually want."*[394]

Primary health care settings also constitute an ideal environment for the transferral of such advice and information, because they are the first level of contact of individuals, families, and communities with the national health care system, and because they bring health care as close as possible to where people actually live and work.[395] Primary health care also provides a continuity of care that allows physicians to repeat and reinforce messages to their patients, and to follow up on efforts to alter lifestyle patterns. Evidence indicates that even 3-4 minutes of focused physician counselling and advice can be effective, especially if backed up by other office services and self-help materials.[396]

Yet surveys indicate that physicians frequently do not provide information and advice on disease prevention to their patients, either because they feel untrained and uninformed in this area, because of time pressures, or because they are not reimbursed for the time spent providing such preventive counselling.[397] A U.S. insurance company survey found that 70% of Americans considered their doctors useful and reliable sources of health information, a higher proportion than for any other source of information, but less than half said they actually got much health

[393] Stachenko, Sylvie, Director, Preventive Health Services, Health Canada, *Preventive Guidelines: Their Role in Clinical Prevention and Health Promotion,* Health Canada, Ottawa, page xxi.
[394] Ockene, Judith, and Ira Ockene, "Helping Patients to Reduce Their Risk for Coronary Heart Disease: An Overview," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 174; see also footnotes 12-18, page 197, providing substantiating evidence for these statements.
[395] Definition of primary care from World Health Organization (1978), "The Alma Ata Conference on Primary Health Care," *WHO Chronicle,* 32: 409-430, page 418.
[396] Ockene, Judith, and Ira Ockene, "Helping Patients to Reduce Their Risk for Coronary Heart Disease: An Overview," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 174-175.
[397] Ibid., page 175.

information from their doctors.[398] One 1999 U.S. survey found that 35% of smokers did not receive advice to quit when visiting a health care professional.[399]

Although the public perceives physicians as the most useful source of nutrition information, only 23% of medical schools in the U.S. require a separate nutrition course, and half of U.S. physicians feel ill-prepared to provide diet counselling.[400] Not surprisingly, 77% of surveyed physicians felt they would need additional education in order to advise patients effectively about needed dietary modification.[401] Many physicians report lack of time, knowledge, financial incentives, and confidence in their counselling skills as reasons they do not provide this advice.[402]

As noted in Part V, physician training in preventive medicine is essential if health care costs associated with an aging population are not to escalate out of control. A U.S. assessment found that physicians have been poorly trained in making the diagnosis of protein calorie malnutrition in elderly patients, or in recognizing those at risk of developing nutritional problems. They are often unaware that malnutrition or under-nutrition may be the presenting feature of a number of treatable diseases in older persons, they do not know how to manage the problem, and they are unaware of its treatable causes (including depression, eating disorders, and inappropriate use of drugs).[403]

Fortunately these deficiencies are easily remedied. Teaching the basics of nutritional assessment and intervention to physicians and nursing staff in a general medical ward dramatically improved their ability to identify patients at nutritional risk, and increased the frequency of nutritional assessments, consultations and provision of nutritional supplements. That study concluded that physician education could remedy the poor capacity of physicians to recognize and treat under-nutrition and malnutrition, and is highly cost-effective in preventing medical complications, reducing hospital stays and medical costs, and improving quality of care.[404]

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[398] Brown, Allan, *Costs and Benefits of Preventive Medicine,* Canadian Medical Association, Department of Medical Economics, 1984, page 15.

[399] Coffield, Ashley, et al., "Priorities Among Recommended Clinical Preventive Services," *American Journal of Preventive Medicine* 2001; 21 (1): 1-9, pages 1-2.

[400] Gardner. Gary, and Brian Halweil, "Nourishing the Underfed and Overfed," chapter 4 in Worldwatch Institute, *State of the World 2000,* W.W. Norton and Co., New York, 2000, pages 76-78; and Glanz, Karen, "Nutritional Intervention: A Behavioral and Educational Perspective," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 232.

[401] LaRosa, John, et al., "Practical Strategies for the Dietary Management of Hypercholesterolemia," cited in Province of British Columbia (1996), op. cit., page 20.

[402] Glanz, Karen, "Nutritional Intervention: A Behavioral and Educational Perspective," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, page 233.

[403] Morley, John, "Why Do Physicians Fail to Recognize and Treat Malnutrition in Older Persons?" *JAGS* 39: 1139-1140, November, 1991; Morley, John, "Death by Starvation. A Modern American Problem?" *Journal of the American Geriatrics Society* 37 (2): 184-185, February, 1989; both cited in Province of British Columbia (1996), op. cit., page 29.

