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Genuine Progress Index for Atlantic Canada / Indice de progrès véritable - Atlantique

MEASURING SUSTAINABLE DEVELOPMENT

APPLICATION OF THE GENUINE PROGRESS INDEX TO NOVA SCOTIA

THE COST OF CHRONIC DISEASE IN
NOVA SCOTIA

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EXECUTIVE SUMMARY

Four types of chronic disease kill an estimated 5,800 Nova Scotians every year, account for nearly three-quarters of all deaths in the province, and are the major causes of premature death and hospitalization. The biggest killer is cardiovascular disease (heart disease, stroke, and atherosclerosis) which claims the lives of 2,800 Nova Scotians each year, and accounts for 36% of all deaths in the province. Cancer kills an estimated 2,400 Nova Scotians every year, accounting for 30% of all deaths in the province.¹

Other chronic conditions disable many more Nova Scotians. Arthritis and rheumatism afflict 20% of Nova Scotians; 16% suffer from high blood pressure; 14% have chronic back problems; 9% suffer from migraine headaches; and 6% have asthma.² One-quarter of all Nova Scotians have a long-term limitation or handicap that interferes with their activity at home, school, or work – the highest rate of activity limitation in the country.³ Not surprisingly, Nova Scotians also have the country's highest reported use of disability days.⁴ Chronic conditions are becoming increasingly common.⁵

Compared to other Canadians, Nova Scotians have particularly high rates of chronic illness. Nova Scotia has the country's highest rate of deaths from cancer and from respiratory disease; and the highest rate of arthritis and rheumatism in Canada. The province has the second highest rate of circulatory deaths and of diabetes in the country, and the second highest psychiatric hospitalization rate.⁶

Medical care costs for people with chronic diseases account for 60% of total medical care expenditures, or \$1.2 billion a year in Nova Scotia.⁷ 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. Premature death due to cancer alone costs the Nova Scotia economy \$427 million each year, while musculoskeletal disorders like arthritis and osteoporosis cost the economy \$307 million due to disability. Circulatory

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*); Nova Scotia Department of Finance, Statistics Division, *Nova Scotia Statistical Review 1999*, Halifax, December, 1999, page 10; Government of Nova Scotia, Vital Statistics, available at: <http://www.gov.ns.ca/snsmr/vstat/annualreports/1999/table9.stm>, 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 2001*, Toronto, April 2001, page 24; 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 Health Canada, *Statistical Report*, page 270.

³ *Ibid.*, page 237.

⁴ *Ibid.*, page 234.

⁵ *Ibid.*, page 268.

⁶ Smith, Bob, "Why Change the Way We Look at Health?" from the President and CEO, Capital District Health Authority, Halifax, NS.

⁷ Sixty percent estimate is from the 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.

diseases cost Nova Scotia more than half a billion dollars a year in productivity losses (all costs in 2001\$).⁸

Combining direct medical costs (\$1.24 billion) and indirect productivity losses (\$1.79 billion), the total economic burden of seven types of chronic illness (cardiovascular diseases, cancer, respiratory ailments, diabetes, musculoskeletal disorders, diseases of the nervous system and sense organs, and mental illness), exceeds \$3.0 billion a year.

These seven chronic diseases account for 78% of productivity losses due to premature death, 76% of productivity losses due to disability, and nearly two-thirds of the total economic burden of illness in Nova Scotia, including both direct and indirect costs. They cost the province the equivalent of 13% of provincial GDP annually. All categories of chronic disease combined are estimated to account for 70% of the total economic burden of illness in Nova Scotia. Cardiovascular diseases alone cost Nova Scotia nearly \$960 million a year in direct and indirect costs, cancer costs another \$580 million, and arthritis and osteoporosis add another \$460 million in costs.

It is estimated that 40% of chronic illness can be prevented. Epidemiological studies indicate that 25% of all medical costs (or nearly half a billion dollars a year in Nova Scotia) are attributable to a small number of excess risk factors like smoking, obesity, physical inactivity, and poor nutrition.⁹

Socioeconomic 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. In Nova Scotia, those without a high school diploma use 49% more physician services than those with a BA, while low income groups use 43% more physician services than higher income groups. Excess physician use due to educational inequality costs the NS health care system \$42.2 million a year; excess physician use due to income inequality costs \$27.5 million a year.

Low income groups have higher rates of smoking, obesity, physical inactivity, and cardiovascular risk. Nova Scotia could avoid an estimated 200 deaths and save \$214 million per year if all Nova Scotians were as heart healthy as higher income groups

This report indicates that Nova Scotia'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 province'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.

⁸ Productivity cost estimates are from Health Canada, *The Economic Burden of Illness 1998*, Ottawa, 2002 (scheduled for release soon.)

⁹ Goetzel, Ron, (ed.), "The Financial Impact of Health Promotion," *American Journal of Health Promotion* 15 (5), May/June, 2001.

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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 Nova Scotians can expect to live to 78; deaths from the deadly infectious diseases of the early 20th century are extremely rare; smallpox has been eradicated, and measles nearly eliminated through immunization.¹⁰ 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.¹¹

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 one hundred 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 account for 80% of deaths in Nova Scotia, that cause untold suffering and debilitate tens of thousands of Nova Scotians, that drain tax dollars and slow the economy, 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.¹² 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.¹³ Just as prevention overcame the acute, infectious diseases of the early 20th century,

¹⁰ 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.

¹¹ 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.

¹² U.S. Department of Health and Human Services, 1990, *Prevention '89/'90: Federal Programs and Progress*, Public Health Service, Washington D.C.

¹³ Gelman, D., "The Price of Progress: Technology and the Cost of Medical Care," *Canadian Medical Association Journal* 1971; 104: 401-406.

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:

“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.”¹⁴

1. Deaths and Costs Due to Chronic Disease in Nova Scotia

Four types of chronic disease now account for 74% of all deaths in Nova Scotia. Cardiovascular diseases (mainly heart disease and stroke) and cancers together account for two-thirds of all deaths in Nova Scotia, 36% and 30% respectively. Chronic obstructive pulmonary disease (bronchitis, emphysema, asthma, and chronic airway obstruction) accounts for another 5% of deaths in the province, and diabetes accounts for 3% more deaths (Table 1).¹⁵ 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.¹⁶

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

Cause of Death	Estimated # of Deaths	Percent of all Deaths
Cardiovascular diseases	2,800	36%
Cancers	2,400	30%
Chronic obstructive pulmonary disease	370	5%
Diabetes	230	3%
Total: Four chronic diseases	5,800	74%

Sources: Health Canada, Statistical Report on the Health of Canadians; Nova Scotia Government, Vital Statistics; Heart and Stroke Foundation, *The Changing Face of Heart Disease and Stroke in Canada 2000*; National Cancer Institute of Canada, *Canadian Cancer Statistics 2001*; COPD and diabetes deaths extrapolated from Statistics Canada, *Canada at a Glance*, and Centers for Disease Control, *Chronic Diseases and their Risk Factors*.

¹⁴ 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 187.

¹⁵ 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*); Nova Scotia Department of Finance, Statistics Division, *Nova Scotia Statistical Review 1999*, Halifax, December, 1999, page 10; Government of Nova Scotia, Vital Statistics, available at: <http://www.gov.ns.ca/snsmr/vstat/annualreports/1999/table9.stm>, 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 2001*, Toronto, April 2001, page 24; 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.

¹⁶ 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.

Seven categories of chronic illness cost the Nova Scotia health care system \$750 million a year in direct costs for hospitals, physicians, and drugs alone. These illnesses are:

- circulatory diseases (mainly heart disease, stroke, and hypertension),
- cancers,
- chronic obstructive pulmonary diseases,
- 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 half of all direct health care spending on hospitals, doctors, and drugs, including 46% of all hospital costs, 49% of physician services, and 59% 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 \$1.23 billion annually (2001\$, Table 2).

Paradoxically, all these direct medical costs are counted in the Gross Domestic Product and thus conventionally assessed as contributions to economic growth and prosperity. An increase in these costs is therefore mistakenly interpreted as a sign that society is "better off." In the Genuine Progress Index (GPI), by contrast, the costs of illness, accidents, crime, pollution, and other liabilities are counted as costs, not gains, to the economy. Instead, population health indicators are used in the GPI as indicators of progress, to assess whether the population is becoming healthier.

Even more costly than the direct medical burden of chronic illness 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 \$1.8 billion a year (2001\$). This amounts to 77% of all productivity losses due to all illnesses combined in Nova Scotia. This high cost is due to the debilitating nature of these particular chronic illnesses, and to the fact that cancer and heart disease kill so many at an early age.

Combining direct medical costs (\$1.23 billion) and indirect productivity losses (\$1.8 billion), the total economic burden of these seven types of chronic illness exceeds \$3.0 billion a year (Table 2). This amounts to nearly two-thirds of the total economic cost of illness in Nova Scotia, and 13% of the province's total gross domestic product.

The estimates in Table 2 do not reflect the full costs of chronic diseases to the Nova Scotia health care system. First, important categories of chronic illness are excluded, including all chronic digestive system disorders, including 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

¹⁷ Health Canada, *The Economic Burden of Illness 1998*, forthcoming 2002.

digestive system disease costs have been excluded here. All congenital and chromosomal anomalies (like Down's syndrome) are also excluded, as are chronic skin conditions (like skin ulcers), diseases of the genitourinary system (like chronic renal failure), all blood diseases (like anemia), and conditions originating in the perinatal period.¹⁸

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 nearly one-quarter of all gallbladder disease in Nova Scotia is attributable to obesity.¹⁹

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 \$36 million a year to the totals in Table 2.²⁰

On the other hand, Table 2 somewhat overstates the costs of chronic nervous system and sense organ disorders, because the figures in Table 2 represent the total costs for all diseases of the nervous system and sense organs, including some acute and infectious illnesses. Although diseases like 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 costs of all these endocrine and related disorders.²¹ According to Katzmarzyk et al., type 2 diabetes constitutes 92.5% of all diabetes cases, and would therefore constitute about 40% of the costs of all endocrine and related disorders.²² For the purposes of this analysis, all

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>.

¹⁹ Colman, Ronald, *The Cost of Obesity in Nova Scotia*, GPI Atlantic, Halifax, Table 1.

²⁰ Cost of low birth weight extrapolated to Nova Scotia from U.S. estimates in "Position of the American Dietetic Association: Cost-Effectiveness of Medical Nutrition Therapy," *Journal of the American Dietetic Association*, 95 (1): 88-91, January, 1995, 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.

²¹ Health Canada, *Economic Burden of Illness in Canada 1993*, Ottawa, 1997, Table 2, page 10.

²² 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.

endocrine, nutritional and metabolic diseases, and immunity disorders, are treated as chronic diseases.²³

Table 2 Cost of Chronic Illness in Nova Scotia 1998 (2001\$ million)

	Hosp.	Doctor	Drugs	Other ²⁴	Total ²⁵ Direct	Premat. Death	Dis- ability	TOTAL
Circulatory	161.6	26.6	63.6	137.8	389.6	326.8	244.4	960.8
Cancer	71.4	11.8	7.5	49.6	140.3	427.2	14.5	582.1
Respiratory ²⁶	21.6	3.2	16.6	22.7	64.1	43.4	78.1	185.5
Musculoskeletal	55.9	20.3	22.0	53.8	152.0	3.5	307.2	462.8
Endocrine ²⁷	18.5	7.2	29.3	30.1	85.0	43.8	27.0	155.8
Nervous system ²⁸	55.3	27.9	19.2	56.0	158.5	30.0	158.6	347.0
Mental	104.2	17.7	39.2	88.2	249.2	16.0	72.3	337.5
TOTAL:	488.4	114.8	197.5	438.1	1,238.8	890.8	901.9	3,031.5

Source: Health Canada, *The Economic Burden of Illness in Canada 1998* (forthcoming).

²³ 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>.

²⁴ Hospital, physician, drug, and research costs are currently available for Nova Scotia by diagnostic category. However, at the present time, other direct health care costs in Nova Scotia, 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. A more accurate breakdown of “other direct costs” by diagnostic category should be available later this year, when the electronic version of *The Economic Burden of Illness in Canada 1998* is released. In the meantime, the absence of direct information for this column will not substantially impact the total results, since the figures given here do reflect the actual proportional breakdown for all diagnostic categories for the province.

²⁵ “Total” 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.

²⁶ 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.

²⁷ 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 all these endocrine-related disorders. 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.

²⁸ 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 like 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 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 estimates for chronic diseases in Table 2 remain underestimates.

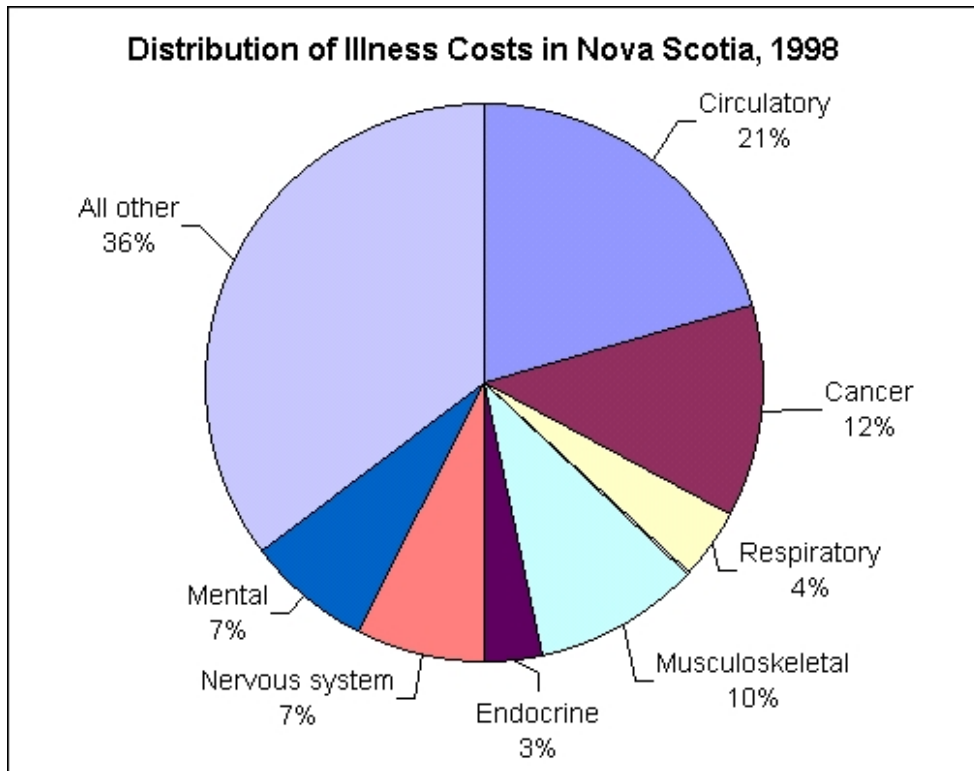
The costs in Table 2 are likely to be underestimates for another reason, aside from exclusion of certain conditions. There are several proximate causes of illness and death that stem directly from chronic illnesses, but are not attributed in the official statistics to the diagnostic categories listed in Table 2, because death certificates and hospital records frequently list immediate rather than underlying conditions. For example, unintentional falls account for 67% of all hospital days due to injury, with seniors accounting for nearly half of all lower limb fractures. 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. 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 cost of chronic diseases to the Nova Scotia health care system matches the 60% estimate of the U.S. Centers for Disease Control and Prevention. This accounts for more than \$1 billion of the province’s \$1.9 billion health care budget. 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 account for more than 70% of the total economic burden of illness in Nova Scotia.

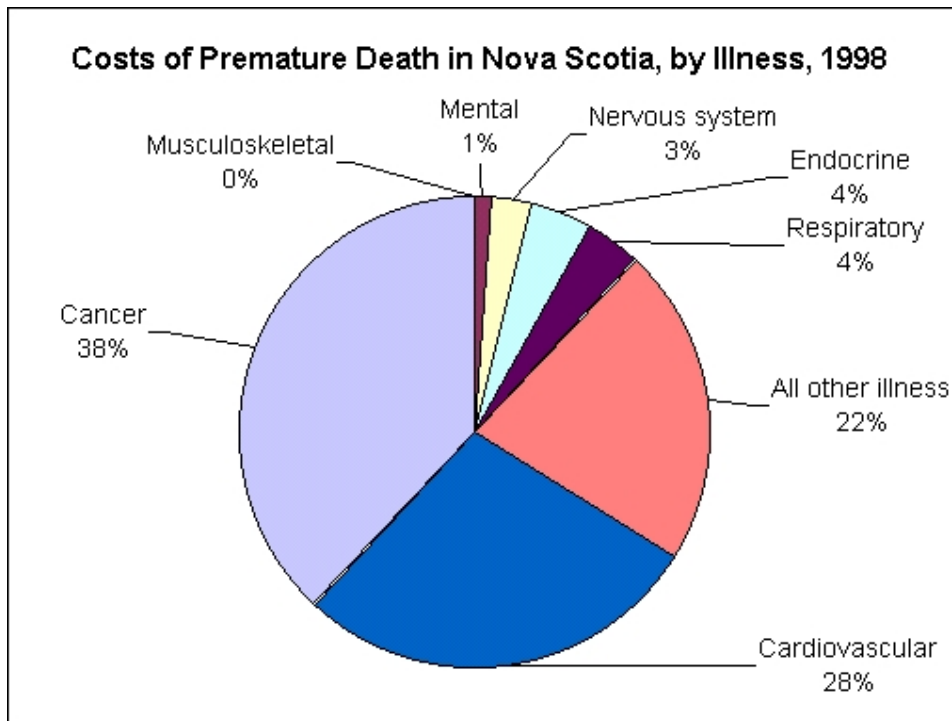
It is noteworthy that different kinds of chronic disease have very different cost distributions. Cardiovascular diseases and mental illnesses account for the highest direct health care costs in Nova Scotia (particularly hospital and drug costs), cancer produces the highest losses in premature death, and musculoskeletal disorders account for the highest disability costs in the province. These seven categories of chronic disease account for 78% of all productivity losses due to premature death in Nova Scotia, and 76% of all disability costs (Figs. 1 through 3 below).

Figure 1 Distribution of Illness Costs in Nova Scotia, 1998



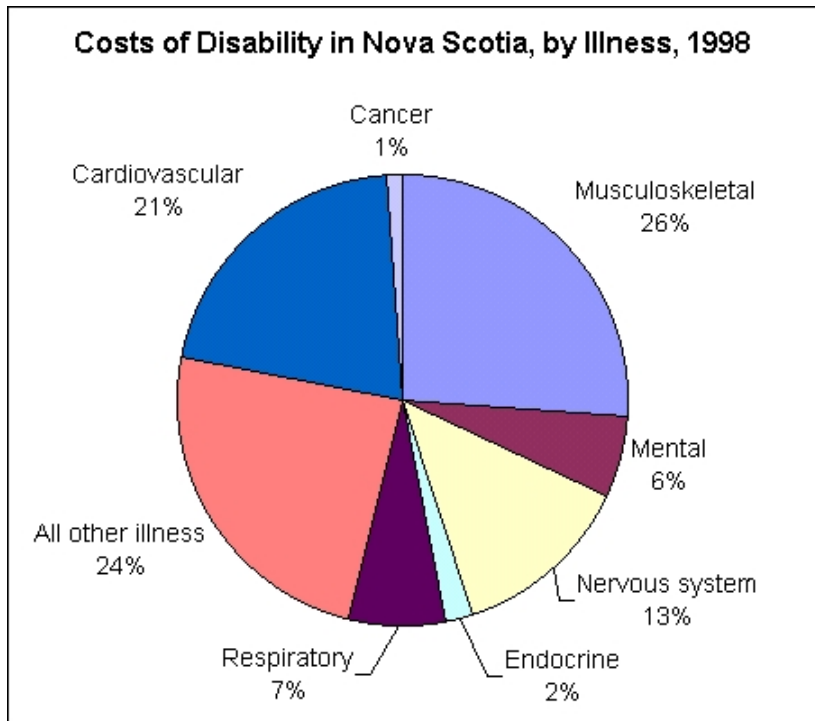
Source: Health Canada, *Economic Burden of Illness in Canada 1998* (forthcoming).

Figure 2 Costs of Premature Death in Nova Scotia, by Illness, 1998



Source: Health Canada, *Economic Burden of Illness 1998* (forthcoming)

Figure 3 Costs of Disability in Nova Scotia, by Illness, 1998



Source: Health Canada, *Economic Burden of Illness 1998* (forthcoming)

1.1 Cardiovascular Diseases

Cardiovascular diseases (mainly heart disease, stroke, atherosclerosis, and high blood pressure) kill 36% of Nova Scotians, and are the leading causes of death throughout the 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 in Nova Scotia. Stroke, or cerebrovascular disease, accounts for 18% of CVD deaths in the province, and acute myocardial infarction (heart attack) for 25%.²⁹

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.³⁰ In the U.S., mortality due to heart disease has fallen by an average of 2-3% annually since the 1950s, and is now 55% of the 1950s rate.³¹

²⁹ Health Canada, *Statistical Report*, page 291; Centers for Disease Control (CDC), op. cit., pages 10 and 14; Heart and Stroke Foundation, op. cit., pages 72-73, 76-77.

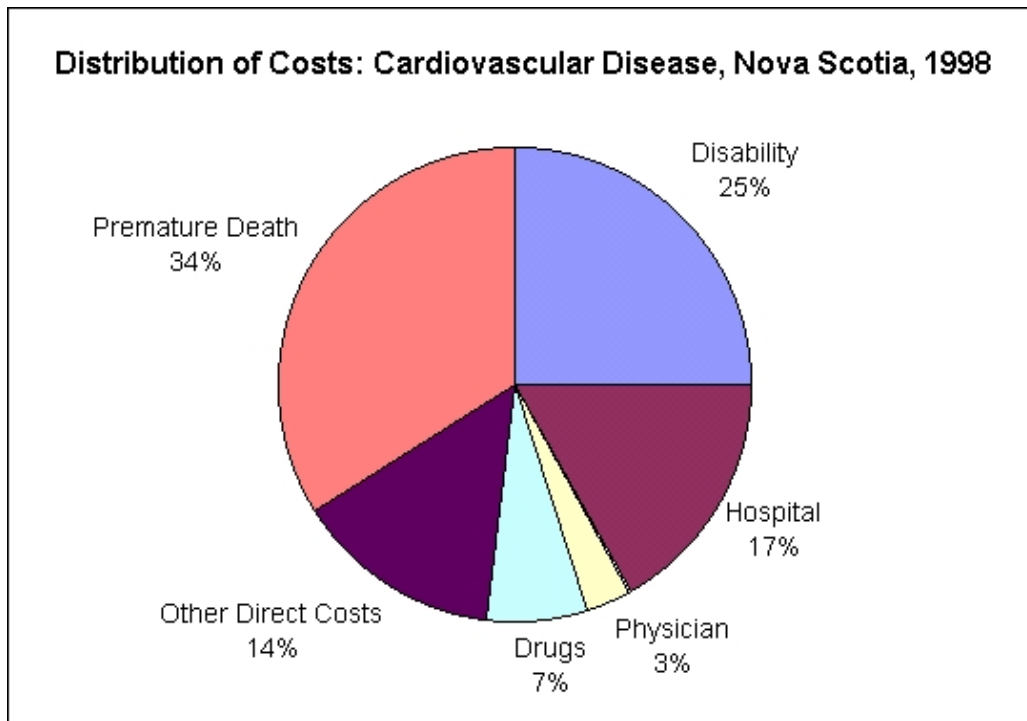
³⁰ Heart and Stroke Foundation, op. cit., page 70.

³¹ 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.

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. Nova Scotians lose 5,830 potential years of life each year as a result of premature death due to heart disease and stroke.³²

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.”³³

Figure 4 Distribution of Costs: Cardiovascular Disease, Nova Scotia, 1998



Source: Health Canada, *Economic Burden of Illness in Canada 1998* (forthcoming).

³² Health Canada, *Statistical Report*, page 321; Heart and Stroke Foundation, op. cit., page 23. US 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.

³³ Heart and Stroke Foundation, op. cit., page 23.

Circulatory diseases (particularly heart disease, stroke, and hypertension) cost the Nova Scotia health care system an estimated \$252 million each year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add \$137.4 million to this sum, for total health care spending of \$389.4 million a year due to circulatory illnesses. Productivity losses due to premature death and disability as a result of heart disease, stroke, and hypertension cost the provincial economy an additional \$571 million a year, for a total economic burden of \$961 million that can be attributed to circulatory diseases.³⁴

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 Nova Scotians can be sustained and improved through reduction of risk factors and conditions.

1.2 Cancers

Cancer is the second leading cause of death in Nova Scotia, and accounts for 30% of all deaths in the province. The National Cancer Institute of Canada estimates that 2,500 Nova Scotians died of cancer in 2001, the highest cancer death rate for both men and women in the country, and 18% above the national average.³⁵

The number of new cases of cancer indicates the future burden and cost of cancer. An estimated 4,700 Nova Scotians were diagnosed with cancer in 2001, the second highest cancer incidence rate in the country after PEI, and 9% above the national average.³⁶

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.³⁷

Because Nova Scotia has by far the highest rate of malignant melanoma in the country, 77% above the national average, excessive sun exposure is also an important modifiable risk factor in the province.³⁸ 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 Nova Scotia for both men and women, and accounts for 29% of all cancer-related mortality in the province. A single behaviour – cigarette smoking – accounts for 85% of all lung cancer cases. Nova Scotian men have a 26% higher rate of death from lung cancer than the national average. Nova Scotian women have the highest incidence of lung cancer in the country, and a 19% higher rate of death from lung cancer than

³⁴ Health Canada, *The Economic Burden of Illness in Canada 1998*, to be published 2002.

³⁵ National Cancer Institute of Canada, *op. cit.*, pages 24 and 28.

³⁶ *Ibid.*, pages 24 and 26.

³⁷ Centers for Disease Control, *op. cit.*, page 18.

³⁸ *Ibid.*, page 26.

other Canadians. According to Statistics Canada's 2000 Canadian Tobacco Use Monitoring Survey, 30% of Nova Scotians smoke, the highest rate in the country, and 25% above the national average. Smoking cessation could prevent more than 600 lung cancer deaths per year in the province.³⁹

Prostate cancer is the second leading cause of cancer death for men, accounting for 13% of male cancer deaths in Nova Scotia. Breast cancer is the second leading cause of cancer for women, accounting for 17% of female cancer deaths in the province. 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 of cancer deaths for both men and women, accounting for 8% of all cancer deaths in the province. Physical inactivity, obesity, and diets high in saturated fats and low in vegetables and whole grains are risk factors for colorectal cancer.⁴⁰

Cancer costs the Nova Scotia health care system \$91.3 million a year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add \$49.4 million to this sum, for total health care spending of \$140.6 million a year due to cancer. Productivity losses due to premature death and disability as a result of cancer cost the provincial economy an additional \$441.3 million a year, for a total economic burden of \$582 million that can be attributed to cancer.⁴¹ 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 (nearly \$430 million annually), because it so often claims its victims at young ages. Circulatory diseases and cancer alone account for more than 40% of all productivity losses due to illness in Nova Scotia, and for more than \$1.5 billion total in direct and indirect costs.⁴²

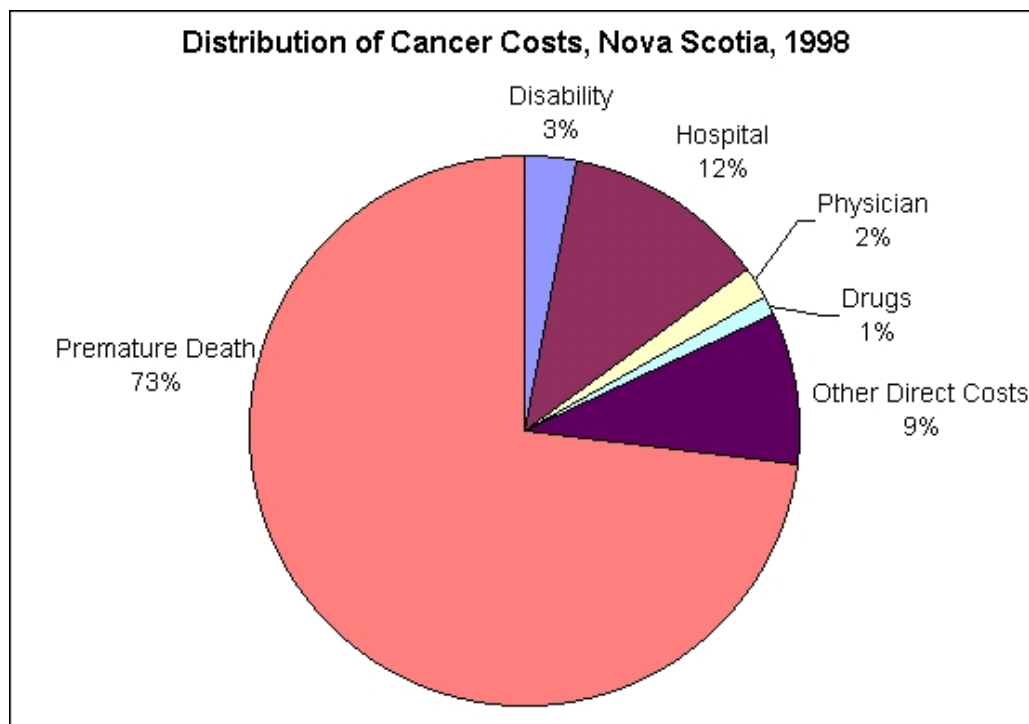
³⁹ Ibid., pages 26-28; Centers for Disease Control, op. cit., page 22; Statistics Canada, *The Daily*, 29 May, 2001, available at: <http://www.statcan.ca/Daily/English/010529/d010529c.htm>; Colman, Ronald, *The Cost of Tobacco in Nova Scotia*, GPI Atlantic, Sydney and Halifax, 2000.

⁴⁰ National Cancer Institute of Canada, op. cit., page 27; Centers for Disease Control, op. cit., pages 26 and 30.

⁴¹ Health Canada, *The Economic Burden of Illness in Canada 1998*, to be published 2002. Hospital, physician, drug, and research costs are currently available for Nova Scotia by illness category, including cancer. However, at the present time, other direct health care costs in Nova Scotia, 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.

⁴² Idem.

Figure 5 Distribution of Cancer Costs, Nova Scotia, 1998



Source: Health Canada, *Economic Burden of Illness in Canada 1998* (forthcoming).

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. More than 38,000 Nova Scotians have non-insulin-dependent diabetes mellitus (often called adult-onset diabetes, or diabetes 2). This amounts to 4% of the total Nova Scotia population, and 14% of those aged 65-74. Cape Breton County has the highest regional prevalence of diabetes in the province.⁴³ U.S. estimates indicate that diabetes mellitus affects 12 million people in that country.⁴⁴

Diabetes is responsible for the total disability of about 3,300 Nova Scotians, including 40 who become blind each year because of diabetic eye disease, more than 200 who receive treatment for kidney failure, and another 200 who undergo diabetes-related lower-extremity amputations. Diabetes is estimated to be the underlying cause of 150 deaths each year in Nova Scotia, and a contributing cause to at least 300 more, for a total of 450 deaths attributable to diabetes (5.7% of all deaths.) These premature deaths represent a loss of 5,000 years of life every year.⁴⁵

⁴³ LeBlanc, John, "The Prevalence of Diabetes Mellitus in Nova Scotia: What Can We Learn from Routinely Collected Health Data," in *Diabetes Care in Nova Scotia* 8 (4), Diabetes Care Program of Nova Scotia, Halifax, October, 1998.

⁴⁴ Manson, Joann, and Angela Spelsberg, "Primary Prevention of Non-Insulin-Dependent Diabetes Mellitus," *American Journal of Preventive Medicine*, 10 (3), 1994.

⁴⁵ These estimates for Nova Scotia 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

Because it leads to other serious illnesses, diabetes is probably 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) therefore attributes just 230 deaths a year to diabetes (3% of total deaths in Nova Scotia,) whereas more comprehensive U.S. estimates attribute 6.8% of total mortality in that country to diabetes mellitus.⁴⁶ Here, both the conventional and comprehensive estimates are given for Nova Scotia, accounting for 3% and 6% of total deaths respectively.

According to Health Canada:

“There were 5,447 deaths in 1996 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.”⁴⁷

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.”⁴⁸

Diabetes is closely associated with obesity, with more than 50% of cases attributable to overweight.⁴⁹ 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 2025.⁵⁰ Statistics Canada reports that Canadians with a body mass index greater than 30 are four times as likely to have diabetes.⁵¹

November, 1986, pages 711-714, 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.

⁴⁶ 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.

⁴⁷ Health Canada, *Diabetes in Canada*, available at: http://www.hc-sc.gc.ca/hpb/lcdc/publicat/diabet99/d02_e.html.

⁴⁸ 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>.

⁴⁹ C. Laird Birmingham, M.D. et al., *Canadian Medical Association Journal*, 23 February, 1999: 160 (4), page 486; Manson, Joann, and Angela Spelsberg, “Primary Prevention of Non-Insulin-Dependent Diabetes Mellitus,” *American Journal of Preventive Medicine*, 10 (3), 1994.

⁵⁰ 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.

⁵¹ 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.

Endocrine and related diseases (including diabetes) cost the Nova Scotia health care system \$54.7 million a year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add \$30 million to this sum, for total health care spending of \$84.8 million 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 provincial economy an additional \$71 million a year, for a total economic burden of \$156 million that can be attributed to this category of diseases.⁵²

According to Health Canada's 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 Nova Scotia, this means that diabetes costs the Nova Scotia health care system \$23.6 million a year in hospital, physician, and drug costs, and accounts for \$36.5 million in total direct health care spending. Diabetes also accounts for \$19.3 million in productivity losses, for a total economic burden of \$79.4 million.

Since type 2 diabetes constitutes 92.5% of all cases of diabetes, adult-onset diabetes accounts for \$20 million a year in hospital, drug, and physician costs; \$33.3 million in total direct health care spending, \$18.2 million in productivity losses, and \$73.5 million in total economic costs. This is, proportionally, a much more conservative estimate than comparable U.S. estimates that have pegged the combined direct and indirect costs of diabetes in that country at \$63 billion a year.^{53*}

⁵² Health Canada, *The Economic Burden of Illness in Canada 1998*, to be published 2002. Hospital, physician, drug, and research costs are currently available for Nova Scotia by illness category, including diabetes. However, at the present time, other direct health care costs in Nova Scotia, 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 diabetes, on the assumption that they occupy the same proportion of total direct health care costs for diabetes as they do for all diagnostic categories combined.

⁵³ Manson, Joann, and Angela Spelsberg, "Primary Prevention of Non-Insulin-Dependent Diabetes Mellitus," *American Journal of Preventive Medicine*, 10 (3), 1994.

* **NOTE:** Throughout this report, all monetary estimates are translated to 2001 Canadian dollars, for comparative purposes. In converting from US dollars, the following method is used: US 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 2001 Canadian dollars. For example, 1990 US dollars are converted to 1990 Canadian dollars; 1994 US 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 2001 Canadian dollars.

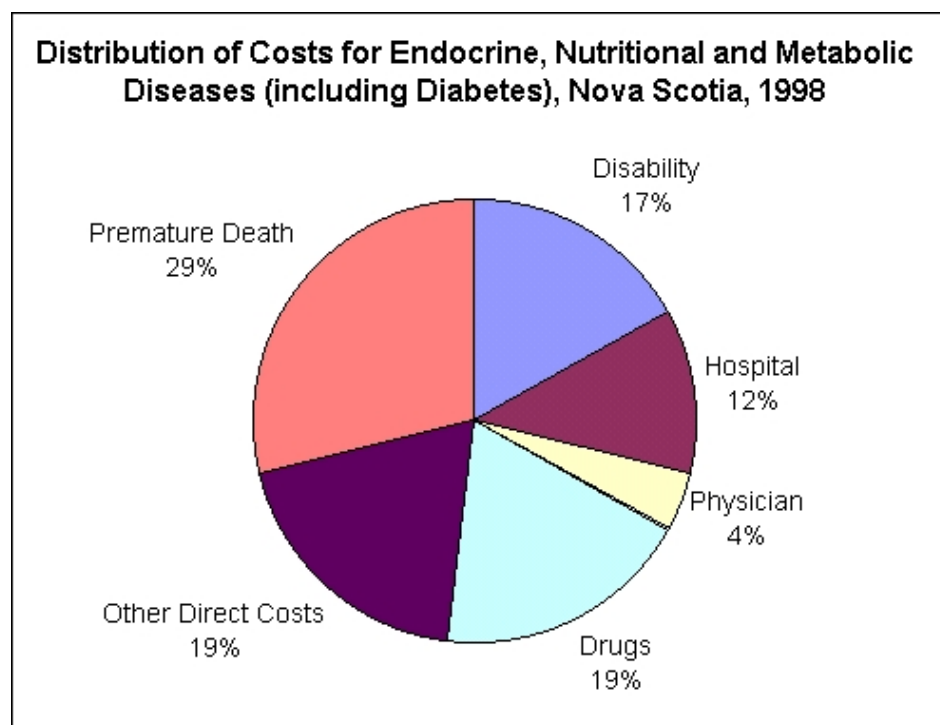
The \$40 billion (1994\$US) estimate in this sentence is given here as an example. Exchange rates are taken from <http://www.x-rates.com/cgi-bin/hlookup.cgi> which gives the rate as \$US1 = \$Can1.3825 on June 30, 1994. To convert 1994 US dollars to 1994 Canadian dollars: Calculation (1): $1.3825 \times \$40 \text{ billion} = \$55.3 \text{ billion (1994 Can\$)}$. Then to convert 1994 Canadian dollars to 2001 Canadian dollars using Statistics Canada's Consumer Price Index (CPI): Calculation (2): $2001 \text{ CPI (116.4) divided by } 1994 \text{ CPI (102)} \times \$55.3\text{b} = \$63.11 \text{ billion}$.

This same method is used throughout the report, with the conversion calculations given in each instance, in order to allow easy conversion 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 only. Thus, whenever U.S. estimates are extrapolated to Nova Scotia, 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 Nova Scotia health care system.

NOTE: 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

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 favourably altering modifiable risk factors was 50-75% for obesity and 30-50% for physical activity.⁵⁴

Figure 6 Distribution of Costs for Endocrine, Nutritional and Metabolic Diseases (including Diabetes), Nova Scotia, 1998



Source: Health Canada, *Economic Burden of Illness in Canada 1998* (forthcoming).

1.4 Chronic Obstructive Pulmonary Diseases

Nova Scotia and Prince Edward Island have the highest death rates for respiratory disorders in Canada. When deaths from acute respiratory infections like pneumonia and influenza are subtracted, it is estimated that about 375 Nova Scotians die each year from chronic obstructive pulmonary diseases (COPD), including emphysema, asthma, and chronic airway obstruction.⁵⁵

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 Nova Scotia 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 US costs and benefits to 2001 Canadian dollars by 44.5% throughout the whole report.

⁵³ Manson, and Spelsberg (1994), op. cit.

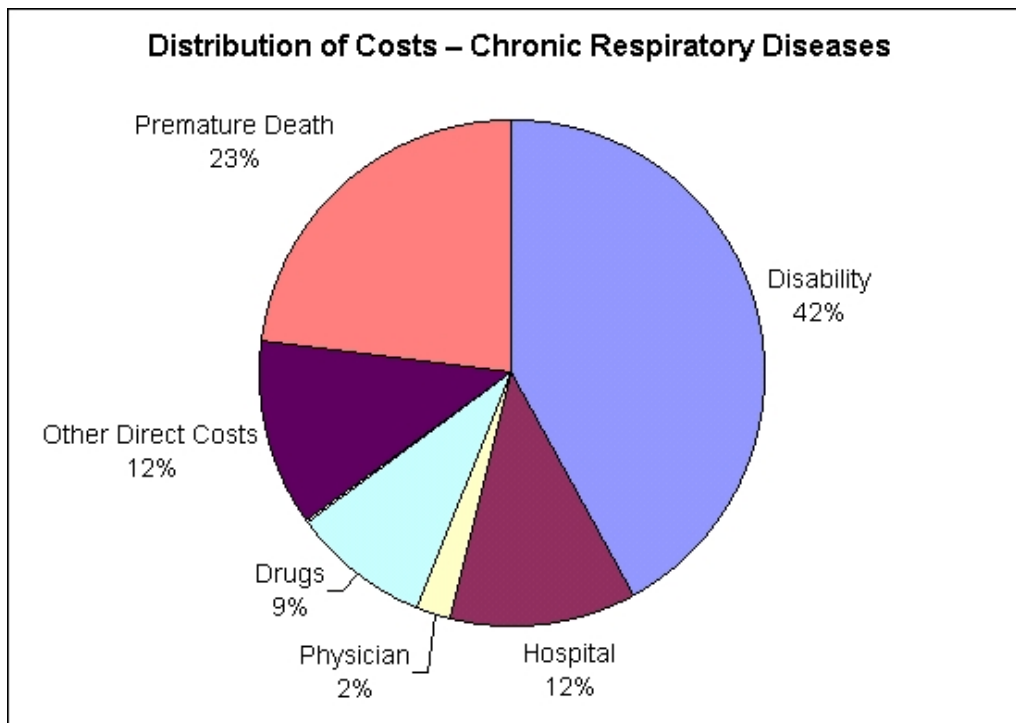
⁵⁴ Manson, and Spelsberg (1994), op. cit.

⁵⁵ Health Canada, *Statistical Report*, page 318; and Smith, Bob, President and CEO, Capital District Health Authority, Halifax, "Why Change the Way We Look at Health?"

About 6% of Nova Scotians (more than 55,000 people) are estimated to have asthma, with the highest rates among children.⁵⁶

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.

Figure 7 Distribution of Costs – Chronic Respiratory Diseases



Source: Health Canada, *Economic Burden of Illness in Canada 1998* (forthcoming).

Bronchitis, emphysema, and asthma cost the Nova Scotia health care system \$42 million a year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add \$22.5 million to this sum, for total health care spending of \$64.4 million 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 provincial economy an additional \$121.3 million a year, for a total economic burden of \$185.7 million that can be attributed to these chronic respiratory disorders.⁵⁷ A substantial portion of these costs could be avoided through smoking cessation.

⁵⁶ Health Canada, *Statistical Report*, page 270.

⁵⁷ Health Canada, *The Economic Burden of Illness in Canada 1998*, to be published 2002. Hospital, physician, drug, and research costs are currently available for Nova Scotia by illness category, including respiratory diseases.

1.5 Musculoskeletal Disorders

Twenty percent of Nova Scotians suffer from arthritis or rheumatism, the highest rate of musculoskeletal disorders in the country, and 43% above the national average. Fourteen percent of Nova Scotians have chronic back problems.⁵⁸ Musculoskeletal disorders are the most prevalent of all chronic conditions in the province, and account for the highest disability costs and third highest overall costs of any disease, after circulatory disorders and cancers.

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 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.⁵⁹ Physical inactivity, obesity, and poor diet are key modifiable risk factors for chronic musculoskeletal disorders.