[404] Roubenoff, Ronenn, et al., "Malnutrition Among Hospitalized Patients – A Problem of Physician Awareness," *Arch Intern Med.,* 147: 1462-1465, August, 1987; Schwartz, Denise, "Enhanced Enteral and Parenteral Nutrition Practice and Outcomes in an Intensive Care Unit with a Hospital-Wide Performance Improvement Process," *Journal of the American Dietetic Association,* 26 (5): 484-489, May, 1996; both cited in Province of British Columbia (1996), op. cit., page 53.

In addition to lack of training, doctors and health administrators cite lack of reimbursement as a key reason for the absence of routine nutrition screening and treatment. Yet 80% of 750 health professionals surveyed believe the money saved from fewer illnesses and faster recoveries would offset the costs of nutrition screening and intervention.[405] The American Diabetes Association has recommended third party payment for outpatient education and nutritional counselling.[406] Until health insurance covers primary prevention services, health promotion and disease prevention are likely to remain population-based rather than clinic based, whereas an effective, comprehensive strategy clearly requires both approaches.

This understanding is not new, and the health care payment and incentive system has been blamed as one of the prime culprits in the failure to realize the benefits of preventive interventions. Nearly 20 years ago, a publication of the Canadian Medical Association noted that:

> *"[D]octors and hospitals cannot be expected to provide additional preventive services unless there are appropriate incentives…. Under the present [fee-for-service] systems of payment, practitioners may be penalized for emphasizing prevention and health maintenance and for employing allied health personnel to help provide these services. Counselling is important in many of these services and there is only limited provision in physician payment schedules for this purpose. Many aspects of preventive medicine lend themselves poorly to payment on an item-by-item basis and hourly rates may be necessary to provide the needed incentive…. {I]t does seem that the benefits of preventive methods have not been realized to their optimal level due to the lack of incentives in the present health care payment system."*[407]

The same author noted the need for changes in federal–provincial cost sharing agreements on health care to include a wider range of preventive interventions, and financial support for physician training programs in preventive counselling. Those observations are as pertinent today as they were in 1984.

When offered, clinical preventive services can be effective. The U.S. Department of Health and Human Services, in a literature review, concludes that 2.5% of smokers who would not have otherwise quit did so following 3 minutes or less of clinician advice.[408] Initial brief physician advice may be followed by more extensive counselling and use of nicotine replacement therapy, which in turn lead to higher quit rates.[409]

[405] "Providers Estimate One in Four Seniors Malnourished," *CNI* 23 (16), April 30, 199; Hart, Peter, quoted in *Nutrition Screening Initiatives Newsletter,* July, 1993, cited in Province of British Columbia (1996), pages 42, 43.
[406] Kaplan, Robert, and Wayne Davis, "Evaluating the Costs and Benefits of Outpatient Diabetes Education and Nutrition Counselling," *Diabetes Care,* 9 (1), January-February, 1986, cited in Province of British Columbia (1996), op. cit., page 49.
[407] Brown, Allan, *Costs and Benefits of Preventive Medicine,* Canadian Medical Association, Department of Medical Economics, 1984, page 15.
[408] Cited in Maciosek, Michael, et al. "Methods for Priority Setting Among Clinical Preventive Services," in *American Journal of Preventive Medicine,* 2001; 21 (1): 10-19, page 14.
[409] Maciosek et al., op. cit., pages 14-15.

One analysis of 30 clinical preventive services found that tobacco cessation counselling was the second most effective clinical intervention that physicians could undertake (after vaccinating children), both in terms of cost-effectiveness and actual burden of illness avoided. Among services with low delivery rates, it received the highest priority classification.[410]

The Canadian Task Force on the Periodic Health Examination has concluded that a periodic health examination targeted at preventing, detecting, and controlling specific conditions and risk factors for different age, sex, and high-risk groups is likely to be more effective than a routine annual physical examination.[411]

Surveys indicate that time barriers are a major obstacle to effective patient counselling for risk factor modification. It has therefore been recommended that integrated offices bringing together physicians, nurses, dieticians, and other personnel may provide the most effective environment for prevention-oriented practice. One such analysis delineates the essential processes of a systematic, office cardiovascular-risk-reduction program as: screening; recording of information; physician intervention; assistance with education and behaviour change; follow up; and outreach. Of these six steps, five can be undertaken primarily by office staff other than the physician.[412]

Physicians can play a crucial role in helping patients overcome some of the deeper psychosocial stresses and causes of chronic disease through active and mindful listening, and through compassionate, non-judgmental communication with patients. In fact, studies have shown that a psychosocial intervention can have a positive impact on the quality of life of CHD, cancer, and HIV/AIDS patients.[413] This positive effect can result in increased survival rates for CHD and cancer patients, and to improved immune status in HIV/AIDS patients.[414]

Jon Kabat-Zinn argues that physicians with a psychosocial perspective on the causes of chronic disease rather than a purely medical one "can make substantial contributions to the life and health of their patients with strategies that consume little time and energy but that can potentially produce powerful returns." Most important, he notes, is the quality of the relationship between