Twenty-five percent of Nova Scotians (190,000 people) suffer from some long-term activity limitation at home, school, or work, with arthritis and back problems accounting for 35% of this number. Arthritis limits the daily activities of 30,000 Nova Scotians, and back problems limit 36,000 more.⁶⁰

Musculoskeletal diseases cost the Nova Scotia health care system \$98.7 million a year in hospital, physician, and drug costs alone. Other direct costs, including private expenditures for other institutions and home care, add \$53.6 million to this sum, for total health care spending of \$152.4 million a year due to musculoskeletal diseases. Productivity losses due primarily to disability caused by arthritis and osteoporosis cost the provincial economy an additional \$310.3 million a year, for a total economic burden of \$462.7 million that can be attributed to musculoskeletal disorders.⁶¹

Arthritis and osteoporosis account for greater productivity losses due to long-term disability in Canada than any other diagnostic category.⁶² One U.S. study estimated that arthritis and heart disease were each responsible for about 15% of total disability in that country.⁶³ A substantial

However, at the present time, other direct health care costs in Nova Scotia, 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.

⁵⁸ Health Canada, *Statistical Report*, page 270.

⁵⁹ *Ibid.*, page 243.

⁶⁰ *Ibid.*, pages 237 and 240.

⁶¹ Health Canada, *The Economic Burden of Illness in Canada 1998*, to be published 2002. Hospital, physician, drug, and research costs are currently available for Nova Scotia by illness category, including musculoskeletal diseases. However, at the present time, other direct health care costs in Nova Scotia, 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.

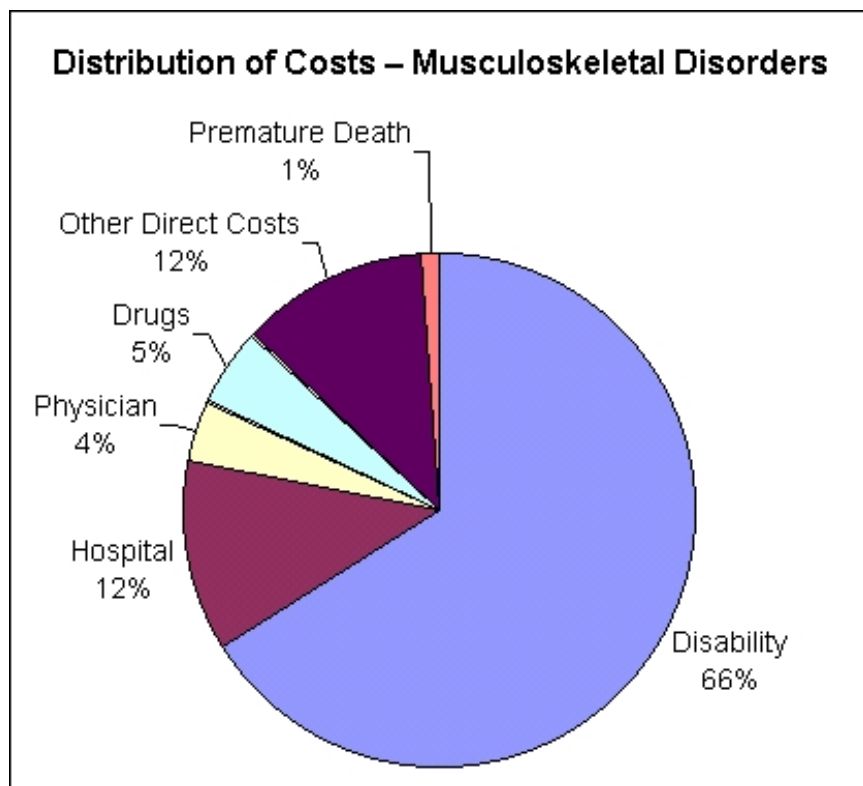
⁶² *Idem.*

⁶³ McDuffie, Frederic, et al., "Arthritis and Musculoskeletal Diseases," in Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness*, Oxford University Press, New York & Oxford, 1987, page 19.

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 Nova Scotia by population, this indicates more than 1,200 hip fractures a year in the province, at a cost of about \$20 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.⁶⁴

Figure 8 Distribution of Costs – Musculoskeletal Disorders



Source: Health Canada, *Economic Burden of Illness in Canada 1998* (forthcoming).

⁶⁴ 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 1992US\$ to 2001Can\$, exchange rates from <http://www.x-rates.com/cgi-bin/hlookup.cgi> show \$US1 = \$Can1.1972 on 30 June, 1992. Therefore calculation (1): 1.1972 X \$14 million = \$16.76 million (1992 Can\$), and calculation (2): 2001 CPI (116.4) divided by 1992 CPI (100) X \$16.76m = \$19.5 million.

PART II
CHRONIC DISEASE RISK FACTORS
AND PREVENTION

2. Reducing Chronic Disease Risk Factors and Health Care Costs*

“Much of the risk for chronic disease is behavioral and can be controlled.”

Thompson and Pertshcuk, 1992.⁶⁵

“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, 1998.⁶⁶

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.

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

⁶⁵ 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.

⁶⁶ 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.

* 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.

defined as “personal, environmental, or social interventions that facilitate behavioral adaptations conducive to improved health, level of function, and sense of well-being.”⁶⁷ 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.⁶⁸

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 Nova Scotia, but are also enormously costly to the Nova Scotia health care system and to the economy, accounting for at least 70% of deaths and 60% of medical care and disability costs. 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 Nova Scotians.

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.⁶⁹ The U.S. Department of Health and Human Services concluded that up to 50% of chronic disease mortality is attributable to lifestyle factors that can be changed.⁷⁰ It noted that better control of 10 modifiable risk factors could

⁶⁷ 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.

⁶⁸ Brown, Allen, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, definitions on pages 2-3.

⁶⁹ 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.

⁷⁰ 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.

prevent 40-70% of all premature deaths, and two-thirds of all cases of chronic disability.⁷¹ And the U.S. Health Care Financing Administration estimates that behavioural risk factors contribute to 70% of the physical decline that occurs with aging.⁷²

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.⁷³ Extrapolated to Nova Scotia, that amounts to 30,000 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.⁷⁴

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.⁷⁵

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 are involved in its development."⁷⁶ Smoking, hypertension, high blood cholesterol, obesity,

⁷¹ U.S. Department of Health and Human Services, 1990, *Prevention '89/'90: Federal Programs and Progress*, Public Health Service, Washington D.C.

⁷² 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>.

⁷³ 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.

⁷⁴ 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.

⁷⁵ 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.

⁷⁶ Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, page 10.

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%.⁷⁷ 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.⁷⁸ 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.”⁷⁹

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 which assumes that 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.⁸⁰

According to the U.S. Secretary of Health and Human Services:

*“We would be terribly remiss if we did not seize the opportunity presented by health promotion and disease prevention to dramatically cut health-care costs, to prevent the premature onset of disease and disability, and to help all Americans achieve healthier, more productive lives.”*⁸¹

⁷⁷ 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.

⁷⁸ Edington, Dee, “Emerging Research: A View from one Research Center,” in Goetzal, Ron (ed.), “The Financial Impact of Health Promotion,” *American Journal of Health Promotion* 15 (5), May/June 2001, pages 341-349.

⁷⁹ Fries, et al. (1998), pages 71 and 73.

⁸⁰ Aldana, Steven, “Financial Impact of Health Promotion Programs: A Comprehensive Review of the Literature,” in Goetzal, Ron (ed.), *op. cit.*, pages 296-320.

⁸¹ Louis W. Sullivan, in U.S. Department of Health and Human Services, 1990, *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*, Public Health Service, Washington, D.C., page vi.

Part Two surveys a few key risk factors for chronic illness, and their prevalence and costs in Nova Scotia. Part Three examines underlying risk conditions in Nova Scotia, including socioeconomic 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 with aging. And Part Six discusses the potential for reducing Nova Scotia'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.⁸²

GPI Atlantic has produced two major reports on the costs of tobacco in Nova Scotia, and one on the cost of obesity in Nova Scotia, all of which include substantial sections on the potential cost effectiveness and economic benefits of various prevention strategies aimed at smoking cessation and weight control. The following section highlights just a few of the key findings and results from those reports, and the reader is referred to the full reports for more details.⁸³

More detail is provided in this report on the cost of physical activity in Nova Scotia, included here as an appendix, and on the cost effectiveness of nutrition interventions, since these assessments were made specifically in the course of preparing this report. The greater detail provided on those subjects here does not imply greater importance than tobacco reduction or weight reduction in the control of chronic disease. Rather it fills out earlier work on risk factors, and should be taken as complementary to the earlier studies on smoking and obesity in the province.

2.1 Tobacco and Chronic Illness

Tobacco use is the single most preventable cause of illness and death in Nova Scotia, and substantially increases the risk for lung and other cancers, for cardiovascular diseases, and for respiratory ailments. More than one in five deaths in the province can be attributed to cigarette smoke. Smoking kills more than 1,600 Nova Scotians each year, and another 200 die from chronic illnesses attributable to second-hand smoke exposure.

One study summarized succinctly why tobacco is the single greatest public health hazard:

*"[T]he human body is equipped neither immunologically nor biochemically to handle the more than 6,000 chemicals in cigarette smoke – many of which are toxic."*⁸⁴

⁸² Stachenko, Sylvie, Director, Preventive Health Services, Health Canada, *Preventive Guidelines: Their Role in Clinical Prevention and Health Promotion*, Health Canada, Ottawa.

⁸³ Colman, Ronald, *The Cost of Tobacco in Nova Scotia*, GPI Atlantic, Halifax, October, 2000; Colman, Ronald, *The Cost of Obesity in Nova Scotia*, GPI Atlantic, Halifax, March, 2000; Colman, Ronald, *The Economic Impact of Smoke-Free Workplaces: An Assessment for Nova Scotia*, GPI Atlantic, Halifax, October, 2001. All these reports can be obtained from the GPI Atlantic web site at www.gpiatlantic.org.

⁸⁴ Steinfield, Jesse, and Craig White, "Tobacco", in Amler, Robert, and Bruce Hull (eds.), *Closing the Gap: The Burden of Unnecessary Illness*, Oxford University Press, New York and Oxford, 1987, page 188.

Nearly half of tobacco-related deaths (48%) are due to cardiovascular diseases; 37% are due to cancers; 12.6% are due to chronic obstructive pulmonary disease; and 1.2% are due to low birth weight infant deaths. Potential years of life lost before age 65 are dependent on the age at which premature death occurs; so 36% of tobacco-related years of life lost are due to cardiovascular diseases; 34% to cancer; 18% to low birth weight infant deaths; and 6% are due to chronic pulmonary disease.⁸⁵

Tobacco costs the Nova Scotia health care system an estimated \$180 million a year – 9% of the annual health care budget. Second-hand smoke costs an additional \$21.5 million in direct health care costs. When productivity losses due to premature death, disability, and absenteeism are added to medical costs, smoking costs the Nova Scotia economy more than half a billion dollars a year. In addition, it costs employers about \$268 million more a year to employ a smoker than a non-smoker in lost on-the-job productivity, excess absenteeism, higher life insurance premiums, and smoking area costs.

Nova Scotians have one of the highest rates of smoking in Canada. Estimates for 2000 indicated that 30% of Nova Scotians smoked, the highest rate in the country. The most recently released figures from Statistics Canada's *Canadian Tobacco Use Monitoring Survey* (not yet incorporated into Figure 1 below) indicate a sharp drop in current smokers from 30% in 2000 to 25% in 2001. However, 27% of Nova Scotian teenagers aged 15-19 were current smokers in 2001, up from 25% in 2000. By comparison, fewer than 17% of British Columbians, and fewer than 17% of B.C. teenagers aged 15-19 smoke.⁸⁶

Figure 9 indicates the change in smoking prevalence in Nova Scotia and the other provinces between 1985 and 2000. Provinces are ordered from left to right by the extent of decline in smoking prevalence. Nova Scotia's drop from 35% to 30% was the third smallest decline in the country. This ordering will change when the recently released 2001 figures are included.

According to the 1996-1997 National Population Health Survey, Nova Scotia has the highest rate of nicotine addiction in the country, as measured by the number of smokers who reach for a cigarette with the first five minutes of waking.⁸⁷ Twenty-eight percent of pregnant mothers smoke in Nova Scotia, thereby increasing the risk of delivering low birth-weight babies.⁸⁸

If 10% of Nova Scotia smokers quit, the province would save \$1 billion over 30 years and save 92,000 life years, compared to the costs incurred if these quitters had kept smoking. There are currently 16,000 underage smokers in Nova Scotia spending \$11.4 million annually on cigarettes. These illegal sales yield \$6.8 million in federal and provincial taxes. Price elasticity

⁸⁵ 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 184.

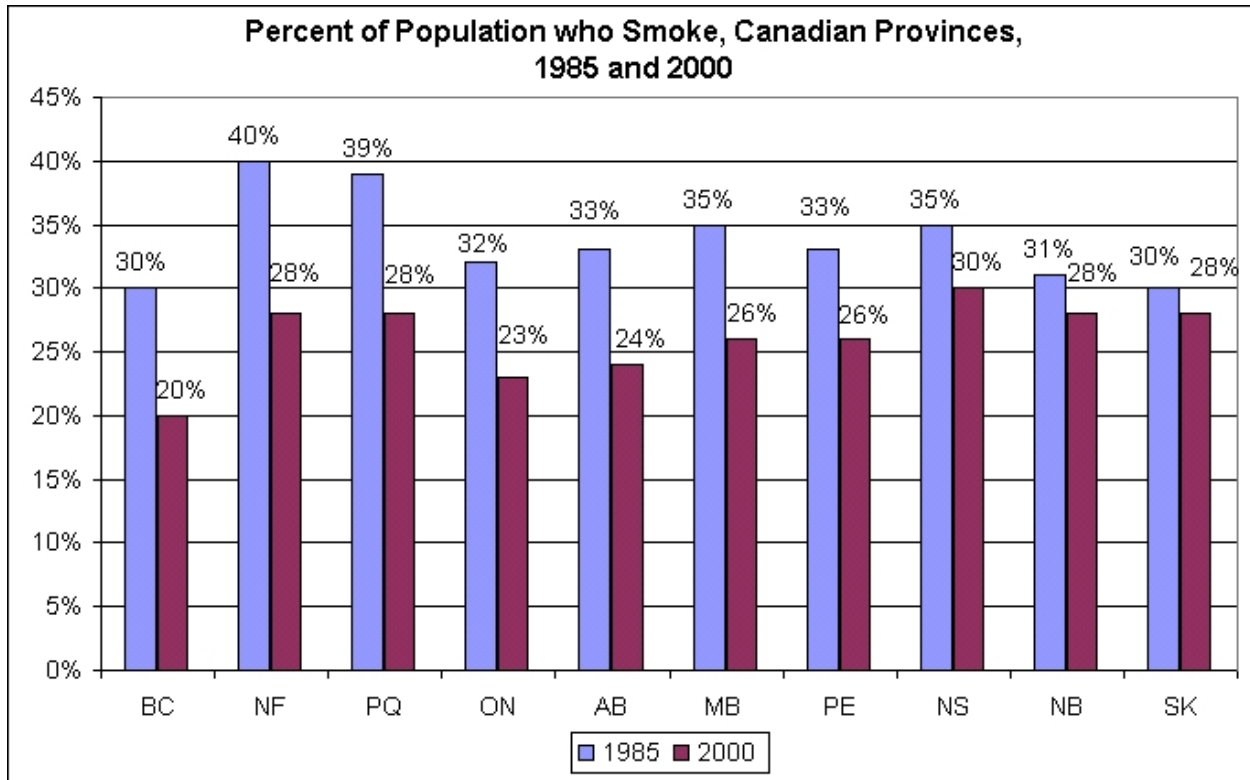
⁸⁶ Health Canada, 2000. *Canadian Tobacco Use Monitoring Survey 2000*, Table 1. 2001 CTUMS provincial data are now available at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/pdf/annual2001_supptables_eng.pdf (Table 2).

⁸⁷ Health Canada, *Statistical Report*, page 170.

⁸⁸ Kirkland, Susan, Linda Dodds, and Gerry Brosky, "The Natural History of Smoking During Pregnancy Among Women in Nova Scotia," *Canadian Medical Association Journal* 163 (3), August 8, 2000, pages 281-2; and Colman, Ronald, "Smoking Cessation Programs for Pregnant Women," chapter 11 in *The Cost of Tobacco in Nova Scotia*, GPI Atlantic, Halifax, 2000, pages 60-64.

studies show that every 10% increase in the price of cigarettes will reduce smoking among Nova Scotia teenagers by 7%.⁸⁹

Figure 9 Percent of population who smoke, Canadian provinces, 1985 and 2000 (Current smokers as percentage of population age 15 and over)



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. 2000 rates are from the 2000 CTUMS data. 2001 CTUMS data were not available at the time of writing, but they demonstrate a sharp decrease in Nova Scotia's smoking rate from 30% in 2000 to 25% in 2001. Future updates of this chart will reflect these new data.

Because of the high health care costs of smoking, tobacco control strategies have substantial potential to reduce the burden of chronic illness in Nova Scotia and its associated health care costs. These strategies include school-based smoking prevention curricula, counselling for pregnant mothers, anti-tobacco advertising, physician advice, and smoking bans at work and in public places.

For example, every dollar spent in delivering Nova Scotia's exemplary "Smoke-Free for Life" curriculum would yield more than \$15 in savings from avoided health care and productivity losses. Delivered to all 76,000 Nova Scotian 10-15 year-olds, it would save \$75 million a year. Similarly, every dollar invested in counselling pregnant smokers will yield more than \$10 in

⁸⁹ Colman, op. cit., chapters 7-9.

savings on intensive neonatal care for low birth-weight babies, long-term infant care costs, and avoided health care costs for the mothers.⁹⁰

One U.S. study estimated that heavy smoking (one pack or more per day) accounted for 7.6% of total illness costs in that country, and that smoking cessation programs directed to heavy smokers yielded a benefit of nearly \$2 for every dollar invested.⁹¹

Needless to say, smoking is not only a risk behaviour in its own right, but can be a particularly potent danger in combination with other risk factors. For example, it has been observed that “the combination of diabetes and smoking [is] a disaster that must be avoided at all costs” for its high potential risk of heart disease. Yet studies show diabetics smoking as frequently as the general population.⁹² In other words, chronic disease is multi-factorial 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) have more than doubled in Nova Scotia, with 38% of the province's adults now overweight compared to just 18% in 1985. The dramatic increase is part of what the World Health Organization has called a "global epidemic." Rates of overweight have also doubled throughout Canada, with twenty-nine per cent of Canadians now overweight compared to just 13% in 1985 (Figure 10).⁹³

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.⁹⁴

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.⁹⁵ It is estimated that 1,000 Nova Scotians die prematurely each year due to obesity-related illness, losing 4,000 potential years of life annually.⁹⁶

⁹⁰ Ibid., chapters 10 and 11.

⁹¹ Extrapolated from Brown, Allen, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, page 10.

⁹² 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.

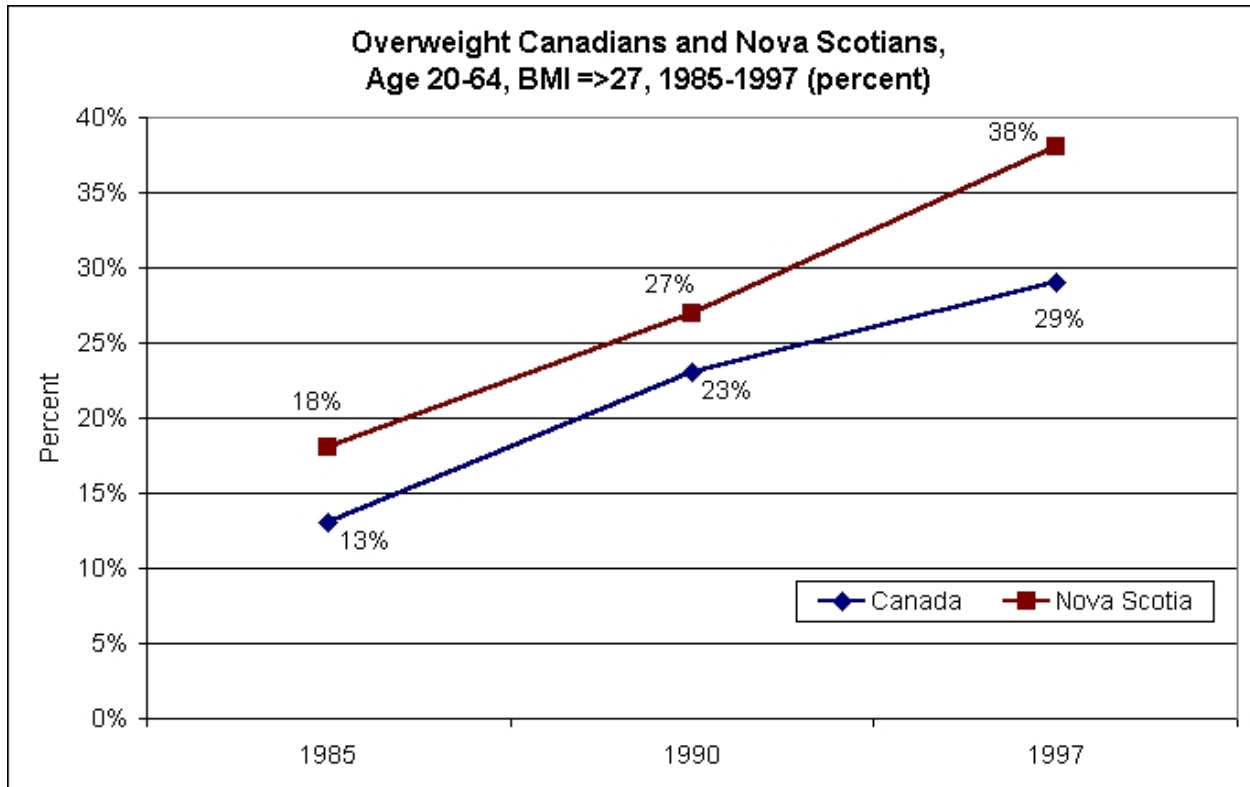
⁹³ Statistics Canada, *Health Indicators* CD-Rom, 1999, Table 00060211.IVT: “Population by Body Mass Index”; World Health Organization, *Obesity: Preventing and Managing the Global Epidemic*, Report of a WHO Consultation on Obesity, Geneva, 1997.

⁹⁴ Gilmore, Jason, “Body Mass Index and Health,” *Health reports* 11 (1), Summer, 1999, Statistics Canada catalogue no. 82-003, Ottawa, pages 31-43.

⁹⁵ *The Chronicle-Herald*, Halifax, October 9, 1999, page C1.

⁹⁶ Nova Scotia estimates are extrapolated from U.S. data cited in Birmingham, C. Laird, et al., in *Canadian Medical Association Journal* 160 (4), 23 February, 1999, page 488, and from a report by the U.S. Surgeon-General cited in *The Chronicle-Herald*, 18 December, 2001, page B3.

Figure 10 Overweight Canadians and Nova Scotians, Age 20-64, BMI ≥ 27 , 1985-1997 (percent)



Source: Statistics Canada, Health Indicators 1999.

Obesity-related illnesses cost the Nova Scotia health care system an estimated \$128 million dollars annually, or 6% of total direct health care costs in the province. When productivity losses due to obesity, including premature death, absenteeism and disability, are added, the total cost of obesity to the Nova Scotia economy is estimated to be more than \$268 million a year.⁹⁷ This compares to the estimated \$430 million in direct and indirect costs due to tobacco in Nova Scotia. Because smoking is on the decline and overweight is increasing rapidly, it is predicted that obesity-related costs will soon overtake the costs of tobacco-related illness.

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.⁹⁸

⁹⁷ Colman, Ronald, *The Cost of Obesity in Nova Scotia*, GPI Atlantic, Halifax, 2000, chapter 6, based on methodology of Birmingham, op. cit., pages 484-488.

⁹⁸ 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.

‘Rich’ diets, 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 epidemic. This is the case even when high blood pressure and cigarette smoking are prevalent (witness Japan).”*⁹⁹

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.”*¹⁰⁰

And an international review of evidence concurs that:

*“In industrialized countries, excess intake of fat, salt, and simple sugar leads to obesity and increased levels of blood lipids and sugar, which, in turn, are risk factors for many conditions, including coronary heart disease, adult-onset diabetes, and hypertension.”*¹⁰¹

Interestingly, these analysts argue that, like a sedentary lifestyle, such diets and their adverse health impacts are a cultural and historical phenomenon unique to modern times, and thus amenable to social rather than medical solutions:

*“The twentieth-century American diet is... a new and unprecedented exposure for the human species. It is radically different from previous eating patterns; there has been no basis in prior human experience for evolutionary adaptation to this exposure.... Given the origins of the coronary epidemic in mass disturbances of human culture, it is clear that high-tech ‘magic bullets’ are not and cannot be the solution, be they drugs, surgical procedures, gene splicing, or whatever.”*¹⁰²

⁹⁹ 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.

¹⁰⁰ 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.

¹⁰¹ Zevallos, Juan, et al., “An International Perspective on Coronary Heart Disease and Related Risk Factors,” in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, page 165.

¹⁰² Idem.

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.”¹⁰³ 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.”*¹⁰⁴

Therefore, according to the U.S. Surgeon-General, Dr. David Satcher:

*“A major goal of Healthy People 2010 is reducing obesity, as well as improving the nutritional status and level of physical activity among all Americans.”*¹⁰⁵

Recommended dietary shifts include:

- reducing saturated fat and total fat consumption, as well as dietary cholesterol intake from animal products like high fat meat, dairy, and egg yolks;
- eating more complex carbohydrates and high fibre foods like whole grains, cereals, fruits and vegetables; and
- reducing consumption of sodium, caffeine, alcohol, sugar, and highly-processed foods.

In fact, public health campaigns have been successful in lowering per capita consumption of butter, dairy fat, lard, high-fat meats, and eggs across North America since the late 1960s, thereby reducing intake of cholesterol and saturated fats. Intake of fish, poultry, and fresh fruits and vegetables has increased, while consumption of low-fat milk has more than doubled.¹⁰⁶ However average consumption levels still exceed the recommended goals of less than 300 mg/day of dietary cholesterol or less than 100 mg per 1,000 kilocalories of energy, and less than 10% of kilocalories for saturated fat intake, and less than 30% of kilocalories for total fat.¹⁰⁷

Healthy school lunches, nutritional education and physical fitness programs, and brief physician advice to patients can be inexpensive and highly cost-effective ways of controlling the obesity epidemic. In the longer term, warning labels and taxes on unhealthy foods akin to current anti-tobacco strategies may be necessary, along with economic incentives for healthy eating:

*“Price subsidies, taxes, and other economic incentives and disincentives can be used to modify the production and usage of tobacco and various foodstuffs.”*¹⁰⁸

¹⁰³ 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.

¹⁰⁴ 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.

¹⁰⁵ Cited in *FYI from the NHLBI: Public Interest News from the Heart, Lung, and Blood Institute*, 1 (2), September 2000, page 1.

¹⁰⁶ 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 50.

¹⁰⁷ Stamler (1992), op. cit., page xiii.

¹⁰⁸ Zevallos, Juan, et al., “An International Perspective on Coronary Heart Disease and Related Risk Factors,” in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, page 165.

Since there is a high correlation between stress, long work hours, poor dietary habits and gains in overweight, Nova Scotia might also achieve health gains by following the lead of European countries that have created jobs by reducing work hours.¹⁰⁹

As indicated in chapter 3, lack of access to quality, healthy food, and functional illiteracy that impedes understanding of educational materials, may constitute serious barriers to healthy eating for those with low socio-economic status.

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.¹¹⁰

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.¹¹¹

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.¹¹² In contrast to improved diet and weight reduction, drugs may also

¹⁰⁹ Colman, op. cit., chapter 7.

¹¹⁰ 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 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.

¹¹¹ 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.

¹¹² 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

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.¹¹³

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 annual cost savings of \$854 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.¹¹⁴

Researchers have concluded that nutrition is the most critical and pivotal component of diabetes care in achieving target blood glucose goals.¹¹⁵ While education programs are important, the most successful care includes follow-up monitoring. One study found that telephone calls were

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.

¹¹³ 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.

¹¹⁴ 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 2001 Canadian dollars: Statistics Canada's CANSIM database, Matrix 933, gives the June 1987 exchange rate as US\$1 = Can\$1.34. Calculation (1): 1.34 X \$446 = \$597.64 (1987 Can\$); Calculation (2): 2001 CPI (116.4) divided by 1987 CPI (81.5) X \$597.64 = \$853.56.

¹¹⁵ 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.

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.¹¹⁶

Excess body weight is also associated with higher cholesterol, a key risk factor in heart disease. Researchers have concluded that high rates of coronary heart disease (CHD) among Americans can be attributed to their diet, and that efforts to reduce CHD by improving lipid levels should include more emphasis on nutritional education and on achieving ideal body weight.¹¹⁷

A study published in the *Journal of the American Medical Association* concluded that lowering cholesterol through dietary modification may be more cost effective than drug therapy, with study results indicating oat bran costing 25% of colestipol and just 15% of cholestyramine resin for equivalent results in years of life saved.¹¹⁸

Evidence indicates that nutrition treatment may avoid drug costs, laboratory tests, and even artery cleaning surgery by lowering blood cholesterol and reversing heart disease. One study found that dietary counselling significantly lowered plasma lipid levels in subjects with hypercholesterolemia and hypertriglyceridemia, and suggested that 20% of the former could avoid drug therapy as a result. Another study found that adding fibre to the diet is the lowest cost treatment for these conditions.¹¹⁹

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 over 10 years in medical expenses and avoided productivity losses.¹²⁰ Extrapolated to Nova Scotia by population, this would produce economic savings to the province of \$21-\$66 million over 10 years.

¹¹⁶ Lasker, Roz, "The Diabetes Control and Complications Trial: Implications for Policy and Practice," *New England Journal of Medicine*, 329 (14): 1035-1036, September 30, 1993.

¹¹⁷ Denke, Margo, et al., "Excess Body Weight," *ARCH Intern Med.*, 153: 1093-1103, May 10, 1993; Millen Posner, Barbara, et al., "Healthy People 2000 – The Rationale and Potential Efficacy of Preventive Nutrition in Heart Disease: The Framingham Offspring-Spouse Study," *Arch Intern Med.* 153, July 12, 1993; both cited in Province of British Columbia (1996), page 15.

¹¹⁸ Kinoshian, Bruce, and John Eisenberg, "Cutting into Cholesterol: Cost Effective Alternatives for Treating Hypercholesterolemia," *Journal of the American Medical Association* 259 (15): 2249-2254, April 15, 1988, cited in Province of British Columbia (1996), op. cit., page 16.

¹¹⁹ "Does Health Insurance Cover Dietary Counselling?" *Tufts University Diet and Nutrition Letter* 11 (8): 7-8, October, 1993; and Kelley, Mark, "Hypercholesterolemia: The Cost of Treatment in Perspective," *Southern Medical Journal* 83 (12): 1421-1425, December, 1990; Dallongeville, Jean, et al., "Short-Term Response to Dietary Counseling of Hyperlipidemic Outpatients of a Lipid Clinic," *Journal of the American Dietetic Association*, 94 (6): 616-621, June, 1994; all cited in Province of British Columbia (1996), op. cit., pages 17, 51.

¹²⁰ 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 US dollars to 2001 Canadian dollars: Exchange rates given at <http://www.x-rates.com/cgi-bin/hlookup.cgi> on June 28, 1996, indicate \$US1 = \$Can1.3657.

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

Calculation (2): 2001 CPI (116.4) divided by 1996 CPI (105.9) X \$5.46b = \$6 billion

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

Calculation (2): 2001 CPI (116.4) divided by 1996 CPI (105.9) X \$17.75 = \$19.5 billion

Calculation (1): 1.3657 X \$14 million = \$19.12 million (1996 Can\$)

Calculation (2): 2001 CPI (116.4) divided by 1996 CPI (105.9) X \$19.12m = \$21 million

Documented case studies in the U.S. demonstrate average cost savings of \$4,185 for each case of hypercholesterolemia and \$6,414 for each case of hypertension treated through dietary intervention. A national expert panel on high blood cholesterol in the U.S. advocated diet therapy as the safest available treatment, and recommended that the tendency to employ drugs should be resisted during the often lengthy period required to modify dietary habits.¹²¹

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 and increased consumption of omega 3 fatty acids in the diet saved more lives and was relatively inexpensive.¹²² These findings confirm the ancient wisdom of the 12th century Chinese philosopher who stated: "Experts in the use of drugs are inferior to those who prescribe the proper diet."¹²³

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. The usual regimen for success includes smoking cessation, weight reduction, a low-fat diet, regular exercise, stress reduction, and in some cases drug therapy to lower cholesterol and LDL and to raise HDL.¹²⁴

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. One study found nutritional intervention to be cost effective in delaying the initiation of

Calculation (1): $1.3657 \times \$44 \text{ million} = \$60.1 \text{ million (1996 Can\$)}$

Calculation (2): $2001 \text{ CPI (116.4) divided by } 1996 \text{ CPI (105.9)} \times \$60.1\text{m} = \$66.1 \text{ million.}$

¹²¹ The Expert Panel, "Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults," *ARCH Intern Med.*, 148: 36-69, January, 1988, cited in Province of British Columbia (1996), page 16. To convert from 1995US\$ to 2001Can\$, exchange rates at <http://www.x-rates.com/cgi-bin/hlookup.cgi> on June 30, 1995, indicate $\text{\$US1} = \text{\$Can1.3738}$.

Calculation (1): $1.3738 \times \$2,728 = \$3,747 \text{ (1995 Can\$)}$;

Calculation (2): $2001 \text{ CPI (116.4) divided by } 1996 \text{ CPI (104.2)} \times \$3,747 = \$4,185$

Calculation (1): $1.3738 \times \$4,180 = \$5,742 \text{ (1995 Can\$)}$

Calculation (2): $2001 \text{ CPI (116.4) divided by } 1996 \text{ CPI (104.2)} \times \$5,742 = \$6,414$

¹²² 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.

¹²³ Ellison, R. Curtis, "Give Diet a Chance in Lowering Cholesterol Levels," editorial in *Arch Intern Med.* 148: 1017-1019, May, 1988, cited in Province of British Columbia (1996), op. cit., page 22.

¹²⁴ 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.

haemodialysis therapy and the progression of end stage renal disease, saving \$3,450 per patient per month in the U.S.¹²⁵

Nutritional intervention is essential in controlling metabolic disorders. Phenylketonuria (PKU), for example, is a genetic metabolic error characterized by deficiency of an enzyme that processes the essential amino acid phenylalanine. It is detectable through blood testing during newborn screening.¹²⁶ Nutrition services for PKU children yield a conservative benefit-cost ratio of about 3:1.¹²⁷

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 \$180.¹²⁸ It has been estimated that nutrition services are required in fully half of all home care cases, and can produce significant cost savings.¹²⁹

Nutritional services have also been shown to be cost-effective in preventing growth retardation and further disability in persons with developmental disabilities, improving performance at work and school, and avoiding related feeding and metabolic problems.¹³⁰

Nutritional intervention has also been shown to be cost-effective in controlling allergies. Among clients of the Allergy Nutrition Clinic of the Vancouver General Hospital, 76% reported fewer symptoms, 52% reported fewer physician visits, 32% used less medication, 20% reported less absence from work or school, and 8% reported fewer hospital emergency admissions. Fully 84% reported better health and quality of life due to clinic visits.¹³¹

¹²⁵ "Ambulatory Nutrition Care: Adults – Renal Disease," *Supplement to Journal of the American Dietetic Association*, April, 1989: S39-40; Gould, Rebecca, "The Next Rung of the Ladder: Achieving and Expanding Reimbursement for Nutrition Services," *Journal of the American Dietetic Association*, 91 (11): 1383-1384; both cited in Province of British Columbia (1996), op. cit., pages 33, 51. To convert 1987 US\$ to 2001 Can\$, Statistics Canada's CANSIM database, Matrix 933 indicates the June 1987 exchange rate to be \$1.34 Can = \$1 US.

Calculation (1): $1.34 \times \$1,802 = \$2,415$ (1987 Can\$)

Calculation (2): $2001 \text{ CPI } (116.4) \text{ divided by } 1987 \text{ CPI } (81.5) \times \$2,415 = \$3,449$

¹²⁶ Information is available at the web site of the Children's PKU Network: <http://www.pkunetwork.org/PKU.html>.

¹²⁷ "Ambulatory Nutrition Care: Infants," *Supplement of the Journal of the American Dietetic Association*, April, 1989, S15-16; Gould, Rebecca, "The Next Rung of the Ladder: Achieving and Expanding Reimbursement for Nutrition Services," *Journal of the American Dietetic Association*, 91 (11): 1383-1384; both cited in Province of British Columbia (1996), pages 5, 51.

¹²⁸ "BC Children's Hospital Clinical Nutrition Report," November, 1994, cited in Province of British Columbia (1996), op. cit., page 42.

¹²⁹ 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. Dietitians 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.

¹³⁰ "Position of the American Dietetic Association: Nutrition in Comprehensive Program Planning for Persons with Developmental Disabilities," *Journal of the American Dietetic Association*, 92 (5): 613-615, May, 1992.

¹³¹ Joneja, Janice, "Summary Data Pilot Project – Vancouver Allergy Clinic," November, 1994, cited in Province of British Columbia (1996) op. cit., page 51.

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.¹³² Conversely, nutritional counselling and dietary interventions have proved successful in promoting health and preventing a wide range of conditions, including diabetes mellitus, cardiovascular disease, certain cancers, obesity, and low birth weight.¹³³

The American Cancer Society attributes 30% of cancer deaths to dietary risk factors, indicating that more than 700 Nova Scotians 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.¹³⁴

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.¹³⁵

In his report on Nutrition and Health, the U.S. Surgeon-General noted:

*“For two out of three adult Americans who do not smoke and do not drink excessively, one personal choice seems to influence long-term health prospects more than any other: what we eat.”*¹³⁶

¹³² Carrow, Anne, and Lorne Klippert, “Ambulatory Health Care Services – Nutrition Counselling,” *Issue Paper, Ministry of Health*, 1992/93, Province of British Columbia.

¹³³ *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.

¹³⁴ 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.

¹³⁵ 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.

¹³⁶ *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; and quoted in “The Role of Nutrition in

Following this report, the U.S. National Research Council issued its landmark report, *Diet and Health: Implications for Reducing Chronic Disease Risk*.¹³⁷ And the U.S. Department of Health and Human Services addressed the explicit relationship between nutrition and chronic disease prevention in its *Healthy People 2000* health promotion objectives.¹³⁸

These documents mark a significant shift from the conventional view of diet and health, which saw dietary recommendations more narrowly as combating nutrient deficiencies, to addressing nutrient needs for good health throughout the life cycle. This more 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 must be culturally competent and address the specific needs of vulnerable or underserved populations.”*¹³⁹

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 over \$300 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.¹⁴⁰ Extrapolated to Nova Scotia by population, these figures indicate costs of 1,100-2,000 deaths and \$700 million a year for this province.

The American Dietetic Association has summarized the annual cost of nutrition-related diseases in the U.S. as follows: low birth weight: \$5.4-11.57 billion; malnutrition among hospitalized

Health Promotion and Disease Prevention Programs – Position of ADA,” *Journal of the American Dietetic Association*, 98: 205-208, 1998; and in “The Coalition for Nutrition Services in Health Care Reform – Position Statement,” *Society for Nutrition Education*, May/June, 1993, page A6, last reference cited in Province of British Columbia (1996), op. cit., page 17.

¹³⁷ 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.

¹³⁸ 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.

¹³⁹ “The Role of Nutrition in Health Promotion and Disease Prevention Programs – Position of ADA,” *Journal of the American Dietetic Association*, 98: 205-208, 1998.

¹⁴⁰ “Rx: 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. (2001 \$Can307 billion = 1994 \$US200 billion, using the calculation methods given above.)

patients: 30-55% excess costs; cancer: \$160.4 billion; cardiovascular disease: \$197.5 billion; diabetes mellitus: \$141.9 billion; and obesity: \$60.6 billion.^{141, 142} The Association notes:

“If nutrition were to play a role in disease prevention, billions of dollars could be saved in direct and indirect costs.... A substantial amount of health care resources could be saved by expanding health promotion and disease prevention programs that target dietary change among Americans.”¹⁴³

European evidence supports this conclusion. A British overview of published studies of cost-effectiveness in the primary and secondary prevention of cardiovascular disease found:

“[H]ealth promotion strategies which promote healthy eating are likely to be more cost-effective than strategies involving modern cholesterol-lowering drugs, screening and advice in primary care, and are comparable to or less expensive per year of life saved than anti-smoking strategies..... EU (European Union) wide food based dietary guidelines are potentially the basis of large health gains in Europe, and cost-effectiveness studies tend to support their adoption.”¹⁴⁴

One U.S. estimate indicates that population-based interventions to encourage reduction of saturated fat intake alone may prevent tens of thousands of cases of coronary heart disease, and save between \$6 billion and \$18.6 billion in health care costs and lost earnings over 10 years.¹⁴⁵ Extrapolated to Nova Scotia by population, this indicates savings to the province of \$20.5 million - \$66 million.

U.S. data also show that nutritional status is a predictor of length of hospital stay and mortality, and that the prevalence of malnutrition is associated with prolonged hospital stay and higher average costs per day. It is estimated that patients with protein calorie malnutrition account for 40-70% of hospital days and have hospital stays 2-3 times longer than their diagnoses warrant.¹⁴⁶

¹⁴¹ “Position of the American Dietetic Association: Cost-Effectiveness of Medical Nutrition Therapy,” *Journal of the American Dietetic Association*, 95 (1): 88-91, January, 1995, cited in Province of British Columbia (1996), op. cit., page 39.

¹⁴² To convert 1995US\$ to 2001Can\$, exchange rates from <http://www.x-rates.com/cgi-bin/hlookup.cgi> show \$US1 = \$Can1.1381 on 30 June, 1995. Therefore calculation (1): 1.1381 X \$3.5 billion = \$4.84 billion (1995 Can\$), and calculation (2): 2001 CPI (116.4) divided by 1995 CPI (104.2) X \$4.84 = \$5.4 billion. The same process is repeated for the other conversions in this paragraph: \$7.5bUS(1995) = \$11.57b Can (2001), \$104bUS(1995) = \$160.4b Can (2001), \$128bUS(1995) = \$197.5b Can (2001), \$92bUS(1995) = \$141.9b Can (2001), \$39.3bUS(1995) = \$60.6b Can (2001).

¹⁴³ “The Role of Nutrition in Health Promotion and Disease Prevention Programs – Position of ADA,” *Journal of the American Dietetic Association*, 98: 205-208, 1998.

¹⁴⁴ Brunner, E, D. Cohen, and L. Toon, “Cost Effectiveness of Cardiovascular Disease Prevention Strategies: A Perspective on EU Food Based Dietary Guidelines,” *Public Health Nutrition*, April 4, 2001 (2B): 711-715.

¹⁴⁵ Oster, G. and D. Thompson, “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* 96: 127-131, 1996. (2001 \$Can 6 billion = 1993 \$US 4.1 billion; 2001 \$Can 18.6 = 1993 \$US 12.7; 2001 \$Can 20.5 million = 1993 \$US 14 million; 2001 \$Can 66 million = 1993 \$US 45 million.)

¹⁴⁶ Gamble Coats, Katherine et al., “Hospital-associated Malnutrition: A Reevaluation 12 Years Later,” *Journal of the American Dietetic Association*, June, 1993: 27-33; Reilly, James, et al., “Economic Impact of Malnutrition: A Model System for Hospitalized Patients,” *Journal of Parenteral and Enteral Nutrition*, 12 (4): 371-376, 1988; Robinson, Georgia, et al., “Impact on Nutritional Status of DRG Length of Stay,” *Journal of Parenteral and Enteral Nutrition*, 11 (1), 1987; Smith, Philip, and Alice Smith, “Nutritional Intervention Influences the Bottom Line,”

By contrast, good nutrition, including a diet low in saturated fats, high in whole grains, and with five or more servings of vegetables and fruits a day, plays a key role in maintaining good health. Improving the diet of Nova Scotians could extend their lives, reduce the occurrence of chronic diseases in the province, including cardiovascular diseases, diabetes, and cancer, and save health care costs.