[410] Coffield et al., op. cit., pages 1 and 5.
[411] Cited in Stachenko, Sylvie, Director, Preventive Health Services, Health Canada, *Preventive Guidelines: Their Role in Clinical Prevention and Health Promotion,* Health Canada, page xix.
[412] Solberg, Leif, et al., "The Prevention-Oriented Practice," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 469-490.
[413] Dusseldorp, E., van Elderen, T., Maes, S., Meulman, J., and Kraaij, V. "A Meta-Analysis of Psychoeducational programs for Coronary Heart Disease Patients, *Health Psychology*, 18, 1999, pages 506-519; Andersen, B.L. "Psychological Interventions for Cancer Patients to Enhance the Quality of Life," *Journal of Consulting Clinical Psychology*, 60, 1992, pages 552-568; Lutgendorf, S., Antoni, M., Ironson, G., Klimas, N., Kumar, M., and Starr, K. "Cognitive Behavioral Stress Management Decreases Dysphoric Mood and Herpes Simplex Virus Type-2 Antibody Titers in Symptomatic HIV Seropositive Gay Men," *Journal of Consulting Clinical Psychology*, 65, 1997, pages 31-43.
[414] Linden, W., Stossel, C., and Maurice, J. "Psychosocial Interventions for Patients with Coronary Artery Disease," *Archives of Internal Medicine,* 156, 1996, pages 745-752*;* Fawzy, F.I., Fawzy, N.W., Hyun, C.S., Elashoff, R., and Guthrie, D. "Malignant Melanoma: Effects of an Early Structured Psychiatric Intervention, Coping and Affective State on Recurrence and Survival 6 Years Later," *Archives of General Psychology*, 50, 1993, pages 681-689; Esterling, B., Antoni, M., Schneiderman, N., Ironson, G., and Carver, C.S. "Psychosocial Modulation of Antibody to Epstein-Barr Viral Capsid Antigen and Herpes Virus Type-6 in HIV-1 Infected and at Risk Gay Men," *Psychosomatic Medicine*, 54, 1992, pages 354-371.

the physician and patient, with the physician simply being fully present and listening with attentiveness and compassion rather than feeling pressured to "fix" the patient's problems. He points to several studies that show a significant relationship between patient satisfaction and the ability of a physician simply to express caring and concern in the medical encounter.[415]

Kabat-Zinn outlines effective methods and stages of physician intervention designed to alter psychosocial risk factors. These begin with observation and assessment and proceed to an exploration of the patient's commitment to change. Brief advice and provision of information (2-3 minutes) may be followed by an additional 3-5 minutes of patient-centred counselling to determine existing strengths and resources, and to produce a plan for change. There may be referrals for more intensive counselling, assistance, or support, and there will always be some follow-up, maintenance, and monitoring of the patient's actions by the physician.[416] In short, preventive clinical interventions can go well beyond conventional medical treatment, and address the full range of deeper determinants and root causes of chronic disease.

[415] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 300 and 317.
[416] Kabat-Zinn, Jon, "Psychosocial Factors: Their Importance and Management," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease,* Little, Brown, and Company, Boston, 1992, pages 319-327.

14. Preventive Alternative Treatments

There is now considerable evidence that, while conventional western medicine is a powerful treatment and surgery tool, alternative therapies may have an important role in disease prevention, particularly in the secondary and tertiary prevention designed to control existing medical conditions.

For example, small-scale studies have found that acupuncture, an ancient form of Chinese medicine, can be highly cost-effective in treating patients with osteoarthritis, back pain, stroke, angina pectoris, and other chronic conditions, avoiding costly surgery and hospital visits, and facilitating a more rapid return to employment. Cost savings estimates range from $12,822 (C$2002) per patient for avoided surgeries in patients with severe osteoarthritis to $41,936 per patient in reduced hospital and nursing home days for stroke victims.[417] For heart disease victims, cost savings averaged $19,918 per patient in avoided surgeries and hospital stays, and another $27,577 in avoided productivity losses due to an increase in patients able to return to work.[418, 419]

Chiropractic care has also been found to be cost-effective in treating musculoskeletal disorders, which are the most prevalent of all chronic conditions, and account for the highest disability costs and second highest overall costs of any disease, after circulatory disorders and ahead of cancers. A 1998 University of Ottawa study concluded that improved access to chiropractic services would lead to very substantial net savings in direct and indirect costs. Direct savings to Ontario's health care system are estimated at more than $500 million annually, while indirect cost savings to the province in avoided disability are estimated at nearly $2 billion.[420] Extrapolated to Canada according to population, these estimates indicate potential savings of $1.3 billion a year to the health care system, and $5 billion in productivity gains.