Yet 1990 survey results showed that 8 out of 10 Nova Scotians ate too much fat. The overall energy Nova Scotians 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. By contrast Nova Scotians reported their carbohydrate consumption at 47% of total energy intake, considerably lower than the 55% recommended level. Nova Scotians also consumed too much protein from animal products, well above recommended levels.¹⁴⁷

But perhaps the most revealing evidence is the low priority this nutrition information has on our health agendas. Only two surveys of Nova Scotian eating habits have ever been conducted – in 1970-72 and again in 1990 – with no more recent information available. The 1990 Nova Scotia Nutrition Survey revealed widespread public ignorance about the processed and prepared foods that constitute an increasing share of our diets. Survey results indicated that food labels were widely misunderstood and misinterpreted, with little comprehension of ingredient lists and nutrition panels, and considerable confusion about the validity of food claims on labels.¹⁴⁸

Effectively, nutrition education comes from food industry advertising, which contributes more than \$32 billion a year to the economies of the U.S. and Canada, more than any other industry. More than half this advertising promotes fast foods, candies, and sugared cereals. Kellogg's, for example, spends \$43 million a year to promote Frosted Flakes alone, while Coca Cola and McDonald's are two of the top 10 advertising spenders in the world among all industries.¹⁴⁹ Nutritional education budgets pale by comparison, and register as "costs" to be cut in ever-tighter government budgets.

Stress, overwork, and low income also contribute to poor eating habits. 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."¹⁵⁰

Healthcare Financial Management, October, 1993; all cited in Province of British Columbia (1996), op. cit., pages 33-35, 41.

¹⁴⁷ 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/Media/Archives/newsnov_93.html; Health Canada, "Household Level Access to Food," available at: <http://www.hc-sc.gc.ca/datahpsb/npu/cpc8.htm>.

¹⁴⁸ Nova Scotia Heart Health Program, op. cit., page 32.

¹⁴⁹ 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 67-68.

¹⁵⁰ National Institute of Nutrition, "Tracking Nutrition Trends 1989 - 1994 - 1997," 10 November, 1997, available at: http://www.nin.ca/Media/Archives/newsnov10_97.html.

Numerous studies have confirmed the economic value and cost-effectiveness of preventive nutrition services. The following examples are culled from an extensive literature review on the subject prepared by British Columbia's Ministry of Health in 1996.¹⁵¹

Worksite interventions can improve health and save money. One U.S. study found that employees participating in a low fat / high activity program cut individual health care claims by more than one-half in three years, from an average of \$2,333 in 1988 to \$1,085 in 1990.¹⁵² If all high risk individuals in an 8,000-employee firm made such changes, it was estimated the firm could save \$40.4 million over three years.¹⁵³

Evidence also shows that public health and community-based nutrition interventions can lower morbidity and mortality, improve quality of life, and reduce costs in the health care system.¹⁵⁴ An extensive community-based health education campaign to reduce dietary salt, increase potassium from fruits and vegetables and protein from seafood, and monitor blood pressure, was credited with reducing stroke mortality rates, as well as blood pressure and hypertensive drug use, in Shimane Prefecture in Japan.¹⁵⁵ One in-store program in Minnesota, using educational materials, shelf-labelling, and product tasting to inform consumers of lower fat and sodium products, encouraged up to 40% of consumers to change their food choices.¹⁵⁶

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 \$18,000-\$23,000 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.¹⁵⁷ One California smoking cessation and nutritional counselling program for pregnant mothers yielded annual net savings of \$115 per enrolled mother.¹⁵⁸

¹⁵¹ *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. References that follow include the original journal citation as well as the page reference in the B.C. review where the citation appears.

¹⁵² To convert 1990US\$ to 2001Can\$, exchange rates from <http://www.x-rates.com/cgi-bin/hlookup.cgi> show \$US1 = \$Can1.1619 on 30 June, 1990. Therefore calculation (1): 1.1619 X \$1155 = \$1,870 (1990 Can\$), and calculation (2): 2001 CPI (116.4) divided by 1990 CPI (93.3) X \$1870 = \$2333. The same process is repeated for the other conversions in this paragraph: \$537US(1990) = \$1085 Can (2001), \$20mUS(1990) = \$40.4m Can (2001).

¹⁵³ "Rx: Good Nutrition - Putting 'Health' into Health Care Reform," American Cancer Society et al., June, 1994, cited in Province of British Columbia (1996), op. cit., page 14.

¹⁵⁴ Glynn, Kayla, and Rae Clemens, *Effectiveness of Public Health Nutrition Programs and Services: A Review*, Middlesex-London Health Unit, London, Ontario, 1995, 127 pages.

¹⁵⁵ Yamori, Yukio, and Ryoichi Horie, "Community-Based Prevention of Stroke: Nutritional Improvement in Japan," *Health Reports* 6 (1): 181-188, 1994, Statistics Canada catalogue no. 82-003.

¹⁵⁶ Mullis, Rebecca, "The Shop Smart for your Heart Grocery Program," *Journal of Nutrition Education* 19 (5): 225-228, 1987, cited in Province of British Columbia (1996), op. cit., page 19.

¹⁵⁷ 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*,

In the U.S., food and nutrition counselling are provided to low-income women, infants, and children under the Special Supplemental Nutrition Program for Women, Infants, and Children, popularly known as WIC. Several studies have found that each dollar spent on WIC services saves \$3 in health costs in the same year, primarily due to avoided hospitalization of premature, low birth weight babies. The long-term savings are even greater, since premature, low birth weight infants are also more likely than full term, normal weight infants to have permanent physical disabilities or mental retardation. At a cost of just \$73 per month, WIC can save \$2,000 per day if the child is premature, \$200,000 in medical costs if low birth weight is accompanied by other physical abnormalities, and \$4 million in lifetime care if severe mental retardation occurs.¹⁵⁹

School-based nutrition programs can also be effective. A concerted nutrition education program in Singapore schools, the "Trim and Fit Scheme" reduced obesity rates among that country's school children by 33% to 50% depending on the age group.¹⁶⁰ Schools in Berkeley, California, have set up vegetable gardens to teach students about food and nutrition, and even to supply food to the school cafeterias. Beginning in 1999, Berkeley schools were required to serve organic lunches.¹⁶¹ Establishing nutritional guidelines for food contracts is a simple step that can be taken by local school boards at any time, without waiting for higher levels of government to act.

A U.S. experiment promoting better nutrition and physical activity in grade 3-5 children, the "Child and Adolescent Trial for Cardiovascular Health," found substantially lower dietary fat intake and higher levels of physical activity well into the adolescent years compared to control groups, indicating that behavioural changes at a young age can have lasting effects. Another study found that proper nutritional training of food service workers reduced the fat content of school meals by 10-15% and the sodium content by 40-54%, through changes in food purchasing and preparation. School-based interventions have also been shown to affect total daily diet, with students consuming fewer calories, less fat, less saturated fat, and less sodium. The studies have concluded that comprehensive educational programs can influence health behaviours in adolescence. One study also found that the availability of school-based nutritional services

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.

¹⁵⁸ "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), page 39. (2001 \$Can 18,416 = 1995 \$US 12,000; 2001 \$Can 23,020 = 1995 \$US 15,000; 2001 \$Can 115 = 1986 \$US 75).

¹⁵⁹ Buescher, Paul, et al., "Prenatal WIC Participation Can Reduce Low Birth Weight and Newborn Medical Costs: A Cost-Benefit Analysis of WIC Participation in North Carolina," *Supplement of the Journal of the American Dietetic Association*, 93 (2): 163-166, February, 1993; Canadian Nutrition Institute, October 11, 1991, page 2; Matsumoto, Masao, "The WIC Program Meets A Special Need," *Food Review* 15 (1): 40-42, 1992; Goldberg, Jeanne, and Jean Mayer, "The White House Conference on Food, Nutrition and Health Twenty Years Later: Where Are We Now?," *Journal of Nutrition Education*, Viewpoint, 1990: 47-50; Mayer, Jean, "Tufts President Speaks Out on Domestic Hunger," *FYI* 90 (10): 1377-1380, October, 1990; "What the 'Contract with America' Won't Tell You," *CNI Newsletter* 24 (3): 4-5, January 20, 1995; "Rx: Good Nutrition – Putting 'Health' into Health Care Reform," American Cancer Society et al., June, 1994; all cited in Province of British Columbia (1996), op. cit., pages 2-4. (2001 \$Can 72.7 = 1990 \$US 35; 2001 \$Can 2,077 = 1990 \$US 1,000; 2001 \$Can 207,724 = 1990 \$US 100,000; 2001 \$Can 4.12 million = 1990 \$US 2 million).

¹⁶⁰ Gardner and Halweil, op. cit., pages 76-78

¹⁶¹ Idem.

reduced primary health care costs for children by about 12% through decreased use of medical care.¹⁶²

A study of Seventh Day Adventist church members in California found they had a death rate from digestive tract cancer of 65% the rate for the rest of the state. The study attributed the results to the dietary restrictions of church members, many of whom follow vegetarian diets, and who are bound by their scriptures to eat “the most healthful diet possible and abstain from the unclean foods” as well as alcohol and tobacco. The study estimated that if this 65% death rate were possible nation-wide, the U.S. would save \$863.7 million a year in direct costs and \$771.1 million more in indirect costs.^{163, 164}

According to one expert: “Nutrition education would save a lot of money for the nation in health care costs,” has already helped cut cardiovascular mortality by 1/3, and has raised the profile of good nutrition practice as protection against cancer.¹⁶⁵ One literature review concluded that nutrition intervention is a very worthwhile investment in preventing and treating coronary heart disease.¹⁶⁶ Responding to that reality, managed care health plans in the U.S. have increasingly endorsed nutritional screening interventions, with one representative noting that “nutritional care is as good as immunization for babies.”¹⁶⁷

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

¹⁶² Ellison, R. Curtis, “The Environmental Component: Changing School Food Service to Promote Cardiovascular Health,” *Health Education Quarterly*, 16: 285-297, 1989; and Simons-Morton, Bruce et al., “Promoting Physical Activity and a Healthful Diet among Children: Results of a School-Based Intervention Study,” *American Journal of Public Health*, 81 (8): 986-991, August, 1991; and Puska, Pekka, et al., “The North Karelia Youth Project: Evaluation of Two Years of Intervention on Health Behaviour and CVD Risk Factors Among 13-15 Year Old Children,” *Preventive Medicine*, 11: 550-570, 1982; “Ambulatory Nutrition Care: Children,” *Supplement of the Journal of the American Dietetic Association*, S17-21, April, 1989; all cited in Province of British Columbia (1996), pages 6-8.

¹⁶³ Brown, Allen, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, pages 9-10, citing Kristein, M., “Economic Issues in Prevention,” *Preventive Medicine* 1977; 6: 252-264, and Kristein, M, et al., “Health Economics and Preventive Care,” *Science* 1977; 195: 457-462.

¹⁶⁴ To convert 1977 US\$ to 2001 Can\$, Statistics Canada’s CANSIM database, Matrix 933 indicates the June 1977 exchange rate to be \$1.06Can = \$1 US. Calculation (1): 1.06 X \$280m = \$296.8m (1977 Can\$). Calculation (2): 2001 CPI (116.4) divided by 1977 CPI (40) X \$96.8 = \$8,63.7m. The same process is repeated for the other conversion in this paragraph: \$250mUS(1977) = \$771.1 Can (2001).

¹⁶⁵ Mayer, Jean, “Tufts President Speaks Out on Domestic Hunger,” *FYI* 90 (10): 1377-1380, October, 1990, cited in Province of British Columbia (1996), op. cit., page 10.

¹⁶⁶ Disbrow, Doris, “A Cost-Benefit Analysis of Nutrition Services for the Prevention of Coronary Heart Disease,” *Topics in Clinical Nutrition*, April, 1988: 31-45, cited in Province of British Columbia (1996), op. cit., page 20.

¹⁶⁷ “Managed Care Health Plans Endorse Need for Nutrition Screening Interventions,” *Nutrition Screening Initiatives*, June 1994: 1-2; cited at Province of British Columbia (1996), op. cit., page 12.

unknown. A prudent approach to these results would be a bias towards whole foods rather than adding or subtracting individual nutrient chemicals."¹⁶⁸

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 62% of Nova Scotians insufficiently active for optimal health benefits.¹⁶⁹

Active living can not only prevent a wide range of chronic diseases, but can 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.¹⁷⁰

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.¹⁷¹

Past GPI Atlantic reports (2000) have detailed the cost of tobacco in Nova Scotia, and the cost of obesity in Nova Scotia.¹⁷² Since that time, a study published in the *Canadian Medical Association Journal* provides the methodology and relative risk assessments that allow, for the first time, a determination of the economic cost of physical inactivity for the Nova Scotia health care system and economy.¹⁷³ For this reason, physical inactivity is examined separately and in more detail in a separate appendix to this report.

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

¹⁶⁸ Robertson, Iain, Rona Bound, and Leonie Segal, "Colorectal Cancer, Diet and Lifestyle Factors: Opportunities for Prevention," *Health Promotion International* 13 (2): 141-150.

¹⁶⁹ 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 1994, and "Results of the 2000 Physical Activity Monitor, available at: <http://www.cflri.ca/cflri/pa/surveys/2000survey/2000survey.html>

¹⁷⁰ Canadian Fitness and Lifestyle Research Institute, "Economic Costs of Physical Inactivity," *The Research File*, 2000.

¹⁷¹ Morgan, William (ed), *Physical Activity and Mental Health*, Taylor and Francis, 1997, chapters 10-13.

¹⁷² Colman, Ronald, *The Cost of Tobacco in Nova Scotia*, GPI Atlantic, Halifax, October, 2000; Colman, Ronald, *The Cost of Obesity in Nova Scotia*, GPI Atlantic, Halifax, March, 2000.

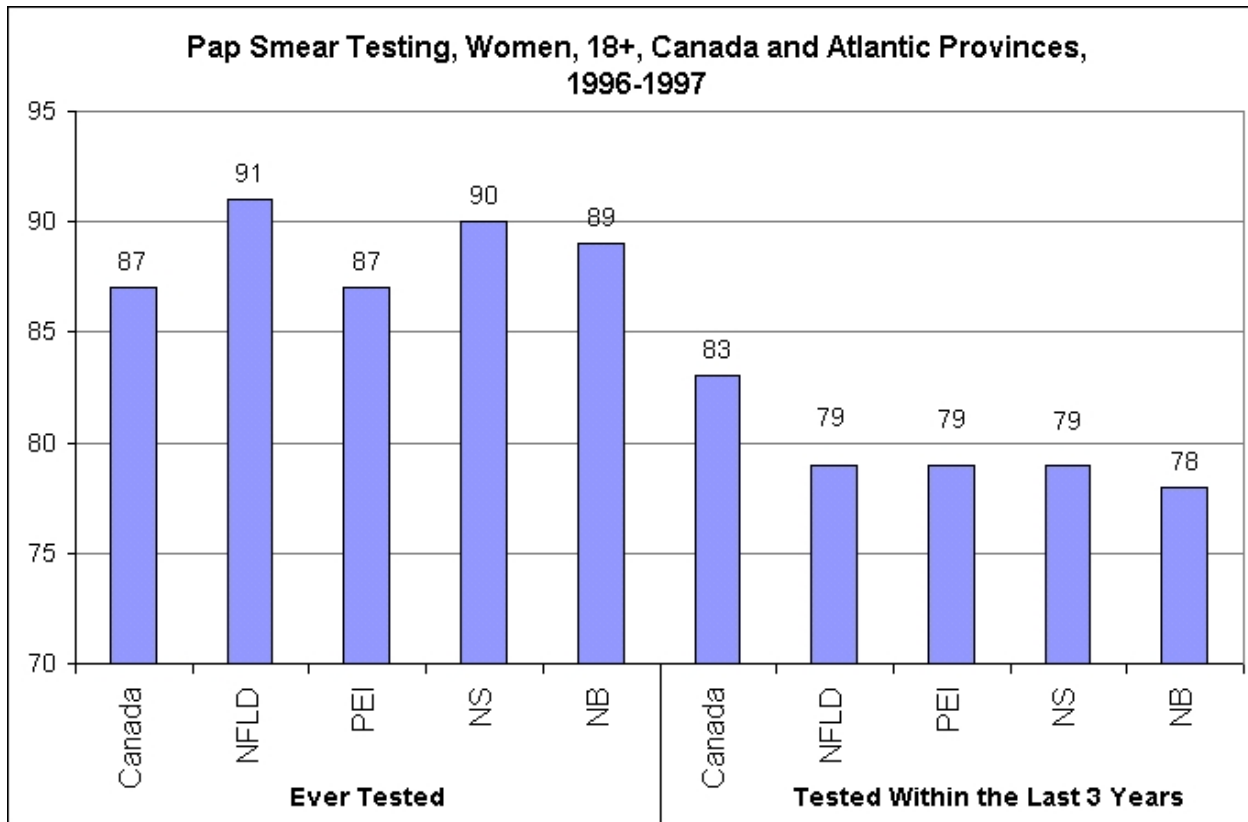
¹⁷³ Katzmarzyk, P.T., N. Gledhill, and R. J. Shephard, "The Economic Burden of Physical Inactivity in Canada," *Canadian Medical Association Journal* 163 (11), 2000, pages 1435-1440.

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.

2.4.1 Pap Smear Tests

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. 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 100,000.¹⁷⁴

Figure 11 Pap Smear Testing, Women, 18+, Canada and Atlantic Provinces, 1996-97



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

Most cases of invasive cervical cancer today occur in women not previously screened *or* not screened recently. Ninety percent of Nova Scotian women have had a Pap smear, above the

¹⁷⁴ 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.

Canadian average; but women in this province are more likely not to have been tested recently. One in three Nova Scotian women has not been tested in the last three years. As Pap smears are recommended on a more regular basis for women aged 18 and over, the Atlantic region results suggest that educational information focus on the importance of the time element (Figure 11).¹⁷⁵

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.¹⁷⁶ Monthly breast self-examinations and annual clinical breast exams can also detect breast cancer at an early stage, allowing effective treatment.

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.¹⁷⁷

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."*¹⁷⁸

In 1990 just 47% of Canadian women 50 and over had ever had a mammogram. By 1996-97, the figure was 75%. 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 50-59.¹⁷⁹

Nova Scotia has the second lowest rate of mammogram screening for women aged 50-69 in the country, after Newfoundland (Figure 12). The Nova Scotia Breast Screening Clinic currently reports a 3-month waiting period for mammogram screening in Halifax. Waiting times are longer at hospitals and in some other regions of the province.

¹⁷⁵ Health Canada, *Statistical Report*, page 81

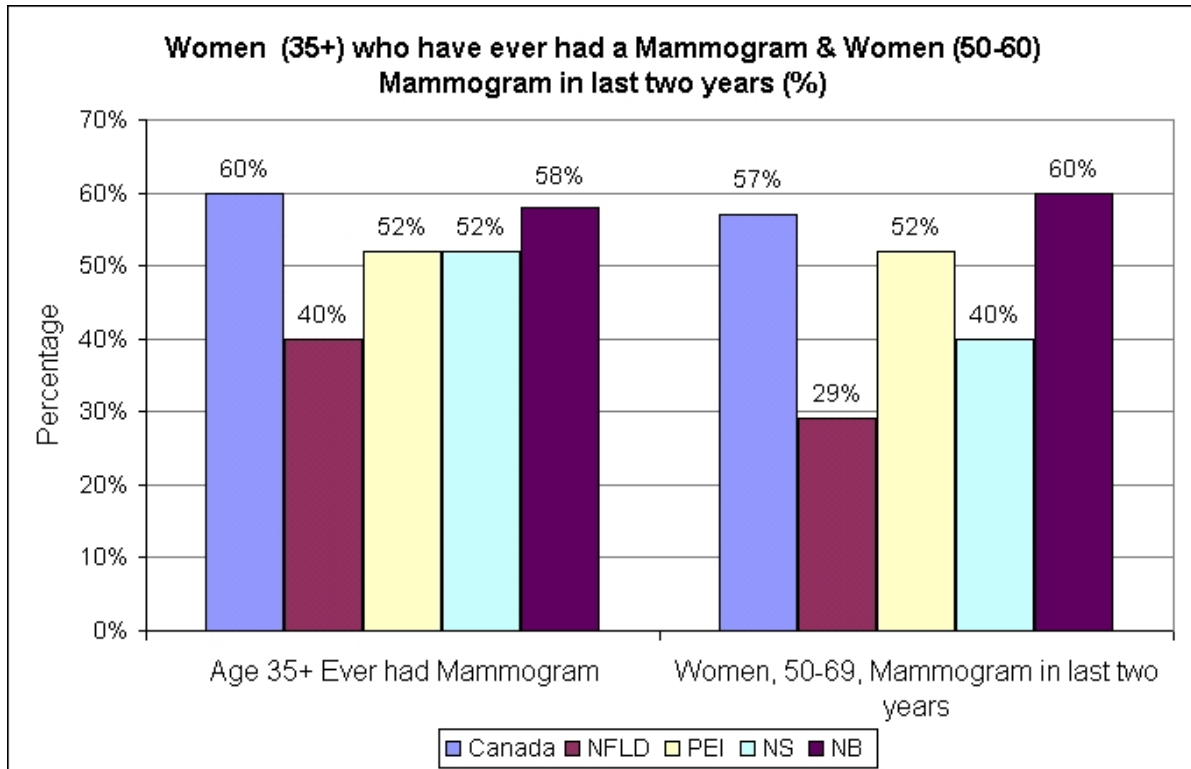
¹⁷⁶ Health Canada, *Statistical Report on the Health of Canadians*, 1999, page 82.