The study also found that the poor, lower middle class, and the elderly were significantly less likely to access and use chiropractic care, due to the deterrent effect of high co-payment or user fees, even though these groups suffer from a greater prevalence of neuromusculoskeletal

[417] To convert US$1992 to C$2002, exchange rates from http://www.x-rates.com/cgi-bin/hlookup.cgi show US$1 = $1.1972 Cdn on 30 June, 1992. Therefore calculation (1): 1.1972 X $9000 = $10,775 (C$1992), and calculation (2): 2002 CPI (119) divided by 1992 CPI (100) X $10,775 = $12,822. To convert US$1994 to C$2002, exchange rates from http://www.x-rates.com/cgi-bin/hlookup.cgi show US$1 = $1.3825 Cdn on 30 June, 1994. Therefore calculation (1): 1.3825 X $26,000 = $35,945 (C$1994), and calculation (2): 2002 CPI (119) divided by 1994 CPI (102) X $35,945 = $41,936.

[418] Findings from these and other studies are described in Birch Stephen, and Richard Hammerschlag, *Acupuncture Efficacy: A Compendium of Controlled Clinical Trials,* 1996, and summarized on the Web site of the Acupuncture and Oriental Medical Alliance at: www.acuall.org/acutreat.htm.

[419] To convert US$1996 to C$2002, exchange rates from http://www.x-rates.com/cgi-bin/hlookup.cgi show $US1 = $1.3635 Cdn on 30 June, 1996. Therefore calculation (1): 1.3635 X $13,000 = $17,725 (C$1996), and calculation (2): 2002 CPI (119) divided by 1996 CPI (105.9) X $17,725 = $19,918. The same process is repeated for the other conversion on this page: $18,000 US (1995) = $27,577 Cdn (2002),

[420] Manga, Pran, and Doug Angus, *Enhanced Chiropractic Coverage under OHIP as a Means of Reducing Health Care Costs, Attaining Better Health Outcomes and Achieving Equitable Access to Health Services,* University of Ottawa, February, 1998. Available from Prof. Pran Manga, Professor, Health Economics, University of Ottawa.

conditions. The authors argue that this socio-economic disparity contributes to the high use among these groups of medical services, drugs, and hospital care, frequently with poorer health outcomes. They conclude that improved coverage of chiropractic care under public and private insurance systems can both save money and increase equity. They further argue for a shift from the biomedical model for treating back and neck pain based on diagnostic testing, drugs and bed rest to a biopsychosocial model, including activities/exercise, patient education, spinal manipulation, and restoration of function.[421]

Other claims on the efficacy and cost-effectiveness of alternative medicine abound. A regimen of diet, exercise, meditation, and herbal supplements was found to reduce total medical costs by more than 50% over five years compared to the norm, and to reduce hospital days among older adults by 88%.[422]

Large cohort and longitudinal studies are clearly needed to explore the efficacy of alternative treatments more thoroughly than has been the case to date. Yet this is unlikely in the absence of dedicated research funding. In the U.S., $12 billion a year is allocated for research to the National Institutes of Health, but only $5.4 million (or 0.05%) goes to the Office of Alternative Medicine to investigate the claims of some 50 therapies. Yet surveys show that one-third of Americans spend $12 billion a year visiting alternative physicians at least once a year.[423] The potential cost-effectiveness of these alternative treatments in illness prevention, avoided surgeries and hospital stays, productivity gains, and chronic disease control, argues for more intensive investigations of their efficacy.

One three-year study currently under way at the Stanford Center for Research in Disease Prevention aims to reduce disability and disease among older adults through the regular practice of meditation, emphasis on a plant-based diet, eastern and western exercise, social support, community service, and appropriate use of both conventional and alternative medicine. Dependent variables being measured at periodic intervals include basic physical assessments, psychosocial variables, and cognitive function. Its stated goal is to provide evidence to insurance companies and Medicare that may encourage the inclusion of such programs in existing health plans.[424]

[421] Manga and Angus, op. cit., pages 4, and 59-61.
[422] *American Journal of Managed Care*, 3 (1997): 135-144; *Psychosomatic Medicine 49,* (1987), 493-507, both cited in Mead, Geoffrey, *Creating a disease-free society through prevention-oriented health care,* available at: http://www.natural-law-party.org.uk/UKmanifesto/health0.htm.
[423] Goldberg, Burton, "You Don't Have to be Sick," *Alternative Medicine Magazine,* cited at: www.garynull.com and www.alternativemedicine.com.
[424] Haskell, William et al., "Successful Aging: A Proposed Intervention to Elicit and Sustain Optimal Health for Individuals Age 55-75," Stanford Center for Research in Disease Prevention, available at: http://prevention.stanford.edu/research/studies/aging_sage.html.