¹⁷⁷ National Cancer Institute of Canada, *Canadian Cancer Statistics 2001*, page 28.

¹⁷⁸ Health Canada, *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.

¹⁷⁹ Health Canada, *Statistical Report*, pages 83- 84

Figure 12 Women, 35+, who have ever had a mammogram; and Women, 50-69, who have had a mammogram in the last two years (%)



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

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.¹⁸⁰ Among the Atlantic Provinces, in fact, women in P.E.I. have the highest rate of breast examinations by health professionals, with Newfoundland, New Brunswick and Nova Scotia registering the lowest rates in the country. In May, 2000, government budget cuts forced the IWK Grace Hospital in Halifax to close its Well Women's Clinic, which had been operating for about 25 years. In 1999, roughly 1,300 women used the clinic, which provided pap tests, breast exams, and other services for women.¹⁸¹

This successful P.E.I. model indicates a potential strategic investment for the other Atlantic 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.

¹⁸⁰ *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.

¹⁸¹ *The Halifax Daily News*, 24 May and 27 May, 2000.

Mammogram screening and Pap test rates across the country are highly correlated with income. A clear policy priority is to provide greater access to health care services for marginalized, minority, and low-income women.

2.4.3 Colorectal Cancer Screening

Sigmoidoscopy is an effective tool both for preventing cancer by detecting precancerous 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 persons aged 50 and older. Annual fecal occult blood tests have been shown to reduce colorectal cancers by one-third, and are also recommended for those 50 and older. Nevertheless, colorectal cancer screening is still underused and lags far behind screening for other cancers.¹⁸²

Nova Scotia has the second highest incidence of colorectal cancer in Canada, 18% above the national average, although mortality rates from the disease are now lower than the national average.¹⁸³ 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.¹⁸⁴

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. While an increase in the frequency of PSA screening has improved the detection of prostate cancer, overall death rates from the disease have not declined, making the issue of widespread screening a contentious one. Nevertheless, many physicians recommend that men between 50 and 70 should have a PSA on at least an annual basis.¹⁸⁵

Nova Scotia has the second highest incidence of prostate cancer in the country after New Brunswick, as well as the third highest mortality rate from prostate cancer.¹⁸⁶

¹⁸² U.S. Centers for Disease Control, op. cit., pages 67 and 71.

¹⁸³ National Cancer Institute of Canada, op. cit., pages 26 and 28. According to the most recent NCI report cited here, the rate of colorectal cancer mortality in Nova Scotia roughly matches the national average, 19 per 100,000 for men compared to 22 per 100,000 nationally; and 15 per 100,000 for women, compared to 14 per 100,000 nationally. However the most recent figures reported on 1 October, 2002 in the NS Health Department's document, *Reporting to Nova Scotians on Comparable Health and Health System Indicators*, indicate average mortality from colorectal cancer is now 16.1 per 100,000 in Nova Scotia compared to the national average of 19.1 (as reported in *The Chronicle-Herald*, 1 October, 2002, page A5.)

¹⁸⁴ Brown, Allan, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics 1984, page 11.

¹⁸⁵ 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.

¹⁸⁶ National Cancer Institute of Canada, op. cit., pages 26 and 28.

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.¹⁸⁷ 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 25% of Nova Scotians 15 and older have not had their blood pressure checked within the past year. Surveys indicate that a significant number of people may have undetected high blood pressure.¹⁸⁸

Nova Scotian men and women consistently record the highest rates of high blood pressure in the country. Seventeen percent of Nova Scotians have high blood pressure, a rate 62% higher than the Canadian average. In previous surveys, too, Nova Scotians have recorded 32%, 40% and 50% higher rates of high blood pressure than the Canadian average.¹⁸⁹

A particularly high percentage of Nova Scotian women record high blood pressure (more than one in five), 80% above the national average, and 43% above the next highest province (Prince Edward Island). Again this high rate has been consistent over time. In previous surveys, in 1985, 1991, and 1994-95, the rate of high blood pressure for Nova Scotian women was 46%, 50% and 55% above the national average. While rates of high blood pressure have declined across the country, they remain stubbornly high among Nova Scotian women (Figure 13).¹⁹⁰

Fortunately, hypertension can be reduced through weight loss, increased physical activity, reduced salt and alcohol intake, and relaxation.¹⁹¹ 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.¹⁹²

¹⁸⁷ 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.

¹⁸⁸ Health Canada, *Statistical Report*, pages 87 and 89.

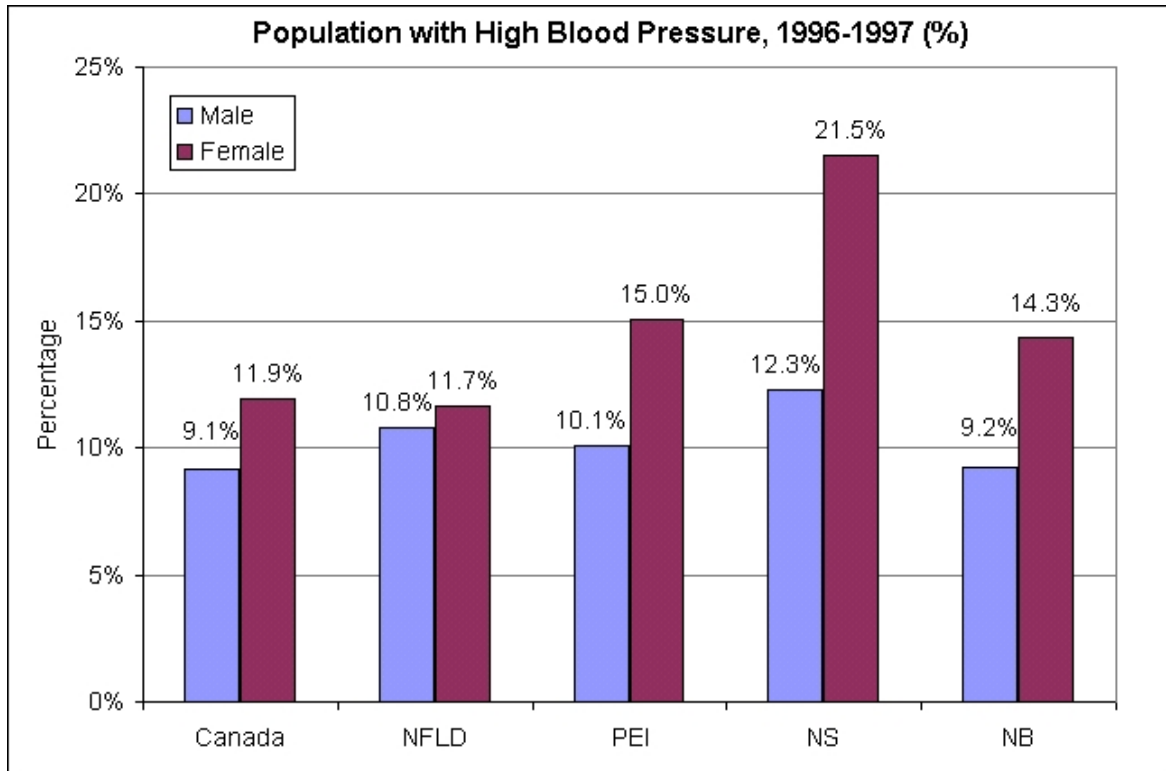
¹⁸⁹ Statistics Canada, *Health Statistics, 1999*, CD-ROM, Table 0060121.IVT

¹⁹⁰ Idem.

¹⁹¹ 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.

¹⁹² Brown, Allen, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, page 9.

Figure 13 Population with High Blood Pressure, 1996-97 (%)



Source: Statistics Canada, *Health Statistics 1999*.

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.¹⁹³ 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.¹⁹⁴

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.¹⁹⁵

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.”*¹⁹⁶

In 1998, the World Health Organization noted that lifestyle is determined by the interplay between an individual's personal characteristics, social interactions, and socioeconomic 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.¹⁹⁷

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

¹⁹³ Chernomas, Robert, *The Social and Economic Causes of Disease*, Canadian Centre for Policy Alternatives, March, 1999, page 1.

¹⁹⁴ 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.

¹⁹⁵ Idem.

¹⁹⁶ 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.

¹⁹⁷ Cited in Lyons and Langille, op. cit., page 10.

rates of smoking, obesity, and physical inactivity, all of which increase the risk of cardiovascular disease.¹⁹⁸ 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.¹⁹⁹ And lack of social support from family, friends and communities is linked to higher rates of cardiovascular disease, premature death, depression, and chronic disability.²⁰⁰

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.²⁰¹

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.

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.²⁰² 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.²⁰³

¹⁹⁸ 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.

¹⁹⁹ 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.

²⁰⁰ Lyons and Langille, op. cit., pages 17-19.

²⁰¹ 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.

²⁰² 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.

²⁰³ *Ibid.*, pages 15 and 43.

Canadian studies have reported that low income is nearly as important a determinant of health service use as is 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.²⁰⁴ 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.²⁰⁵ In all these cases, there is a clear gradient by social class.²⁰⁶

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 at York University found poor Canadians at 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.²⁰⁷ Extrapolating from these figures, it can be estimated that if all Nova Scotians were as heart-healthy as the richest Nova Scotians, the province could avoid 200 deaths and \$124 million a year in costs due to heart disease. 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.²⁰⁸

Across North America, improvements in lifestyle behaviours (eating, drinking, smoking, and exercise patterns), and consequent declines in heart disease incidence and mortality, have

²⁰⁴ 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.

²⁰⁵ Kabat-Zinn, Joh, "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.

²⁰⁶ 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.

²⁰⁷ 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.

²⁰⁸ Kabat-Zinn, Joh, "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.

occurred at a much lower rate among the less educated, less affluent, strata than among higher socio-economic groups.²⁰⁹

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.²¹⁰ 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.²¹¹

Reviewing the evidence, the editor of the British Medical Journal concluded:

*What matters in determining mortality and health in a society is less the overall wealth of the society and more how evenly wealth is distributed. The more equally wealth is distributed, the better the health of that society.*²¹²

A separate 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."²¹³

If growing inequality is bad for health, then the trends of the 1990s are cause for concern. In 1990, the richest 20% of Nova Scotian households had 6.2 as much disposable income as the poorest 20%. By 1998, they had 8.5 times as much. Since 1980, the poorest 20% of Nova Scotian households have lost 14% of their real disposable income. Compared to 1990, they have lost 29%.²¹⁴

²⁰⁹ Stamler, Jeremiah and Rose, preface to Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown and Company, Boston, 1992, page xiv.

²¹⁰ 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.

²¹¹ 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.

²¹² "Editorial: The Big Idea," *British Medical Journal* 312, April 20, 1998, page 985, cited in Health Canada, *Toward a Healthy Future*, page 39. See previous footnote for citations of several articles on the subject published by the British Medical Journal that are the basis for this editorial.

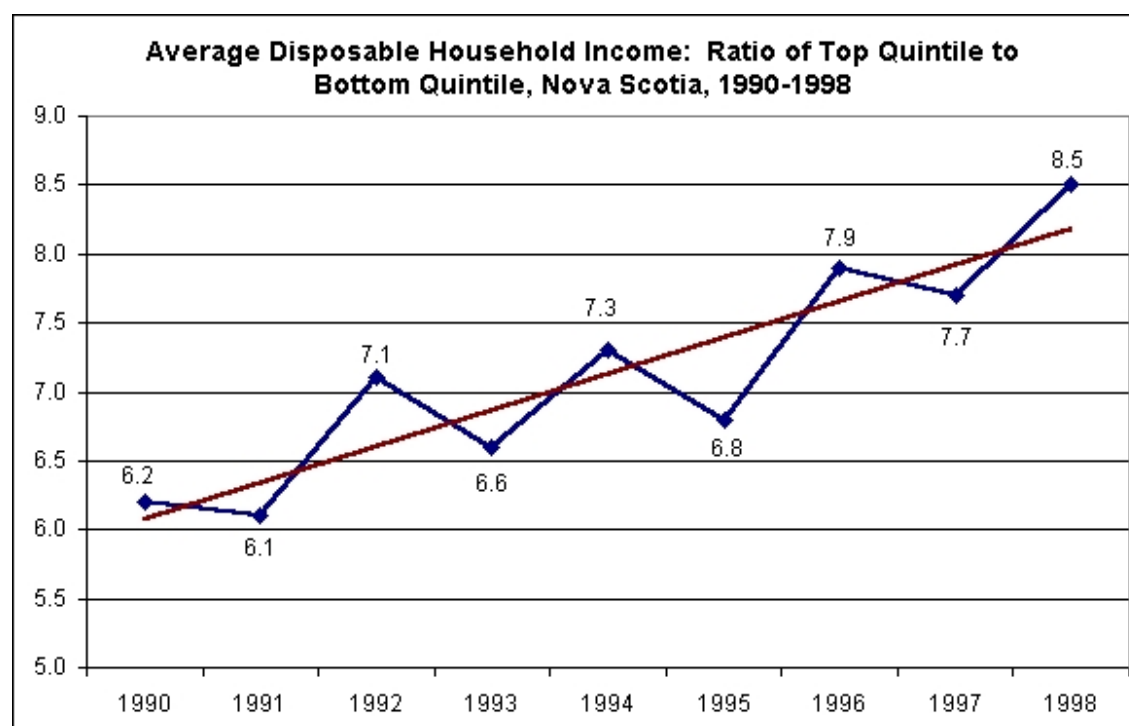
²¹³ Ted Schrecker, "Money Matters: Incomes tell a story about environmental dangers and human health," *Alternatives Journal*, 25:3, Summer, 1999, page 16

²¹⁴ Dodds, Colin, and Ronald Colman, *Income Distribution in Nova Scotia*, GPI Atlantic, Halifax, July, 2001, pages 10, 14-16.

Table 3 Average Disposable Household Income Ratios, 1980-1998.²¹⁵

	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

Figure 14 Average Disposable Household Income: Ratio of Top Quintile to Bottom Quintile, Nova Scotia, 1990-1998.²¹⁶



²¹⁵ 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.

²¹⁶ 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.²¹⁷ 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.²¹⁸

Although they engage in less organized sports, poor children have higher injury rates, and twice the risk of death due to injury than children who are not poor.²¹⁹ 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.²²⁰

Malnutrition, under-nutrition, and “failure to thrive” are chronic conditions that account for 1% of pediatric hospitalizations in the U.S., and can lead to serious developmental, cognitive, and behavioural problems, as well as permanent damage to infants’ developing central nervous systems. These conditions afflict children living in poverty.²²¹

A 1998 U.S. Department of Agriculture study found nearly one-fifth of American children are “food insecure,” – either hungry, on the edge of hunger, or worried about being hungry.²²² In the U.K., an 18-month inquiry in the mid-1990s blamed mounting poverty for a rise in malnutrition on a scale unseen since the 1930s.²²³ The problem is clearly not a shortage of food – in Canada, estimates suggest that 20% of the food supply is wasted.²²⁴

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.”²²⁵

²¹⁷ “Stunning Statistics Reveal Toll of Poverty on Children,” *Vancouver Sun*, 28 December, 1990; cited in Province of British Columbia (1996), page 5.

²¹⁸ Health Canada, *Toward a Healthy Future*, page 85, and chapter 3.

²¹⁹ Barbara Morrongiello, “Preventing Unintentional Injuries Among Children,” *Determinants of Health: Children and Youth*, Canada’s Health Action: Building on the Legacy, Volume 1, National Forum on Health, 1998.

²²⁰ David Ross, “Rethinking Child Poverty,” *Insight, Perception*, 22:1, Canadian Council on Social Development, Ottawa, 1998, pages 9-11.

²²¹ Bithoney, W.G., et al., “The Effect of a Multidisciplinary Team Approach on Weight Gain in Nonorganic Failure-to-Thrive Children,” *Journal of Developmental and Behavioural Pediatrics*, 12 (4): 254-258, August, 1991, cited in Province of British Columbia (1996), page 4.

²²² Gardner, Gary, and Brian Halweil, “Nourishing the Underfed and Overfed,” chapter 4 in Worldwatch Institute, *State of the World 2000*, W.W. Norton and Company, New York, 2000, page 62.

²²³ “Poverty is Blamed for Diet Crisis,” *Guardian*, 28 January, 1996, cited in Province of British Columbia (1996), page 11.

²²⁴ Norman, Diane, “Access to Food for the Elderly,” *Rapport* 6 (1): 4-5, January, 1991.

²²⁵ National Institute of Nutrition, “Tracking Nutrition Trends 1989 - 1994 - 1997,” 10 November, 1997, available at: http://www.nin.ca/Media/Archives/newsnov10_97.html.

If child poverty has health consequences, there is cause for concern. Nearly one in five Nova Scotian children live below Statistics Canada's low income cut off (LICO), compared to 16.5% in 1989, when the House of Commons passed its unanimous resolution to eliminate child poverty by the year 2000. Nearly 70% of Nova Scotian children in single parent families live in poverty.²²⁶

High rates of poverty among single mothers are partly responsible for high rates of poverty among children in the province. Children of single mothers are 14% of children in Canada, but 42% of children in low-income families. A child who lives with a single mother is nearly four times as likely to be poor as a child living with both parents.²²⁷ In Nova Scotia, 17% of all families with children are headed by single mothers, and 70% of these single mothers live below the low-income cut-off, accounting for fully half the children living in poverty in the province.²²⁸

The high poverty rates of single mothers translate into health costs for themselves as well as 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.²²⁹

3.2 Health Care Costs of Poverty in Nova Scotia

The poorer health status of low income Canadians translates into increased use of health services and higher health care costs. In Nova Scotia, a clear and substantial inverse association has been shown between socioeconomic 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.²³⁰

Since socioeconomic 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 socioeconomic 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.

²²⁶ Statistics Canada, *Low-Income Persons*, catalogue no. 13-569-XIB, cited in Dodds and Colman, op. cit., page 42.

²²⁷ Statistics Canada, *Women in Canada*, 3rd edition, catalogue no. 89-503E, page 86.

²²⁸ Statistics Canada, *Selected Statistics on Women in Nova Scotia*, August, 1995, catalogue no. 89-503.

²²⁹ 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.

²³⁰ 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.

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 expenditures, or \$42.2 million per year out of a total of \$242.4 million. Excess use associated with income inequality is estimated at 11.3%, or \$27.5 million annually.²³¹ These are the amounts that would be saved in avoided physician services if all Nova Scotians 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 socioeconomic and health status of low income, poorly educated Nova Scotians. Physician costs amount to just 22% of hospital costs in Nova Scotia, and 9% of total direct health care expenditures in the province.²³² Although separate estimates on excess hospitalization have not been calculated for Nova Scotia, 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 socioeconomic gap and by reducing income and educational inequality in the province. 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.²³³ 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.²³⁴

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 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.²³⁵

²³¹ Ibid., page 802.

²³² Health Canada, *Economic Burden of Illness in Canada 1998*, forthcoming, fall, 2002.

²³³ Cited in Perreten, Dan, "Healing the Homeless," *Poverty and Health* 10, Chicago, July-August, 1999.

²³⁴ Idem. (2001 \$Can 3,879 = 1999 \$US 2,500; 2001 \$Can = 1999 \$US 4,000)

²³⁵ Idem.

3.4 Costs of Social Exclusion and Vulnerability

The evidence clearly indicates that lower socioeconomic 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.²³⁶

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.²³⁷

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.”²³⁸

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. In Nova Scotia, one in six women lives below the LICO, a rate that is 50% higher than the male rate, and the widest gender gap in the country.²³⁹

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

²³⁶ “Social Inclusion,” *Health Promotion Atlantic*, 7 (1), Spring, 2001, pages 10-12.

²³⁷ Health Canada, *Statistical Report on the Health of Canadians*, page 267.

²³⁸ 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.

²³⁹ 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.

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.”²⁴⁰ In short, there is 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.²⁴¹

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.”²⁴²

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, and recognizes the need for a comprehensive and holistic health promotion strategy that acknowledges the full range of socioeconomic and cultural determinants of health and the synergistic interaction between them. The good news in this approach is that reducing disadvantage and exclusion in even one area may produce positive spin-off benefits across a wide range of linked dimensions.

4. Cost Effectiveness of Socio-economic 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.”²⁴³

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,

²⁴⁰ 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.

²⁴¹ Alberta Association of Registered Nurses, *Position Paper on Vulnerability*, Edmonton, September, 1998, page 1, available by contacting aarn@nurses.ab.ca.

²⁴² Ibid., page 2.

²⁴³ Lyons and Langille, op. cit., page 7

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.²⁴⁴ 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.”*²⁴⁵

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 socioeconomic levels.²⁴⁶

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. As an example of the former, it was noted above that every dollar spent on the WIC Special Supplemental Nutrition Program for low-income women, infants, and children in the U.S. saves \$3 in health costs within the same year.²⁴⁷

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.²⁴⁸

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 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 6).²⁴⁹

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

²⁴⁴ 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.

²⁴⁵ Cited in Lyons and Langille, op. cit., page 22.

²⁴⁶ Ibid., pages 23-25.

²⁴⁷ Buescher, Paul, et al., "Prenatal WIC Participation Can Reduce Low Birth Weight and Newborn Medical Costs: A Cost-Benefit Analysis of WIC Participation in North Carolina," *Supplement of the Journal of the American Dietetic Association*, 93 (2): 163-166, February, 1993; Canadian Nutrition Institute, October 11, 1991, page 2; Matsumoto, Masao, "The WIC Program Meets A Special Need," *Food Review* 15 (1): 40-42, 1992; Goldberg, Jeanne, and Jean Mayer, "The White House Conference on Food, Nutrition and Health Twenty Years Later: Where Are We Now?," *Journal of Nutrition Education*, Viewpoint, 1990: 47-50; all cited in Province of British Columbia (1996), op. cit., pages 2-4.

²⁴⁸ 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,

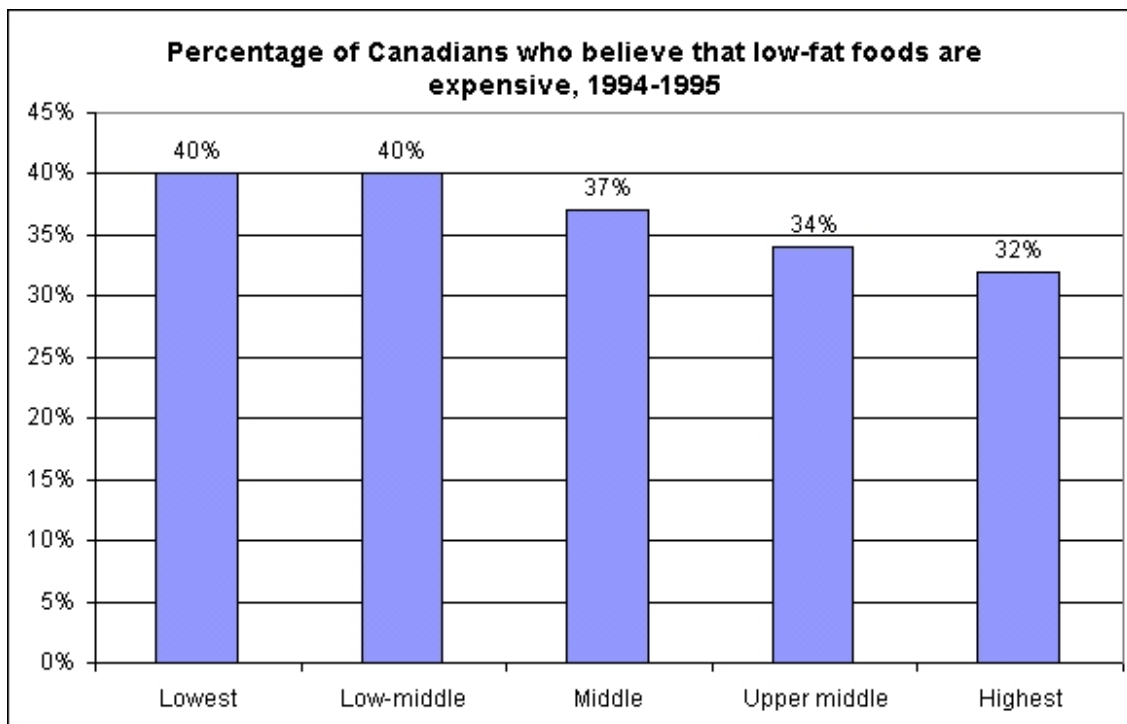
²⁴⁹ Health Canada, *Statistical Report on the Health of Canadians*, Ottawa, September, 1999, page 267.

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.²⁵⁰

In the longer term, health researchers have pointed to the need for wider social reforms that increase the income of the poor, prevent material deprivation, and address social exclusion and powerlessness. Recommendations include increasing the minimum wage, ensuring pay equity, providing a guaranteed minimum income, increasing welfare payments, improving access to education and training, protecting minority rights through legislation, building housing cooperatives, and funding daycare programs. According to one Toronto physician:

*“These are reasonable solutions that are within our grasp as a society concerned about creating a healthier future for all its citizens. Preventing heart disease is possible, if we resist doing the familiar and insist on doing the political.”*²⁵¹

Figure 15 Percentage of Canadians who believe that low-fat foods are expensive, 1994-1995



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

²⁵⁰ 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.

²⁵¹ “Having Healthy Heart is Often a Question of Income,” *The Toronto Star*, 9 November, 2001, page F02.

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.²⁵²

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.”*²⁵³

It has been argued that social support and social cohesion are stronger influences on cardiovascular disease than individual medical care.²⁵⁴ 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.²⁵⁵

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.”*²⁵⁶

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.”*²⁵⁷

²⁵² “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.

²⁵³ Health Canada, *Toward a Healthy Future*, page 60.

²⁵⁴ Lyons and Langille, op. cit., page 17.

²⁵⁵ Ibid., page 18; and Health Canada. *Statistical Report*, page 131.

²⁵⁶ 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.

²⁵⁷ Kabat-Zinn, Joh, “Psychosocial Factors: Their Importance and Management,” in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, 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.²⁵⁸

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.”*²⁵⁹

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.²⁶⁰ 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.²⁶¹

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.²⁶² 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. Newfoundland, Prince Edward Island and New Brunswick all have a smaller proportion of single-parent families than the national average, and thus fewer individuals in this low-support group, while Nova Scotia has more.²⁶³

²⁵⁸ Ibid., page 303.

²⁵⁹ Lyons and Langille, op. cit., page 18.

²⁶⁰ Health Canada, *Statistical Report*, page 21

²⁶¹ Statistics Canada, *Health Statistics 1999*, Tables 00060139.IVT, and 00060150.IVT; Health Canada, *Statistical Report*, pages 51, 219, 225, 231, 270, 287, and 315.

²⁶² Health Canada, *Toward a Healthy Future*, pages 60-61.

²⁶³ Ibid., page 60; and Health Canada, *Statistical Report*, page 22.

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.²⁶⁴

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 is 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.”²⁶⁵

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.²⁶⁶

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 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 below).²⁶⁷ 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.²⁶⁸

²⁶⁴ 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.

²⁶⁵ 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.

²⁶⁶ For further information on the needs of caregivers, see the Atlantic Centre of Excellence for Women's Health *Gender and Health Policy Discussion Series*, Halifax, Paper no. 1, March 1998.

²⁶⁷ Colman, Ronald, *The Economic Value of Civic and Voluntary Work in Nova Scotia*, GPI Atlantic, Halifax, 1998, with updates in 1999 and 2000.

²⁶⁸ 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

However, the evidence is equally strong that these support networks cannot be taken for granted and may well be in decline. One indicator is the “Index of Social Health” developed by Human Resources Development Canada (HRDC) in conjunction with Statistics Canada. The fifteen 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 all provinces have experienced a decline in their social health indicators since the early 1980’s, with Newfoundland and New Brunswick registering modest declines (5% and 8%), and Prince Edward Island and Nova Scotia much steeper declines (15% and 21%). In fact, the Nova Scotia drop is the 2nd steepest in the country.²⁶⁹ In a separate study, GPI Atlantic found that the Nova Scotia crime rate today is 98% of the national average, up sharply from two-thirds the Canadian rate 25 years ago.²⁷⁰ While the province still has a significantly lower rate of serious crimes, the 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. Others volunteer with first aid groups, the Heart and Stroke Foundation, the Cancer Society, the Lung Association, the Multiple Sclerosis Society, the Diabetes Association, the VON and many other groups. Volunteers assist the elderly and disabled, staff help lines, and work in food banks, soup kitchens, sheltered workshops, and homes and shelters for abused women and children.

Others volunteers contribute to population health in the broader sense by voluntarily 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.²⁷¹

Yet, despite its enormous contribution to population health, the work of volunteers is invisible in our standard measures of progress based on economic growth statistics, because money is not exchanged. If the voluntary sector were to decline in strength, there is no doubt that our standard of living, quality of life, and population health would decline markedly. Aside from the direct value of the work performed, the voluntary sector also strengthens communities and creates that

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.

²⁶⁹ Health Canada, *Statistical Report*, pages 58-60.

²⁷⁰ Dodds, Colin, and Ronald Colman, *The Cost of Crime in Nova Scotia*, GPI Atlantic, Halifax, April, 1999.

²⁷¹ 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;

wider network of social support identified by experts as a vital buffer against the stressors responsible for ill-health and disease.

If voluntary services were replaced for pay, they would contribute \$1.9 billion a year of services to the Nova Scotia economy. When volunteers' out-of-pocket expenses are added, the voluntary sector contributes services equivalent to nearly 10% of the total value of the Gross Domestic Product in the province, more than any other industry.²⁷²

Atlantic Canadians have by far the highest rates of volunteering in the country, with residents of all four provinces contributing far more voluntary hours per capita than other Canadians, with Nova Scotians registering the highest rates in the country, exceeding the national average by 43%. Nova Scotians give 138 million hours of voluntary service time a year, equal to three and a half hours each week for every person 15 years and older. This is more than an hour a week longer per person than the Canadian average, and is the equivalent of more than 80,000 jobs in the province (Figures 17 and 18).

In Figure 17, it should be noted that people who volunteer actually give far more hours per week on average, as the per capita hours are averaged over the entire adult population, including non-volunteers.

The enormous contribution that Atlantic Canadians 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.

Results from the 1997 National Survey on Giving, Volunteering and Participating reveal that, on an hourly per capita basis, formal volunteering through non-profit organizations has declined by 4.7% across the country since 1987, and by 7.2% in Nova Scotia.²⁷³ This decline in formal voluntary work appears to be accompanied by a substantial increase in informal voluntary work, mainly by women. That shift 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. Non-profit organizations report increasing difficulties in recruiting volunteers for leadership positions that demand substantial time commitments, and in

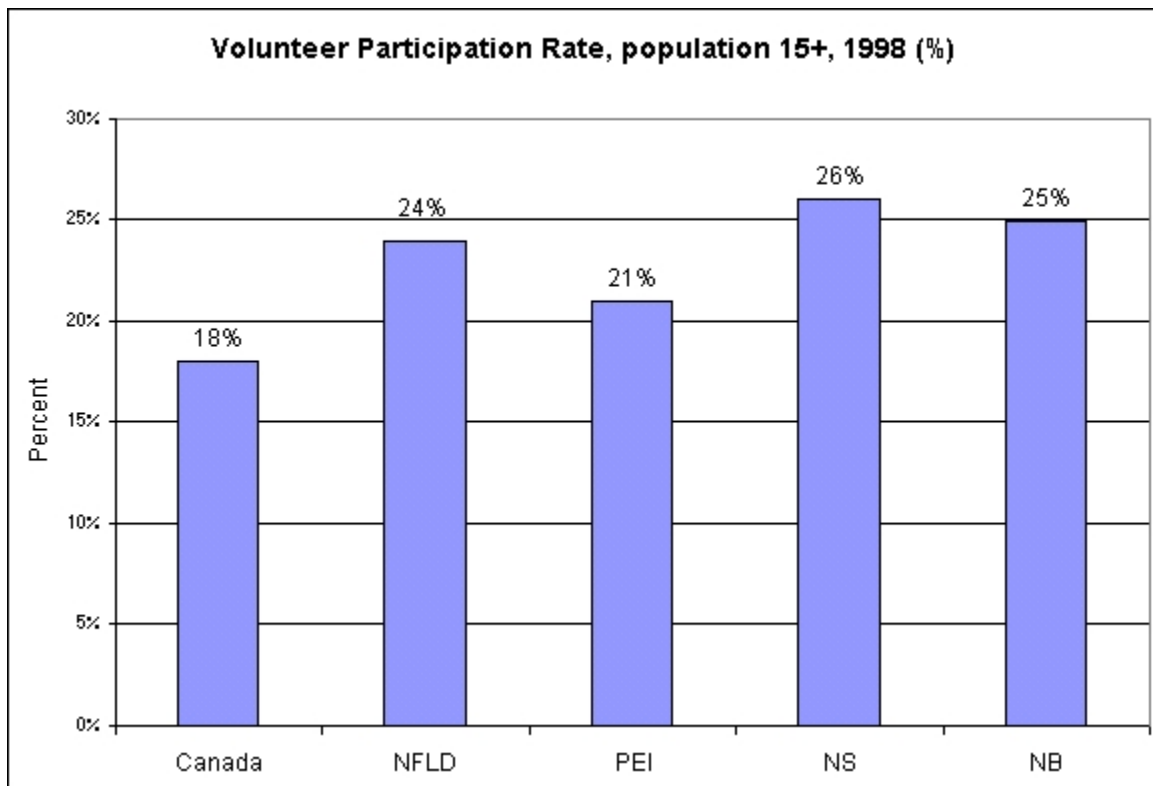
²⁷² Statistics Canada, *General Social Survey 1998*, Housing, Family and Social Statistics Division, Statistics Canada; Economic valuations use Statistics Canada's calculations of equivalent market values for the different types of voluntary work, as given in Statistics Canada, *Households' Unpaid Work: Measurement and Valuation*, Studies in National Accounting, catalogue no. 13-603E, #3, December, 1995. Equivalent hourly *The Economic Value of Civic and Voluntary Work in Nova Scotia*, GPI Atlantic, Halifax, 1998, pages 17-20, and 32-42. All calculations in this report refer to both formal and informal voluntary work, the former referring to work done through community organizations, and the latter offered directly to individuals and not through any organization.

²⁷³ Tabulations for this report are based on results in Statistics Canada, *Caring Canadians, Involved Canadians*, catalogue no. 71-542-XPE, and correlated with population statistics for 1987 and 1997 for the population 15 and older, from Statistics Canada, *Revised Intercensal Population and Family Estimates, 1971-1991*, catalogue no. 91-537, page 79, and Statistics Canada, *Quarterly Demographic Statistics, July-September 1997*, catalogue no. 91-002-XPB, volume 11, no. 3, page 16, using the methodology in Ronald Colman, *The Economic Value of Civic and Voluntary Work in Nova Scotia, Update: February 11, 1999*, GPI Atlantic, Halifax, February 1999, Table 1, p. 12.

meeting increased demands with fewer staff and financial resources. Volunteer burnout is widely reported.²⁷⁴

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 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.²⁷⁵

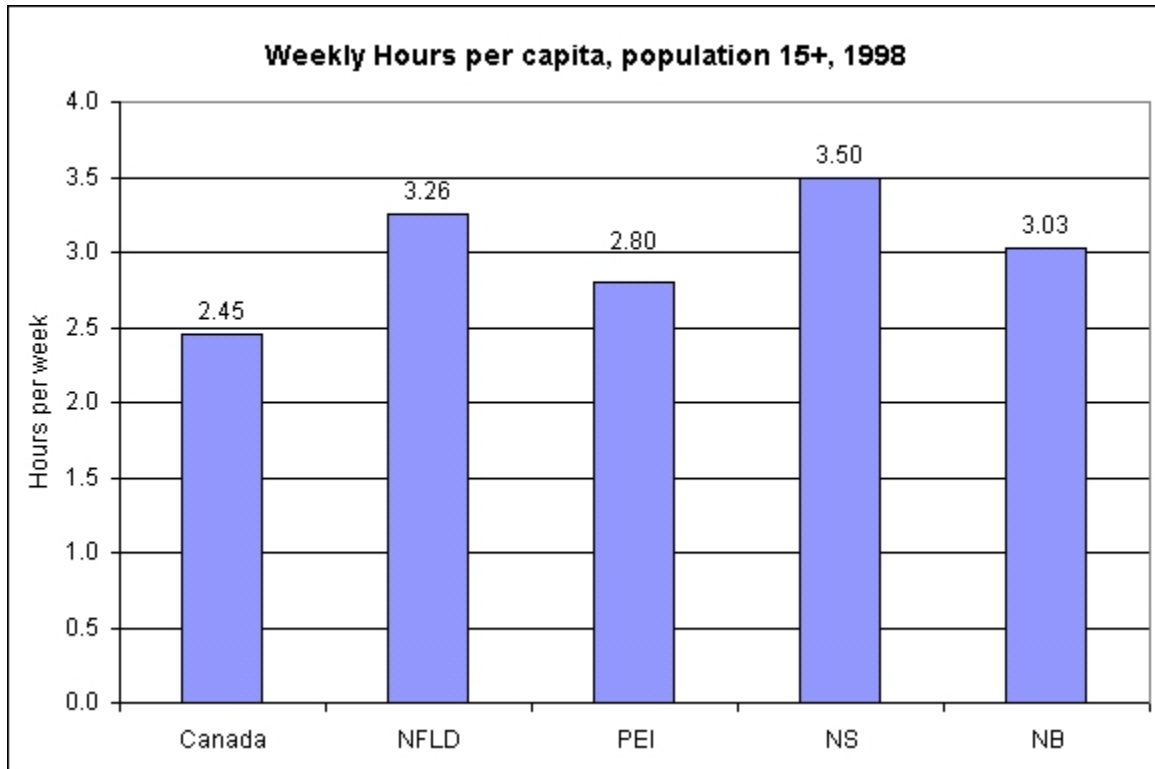
Figure 16 Volunteer Participation Rate, population 15+, 1998 (%)



²⁷⁴ 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.

²⁷⁵ 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.

Figure 17 Weekly Hours per capita, population 15+, 1998



Source: Statistics Canada, *General Social Survey 1998*

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.²⁷⁶ It is significant that earlier volunteer surveys found married women to have the highest rate of volunteer participation of any household type.²⁷⁷ 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 if it is not arrested.

²⁷⁶ 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.

²⁷⁷ Webber, op. cit., page 12

PART IV
COSTS OF MENTAL
ILLNESS

6. Costs of Mental Illness

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 suffer from depression and high stress.²⁷⁸ In addition, mental health problems can lead to a range of causes of premature death, including violence, substance abuse, and suicide.²⁷⁹

In the U.S., an estimated \$16 billion a year is lost due to undiagnosed and untreated depression in the workplace, through lowered productivity, absenteeism, injury, alcoholism, and related physical illness. Yet many employees are afraid to disclose addiction or mental illness, and therefore avoid support that may be available through workplace health plans, employee assistance programs, or flexible work schedules.²⁸⁰ Extrapolated to Nova Scotia by population, this estimate implies that the province may be losing more than \$50 million a year due to undiagnosed and untreated depression.

Substantial research has found that stress negatively affects health, weakens the immune system, and increases susceptibility to a wide range of illnesses.²⁸¹ 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.”²⁸²

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.²⁸³

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.²⁸⁴

²⁷⁸ Goetzel, Ron, David Anderson, R. William Whitmer, Ronald Ozminowski, 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.

²⁷⁹ 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.

²⁸⁰ Ballon, Diana, Editor, *Journal of Addiction and Mental Health*, 4 (1), Toronto, January-February 2001, available at: www.camh.net/journal/journalv4no1/note_from_editor.html.

²⁸¹ 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.

²⁸² 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>.

²⁸³ Kabat-Zinn, Joh, “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.

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.”*²⁸⁵

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.²⁸⁶ 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 is 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.²⁸⁷

In 1985, across the country, women registered *lower* levels of stress than men, by more than 10% in the four Atlantic provinces and 6% nation-wide. By 1991, female stress levels in Atlantic Canada had increased markedly and *exceeded* male levels by more than 7%. In Nova Scotia, the jump in female stress levels was particularly dramatic, rising from 12 % *below* the male level in

²⁸⁴ Goetzel, Ron (ed), “The Financial Impact of Health Promotion,” *American Journal of Health Promotion* 15 (5), May/June 2001.

²⁸⁵ 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.

²⁸⁶ 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.

²⁸⁷ 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.)

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 1985.²⁸⁸

By 1994-95, female levels of chronic stress had become *markedly* higher than male levels right across the country, by more than 20%.²⁸⁹ And in 1998, female levels of time stress in Canada were more than 30% higher than male levels.²⁹⁰ While these different questionnaires are not strictly comparable, there does seem to be a clear trend of steadily higher stress levels for women. On the three dimensions of mental health in the 1994-95 National Population Health Survey (see footnote, previous page), 20% more Atlantic Canadian women than men registered *low* levels of psychological well-being.²⁹¹

But these averages conceal significant inter-provincial differences, including among the Atlantic provinces themselves. In all 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 well-being in the country.²⁹² In 1985, Newfoundland stress levels were 27% below the national average; in 1991 they were 16% less; and in 1994-95 they were 35% less. Newfoundlanders were also 30% more likely than other Canadians to report a high level of psychological well-being.

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.²⁹³

Prince Edward Islanders also have a high level of mental health – 23% less than national levels for chronic stress, and 17% higher for psychological well-being.²⁹⁴ 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

²⁸⁸ Statistics Canada, *Health Statistics, 1999*, CD-ROM, Table 00060139.IVT: "Level of Stress."

²⁸⁹ Health Canada, *Statistical Report*, page 51.

²⁹⁰ 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.

²⁹¹ Statistics Canada, *Health Statistics 1999*, CD-ROM, Table 00060150.IVT: "Psychological Well Being."

²⁹² Statistics Canada, *Health Statistics 1999* Tables 00060139.IVT, and 00060150.IVT; ACPH, *Statistical Report*, p. 51

²⁹³ 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).

²⁹⁴ Health Canada, *Statistical Report*, page 51; Statistics Canada, *Health Statistics 1999*, table 00060150.IVT

utilization.²⁹⁵ For the other two Maritime provinces, the mental health signals are more mixed, with Nova Scotia and New Brunswick now registering lower levels of psychological well-being than other Canadians.

The World Health Organization definition of health cited above ranks mental and spiritual well-being as vital components of human health, and explicitly defines well-being and positive health as more than the absence of disease. The "Newfoundland advantage" in this sphere, once fully recognized and appreciated for its considerable health impact, may provide a model for a realignment of our conventional definitions from a "disease treatment" perspective to a more complete and positive view of health. At the same time the apparent loss of mental health advantage once enjoyed by women in general and by Nova Scotians and New Brunswickers in particular may reawaken an appreciation for non-material quality of life factors that have historically distinguished this region.

Even from a purely instrumentalist and cost-conscious perspective, however, policy makers have good reason to pay attention to trends in mental health. Here is a basic fact that is not well known in the public arena. 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) hospitals, mental disorders account for nearly six million hospital days a year, and are the second leading cause of hospitalization after cardiovascular diseases.²⁹⁶

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 1990's, 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.²⁹⁷

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.²⁹⁸

²⁹⁵ Health Canada, *Toward a Healthy Future*, page 14; ACPH, *Statistical Report*, page 219.

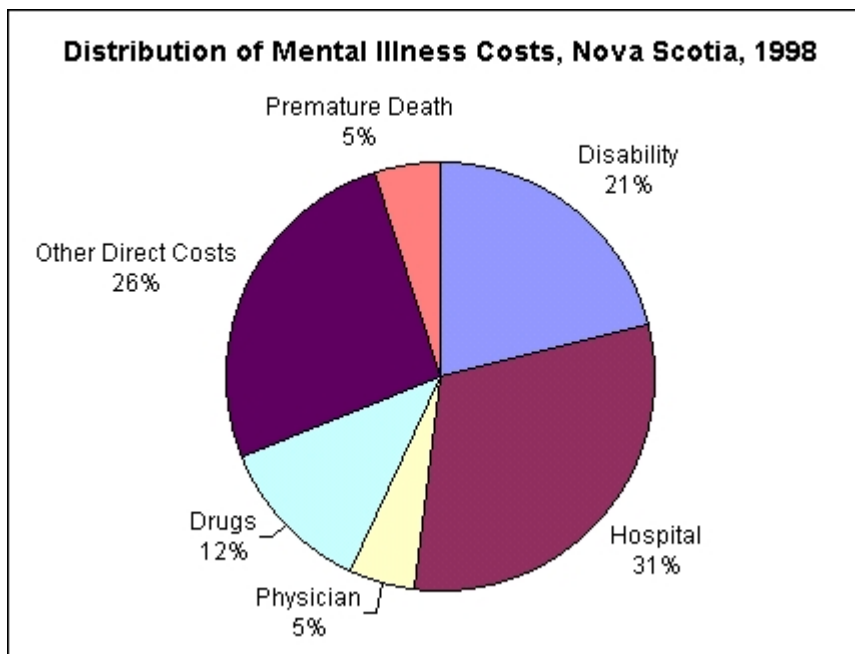
²⁹⁶ Statistics Canada, *Mental Health Statistics, 1993-94*, catalogue no. 83-245-XPB, 1996; Canadian Institute for Health Information, *Hospital Morbidity Database, 1994-95*, and *1995-96*; Health Canada, *Toward a Healthy Future*, pages 142-143; ACPH, *Statistical Report*, pages 296-301, Health Canada, *Economic Burden of Illness in Canada 1998* (forthcoming.)

²⁹⁷ 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;

²⁹⁸ Health Canada, *Statistical Report*, pages 296 and 301.

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.

Figure 18 Distribution of Mental Illness Costs, Nova Scotia, 1998



Source: Health Canada, *Economic Burden of Illness in Canada 1998* (forthcoming).

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, and are affected by subtle trends like the growing materialist and consumerist orientation of western society that neglects non-material quality of life variables. Our obsession with economic growth, for example, frequently overrides concern with mental and spiritual well-being.

Given the seriousness and magnitude of this challenge, it is clearly essential to identify practical and cost-effective interventions to improve population 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.

7. Stress and Chronic Disease

In 1985 and 1991, there was a clear east-west stress gradient in the country with higher levels of stress reported in Ontario and the west, and all four Atlantic provinces ranking well below national levels. But throughout the 1990's both Nova Scotia and New Brunswick gradually moved towards national levels, and registered increasing levels of chronic stress.

In 1985, 14% fewer Nova Scotians reported high stress levels than other Canadians. By 1991, just 4% fewer Nova Scotians were highly stressed; and by 1994-95, *more* Nova Scotians were chronically stressed than other Canadians. In the same year, eighteen percent more Nova Scotians were likely to report low levels of psychological well-being than other Canadians. New Brunswickers have also seen their stress levels rise, and now register similar levels of both chronic stress and psychological wellbeing to other Canadians. As noted earlier, Newfoundlanders and Prince Edward Islanders still register the lowest stress levels in the country.²⁹⁹

Abundant evidence exists that stress is an independent risk factor for several chronic illnesses. However, more recent evidence has uncovered evidence on the physiological pathways between psychosocial stress, emotional arousal, and disease. Two stress-related neuroendocrine 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.”³⁰⁰

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.³⁰¹

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 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

²⁹⁹ Statistics, *Health Statistics 1999*, tables 00060139 and 00060150; and Health Canada, *Statistical Report*, page 51.

³⁰⁰ 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.

³⁰¹ Kabat-Zinn, op. cit., page 314.

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.³⁰²

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.³⁰³

Statistics Canada also reports that the proportion of "severely time-stressed" youth, age 15-24, increased by 25% between 1992 and 1998, to 22% among young women and 10% among young men.³⁰⁴ High youth unemployment and falling real incomes for youth in the 1990s, as well as higher levels of student debt, have all likely contributed to rising youth stress levels. During the same period, teenage smoking rates also increased dramatically.³⁰⁵ Though there are certainly many other factors involved, including drastic cuts in tobacco taxes in several provinces, teenagers report stress as a primary reason for smoking.

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.

³⁰² 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.

³⁰³ 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.

³⁰⁴ Respondents classified as "severely time stressed" by Statistics Canada are those that give affirmative answers to seven out of ten questions on a time stress questionnaire that includes questions like "Do you consider yourself a workaholic?", "Do you worry that you don't spend enough time with your family and friends?", and "Do you feel that you're constantly under stress trying to accomplish more than you can handle?"

1992 results from Statistics Canada, *As Time Goes By... Time Use of Canadians*, General Social Survey, by Judith Frederick, catalogue no. 89-544E, pages 15-16;

1998 results from Statistics Canada, *The Daily*, November 9, 1999, catalogue no. 11-001E, pages 2-4; and Statistics Canada, General Social Survey, Cycle 12, 1998, Housing, Family and Social Statistics Division, special tabulation.

³⁰⁵ Ontario Tobacco Research Unit, *Monitoring the Ontario Tobacco Strategy: Youth and Tobacco in Ontario, 1997*, Ontario Tobacco Research Unit, University of Toronto, Toronto, 1997; Province of Nova Scotia, *Nova Scotia Student Drug Use, 1998; Highlights Report and Technical Report*, Halifax, Nova Scotia Department of Health, Drug Dependency, Dalhousie University, Communications Nova Scotia, 1998; both references cited in Federal, Provincial and Territorial Advisory Committee on Population Health (ACPH), *Toward a Healthy Future: Second Report on the Health of Canadians*, Health Canada and Statistics Canada, September, 1999, pages 119-123.

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.³⁰⁶

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. Nova Scotians spent two hours less per week in their kitchens in 1998 than in 1992, a decline of 30% in just six years. At the same time, the proportion of the average household food budget spent eating out has steadily increased.³⁰⁷

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 released this year found that the more families ate together, the more fruits and vegetables and the less fried food were consumed. Children who had regular family meals also had a far higher intake of important nutrients, such as calcium, fibre, folate, iron, and vitamins B and E, and had healthier diets at other times of day as well than children who rarely ate family meals.³⁰⁸

Commenting on the study results, Dr. Michael Rosenbaum, associate professor of clinical pediatrics and medicine at New York Presbyterian Hospital, Columbia University, remarked: "In terms of teaching your children good habits, the dinner table is great....There is a tremendous amount of data to show that healthy habits learned early persist into adulthood."³⁰⁹ Conversely, the current trend away from family meals to fast food may therefore have negative health impacts into adulthood.

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. 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.³¹⁰

³⁰⁶ 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.

³⁰⁷ 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.

³⁰⁸ Randi Hutter Epstein, "Linking Children's Health to Family Meals: Study shows families who eat together have better eating habits," *The New York Times*, reprinted in *The Chronicle-Herald*, Halifax, 29 March, 2000.

³⁰⁹ Idem.

³¹⁰ 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

A recent 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.³¹¹

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. Despite the massive influx of women into the paid workforce, work arrangements have hardly changed from the era of single-earner families. There is a clear need for family-friendly work arrangements that accommodate the needs of two-earner households.

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.³¹² In particular, such stress management techniques have been shown to be most effective when integrated with a

Perspective,” *Statistics in Transition*, November, 1995, volume 2, no. 4, pages 595-610, especially Table 3, page 603.

³¹¹ Margot Shields, “Long Working Hours and Health,” Statistics Canada, *Health Reports*, volume 11, no. 2, autumn 1999, pages 33-48.

³¹² 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.

regime of regular, moderate physical activity, smoking cessation, low-fat vegetarian diets, and a strengthening of social supports.³¹³

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.³¹⁴ 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.”³¹⁵

³¹³ 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.

³¹⁴ Idem.

³¹⁵ 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.³¹⁶

Ethical problems have arisen when such arguments have been used by the tobacco industry to counter lawsuits for recovery of health care costs due to smoking. According to the Mississippi Attorney-General:

“It is selling death as a benefit. This is offensive to human decency, an affront to justice, and uncharacteristic of civilized society. The industry should not be rewarded for relieving the State of the burden of caring for many of its elderly citizens. It is not doing the State a favor by killing smokers early and saving the State money; and the amounts the State seeks in restitution should not be reduced by such grizzly ‘savings.’”³¹⁷

Indeed, 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.”³¹⁸

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 and monetary grounds, noting that *lifetime* health care costs are actually lower for those with fewer modifiable risk factors. 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

³¹⁶ 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.

³¹⁷ Moore, Michael JD, and Charles Mikhail MD, “A New Attack on Smoking: Using an Old-time Remedy,” *Public Health Reports* 111, May-June, 1996, page 201.

³¹⁸ Colman, Ronald, *The Cost of Tobacco in Nova Scotia*, GPI Atlantic, Halifax, November, 2000, pages 21-22.

rather than simply deferred to older ages.³¹⁹ Physical activity helps prevent falls and hip fractures, and can preserve independence in old age, thereby avoiding costly nursing home and other institutional care.³²⁰

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.³²¹ A study by the American Federation for Aging Research (AFAR) estimated that a 5-year population-wide delay in onset of cardiovascular disease would save the U.S. \$100 billion annually. A 5-year delay in occurrence of hip fracture could cut the number of events by 140,000 annually, saving \$7.3 billion a year.³²² Extrapolated to Nova Scotia in proportion to population, the savings amount to \$350 million a year for cardiovascular disease and \$25 million a year for hip fractures, with 500 such fractures avoided annually in the province.

The AFAR study concluded:

“...[A] strategic aging research effort would benefit the nation’s economy and boost productivity.... The United States will save billions of dollars by keeping older people out of hospitals, out of operating rooms and out of nursing homes.... [L]ong life can be healthy and productive to the end, with the force of morbidity compressed to an irreducible minimum.”³²³

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:

“...that the number of very old persons will not increase, that the average period of diminished physical vigor 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

³¹⁹ 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.

³²⁰ Colman, Ronald, *The Cost of Physical Inactivity in Nova Scotia*, GPI Atlantic, Halifax, May, 2002, page 8 and references in footnote 14.

³²¹ The Institute of Medicine, *Extending Life, Enhancing Life: A National Research Agenda on Aging*, National Academy Press, Washington DC, 1991.

³²² American Federation for Aging Research (AFAR), *Putting Age on Hold*, Alliance for Aging Research, 1996, page 5. (2001 \$Can 100 billion = 1996 \$US 69 billion; 2001 \$Can 7.3 billion = 1996 \$US 5 billion).

³²³ AFAR, op. cit., page 6

many of the '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."³²⁴

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."³²⁵

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 in 1900 and 19 years at the end of the 20th century.³²⁶ 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.³²⁷

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 vigor will come later than it used to."*³²⁸

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

³²⁴ 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.

³²⁵ Ibid., page 131. See also Chernomas, Robert, *The Social and Economic Causes of Disease*, Canadian Centre for Policy Alternatives, March, 1999, page 2.

³²⁶ 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.

³²⁷ Brown, Allan, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, page 1.

³²⁸ Ibid., page 133.

that the pace of the atherosclerotic process can be modified by alteration of risk factors, even when significant arterial disease is already present."³²⁹

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.'"³³⁰

9.2 Reducing Illness among the Elderly

According to the 2001 Census results, recently released, 14% of Nova Scotia's population is now 65 or older, up from 13% in 1996.³³¹ By 2011, nearly 16% of Nova Scotians will be 65 and older, and by 2036 this will rise to more than 28%. The population over 80 will triple from 3% in 1996 to 9% in 2036.³³² The province now has a median age of 38.8, the highest in the country.³³³

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.³³⁴

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 it has the country's oldest population, Nova Scotia is a highly suitable laboratory and testing ground for such efforts, particularly those aimed at what has been termed "successful aging."

We have already noted that regular physical activity reduces lifetime morbidity and extends independence into old age. But health promotion efforts targeted specifically at the elderly can

³²⁹ 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.

³³⁰ *Ibid.*, pages 134-135.

³³¹ *The National Post*, 17 July, 2002, page A9.

³³² 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.

³³³ *The National Post*, 17 July, 2002, page A9.

³³⁴ 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.

also be effective in reducing health care costs. In the U.S., it has been estimated that one in four elderly outpatients, one-half of elderly hospital patients, and two in five nursing home residents suffer from malnutrition, particularly protein calorie malnutrition, resulting in higher morbidity and mortality. Data also indicate a 25-45% decrease in hospital utilization, shorter hospital stays, and improved clinical outcomes among seniors who receive nutritional screening and intervention.³³⁵

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.³³⁶

Certainly malnutrition is less expensive to prevent than to treat. Malnourished patients stay in health care institutions 2/3 longer than well-nourished patients. The average cost of hospital stay for well-nourished patients is \$32,000 compared to \$50,000 for malnourished patients. And

³³⁵ Coombs, J., and N. Weilman, "Nutrition and the Elderly," *HMO Magazine*, November-December, 1995: 31-34; "Building a Nutrition Case Management System for Florida's Seniors," *Nutrition Screening Initiatives*, Issue 16, page 2, fall, 1995; Morley, John, "Why Do Physicians Fail to Recognize and Treat Malnutrition in Older Persons?" *JAGS* 39: 1139-1140, November, 1991; Reilly, James, et al., "Economic Impact of Malnutrition: A Model System for Hospitalized Patients," *Journal of Parenteral and Enteral Nutrition*, 12 (4): 371-376, 1988; Robinson, Georgia, et al., "Impact on Nutritional Status of DRG Length of Stay," *Journal of Parenteral and Enteral Nutrition*, 11 (1), 1987; Calvert Finn, Susan, "Nutrition in Home Care," *Caring Magazine*, 4, October, 1990; Tkatch, Lubos, et al., "Benefits of Oral Protein Supplementation in Elderly Patients with Fracture of the Proximal Femure," *Journal of the American College of Nutrition*, 11 (5): 519-525, 1992; Smith, Philip, and Alice Smith, "Nutritional Care Cuts – Hospital Days: Managed Care Perspectives," *Nutritional Care Management Institute*: 1-21; Smith, Philip, and Alice Smith, "Nutritional Intervention Influences the Bottom Line," *Healthcare Financial Management*, October, 1993; "Providers Estimate One in Four Seniors Malnourished," *CNI* 23 (16), April 30, 1993; 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; Gallagher-Allred, Charlette, and Sherry Bockus, "Specialized Nutritional Support in Long-Term Care," *Journal of Long Term Care Administrators*, Summer, 1990; all cited in Province of British Columbia (1996), op. cit., pages 29, 34, 35, 36, 38, 41, 42, 43. These U.S. data are also supported by a Canadian assessment of nursing home residents in London, Ontario, where 45.5% of residents were undernourished, among whom 18% were severely undernourished: 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.

³³⁶ "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," *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.

overall charges for malnourished patients are three times greater than for well-nourished patients.³³⁷

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 \$16,500. 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.³³⁸

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.³³⁹

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.³⁴⁰

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 dietitian should be available for each 100-200 patients in a nursing home.”³⁴¹ 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.³⁴²

³³⁷ 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. (2001 \$Can 31,518 = 1990 \$US 16,588; 2001 \$Can 50,084 = 1990 \$US 26,359.)

³³⁸ 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. (2001 \$Can 22,517 = 1996 \$Can 15,000).

³³⁹ 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.

³⁴⁰ 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.

³⁴¹ 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.

³⁴² 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

Ten years ago, the Premier of Nova Scotia, the Health Minister, and the Provincial Health Council announced their intention to “shift our emphasis to the promotion of health and the prevention of illness, disability, and premature death.” In a joint statement, they acknowledged that this shift included:

- a healthy environment, with clean air, water, and soil, and safe places to live and work;
- social justice – addressing poverty, unemployment, racism, illiteracy, and other issues that affect health;
- healthy living – supporting community, family, and individual efforts to control the factors that affect their health.³⁴³

Yet the major shift announced in 1992 has not yet translated into a significant reallocation of resources, despite substantial evidence that preventive interventions may not only improve the health of the population, but save money as well.

10.1 The Challenge of Demonstrating Cost Savings

The understanding that health promotion can be cost-effective is not new. 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.”

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.”³⁴⁴

This understanding is not just a matter of description or analysis, but of policy. Nova Scotia currently devotes less than 2% of its health care budget to prevention.³⁴⁵ But if curative treatment is producing diminishing returns and if prevention is more cost-effective, then efficient use of

³⁴³ “Nova Scotia’s Health Goals,” Provincial Health Council, signed by the Premier and Minister of Health, Nova Scotia, August, 1992.

³⁴⁴ Brown, Allan, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, page 1.

³⁴⁵ Statistics Canada, *CANSIM Database*, “Provincial General Government Revenue and Expenditure, Fiscal Year Ending March 31, Annual,” tables on “Health” and “Preventive Care.” Percentage confirmed to author by sources within NS Department of Health.

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.³⁴⁶ 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.”³⁴⁷

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 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.³⁴⁸

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

³⁴⁶ Brown (1984), op. cit., page 4.

³⁴⁷ 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

³⁴⁸ Brown (1984), op. cit., pages 5 and 18.

be deemed inefficient from the perspective of cost-benefit analysis if the benefits do not outweigh the costs.³⁴⁹

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.³⁵⁰

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 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.)³⁵¹

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.

³⁴⁹ Brown (1984), op. cit., page 4.

³⁵⁰ Brown (1984), op. cit., page 16.

³⁵¹ Brown (1984), op. cit., pages 4-9 detail some of the difficulties in realizing and demonstrating the cost savings of prevention.

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 smoke 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.³⁵²

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.³⁵³ 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.”³⁵⁴

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.”*³⁵⁵

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.

³⁵² 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.

³⁵³ 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.

³⁵⁴ Brown, Allan, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, page 16.

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, page 496.

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 Nova Scotia's population over 65 will 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 province 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 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."*³⁵⁶

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, socioeconomic 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.

³⁵⁶ 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 behaviors associated with increased risk of CHD in the employed population."*³⁵⁷

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.³⁵⁸

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.³⁵⁹

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 \$1,615 a year in excess illness costs, overweight cost \$675, excess alcohol \$655, elevated cholesterol \$623, high blood pressure \$594, and lack of exercise \$219, per person at risk. Projected to the total company workforce, preventable illness was estimated to cost DuPont more than \$118 million a year, a conservative estimate because it excluded spouses, dependents, and retirees who receive company paid health care.³⁶⁰

³⁵⁷ 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.

³⁵⁸ 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.

³⁵⁹ Goetzl, Ron, David Anderson, R. William Whitmer, Ronald Ozminowski, 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.

³⁶⁰ 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. (2001 \$Can 1,615 = 1991 US \$960; 2001 \$Can 675 = 1991 US 401; 2001 \$Can 655 = 1991 US \$389; 2001 \$Can 623 = 1991 US \$370; 2001 \$Can 594 = 1991 US \$353; 2001 \$Can 219 = 1991 US \$130; 2001 \$Can 117.8 million = 1991 US \$70 million.)

There is abundant evidence that worksite health promotion programs are successful in reducing personal health risk factors and associated medical costs.³⁶¹ They have also demonstrated indirect benefits in attracting and retaining key personnel; reducing absenteeism, training costs and accidents; enhanced productivity; improved public image, morale, and allegiance to the company by employees.³⁶²

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.³⁶³

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.³⁶⁴

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.³⁶⁵ 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 1992.³⁶⁶

³⁶¹ Edington et al., op. cit., page 1037 and endnotes 5-13.

³⁶² 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.

³⁶³ 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.

³⁶⁴ 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.

³⁶⁵ Hartman, Terry, 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; Himgburg, Susan, and Michele Keane, "Cost-Benefit Analysis as an Evaluation Technique in Nutrition Education Programs," *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.

³⁶⁶ "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.³⁶⁷ 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.³⁶⁸ 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.”³⁶⁹

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 behaviour 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.”³⁷⁰

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.

³⁶⁷ Edington et al., op. cit., page 1044.

³⁶⁸ Edington et al., op. cit., pages 1037 and 1043.

³⁶⁹ Edington et al, page 1045.

³⁷⁰ 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.³⁷¹ In fact, there is evidence that the atherosclerotic process itself begins in childhood.³⁷²

One study summarized the prevailing wisdom among health researchers that:

“[P]sychosocial conditions of childhood contribute to behaviours 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.”³⁷³

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.”³⁷⁴

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 Nova Scotia 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,

³⁷¹ 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.

³⁷² 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.

³⁷³ 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.)

³⁷⁴ Eriksen, Michael, “School Intervention,” in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, pages 542-543.

and a successful school-based nutrition and physical activity program in Singapore that reduced teenage obesity rates by 30-50%.³⁷⁵

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 the province or in Canada as a whole.

U.S. evidence indicates that most American children have an excessive intake of high-fat foods, consuming, on average, 36-39% of their calories as fat compared to the recommended level of less than 30%. Dairy fat is the greatest source of saturated fat in children's diets. A switch to lower-fat milk is clearly essential. Other sources of saturated fat in children's diets include ice cream, fast food hamburgers, hot dogs, pizza, french fries, cookies, cakes, and donuts. Medical studies indicate that "this excessive intake of dietary fat contributes to childhood obesity and hypercholesterolemia."³⁷⁶ The mean dietary fibre intake of American children is just 12 gm. per day compared to the 20-30 gm. per day recommended by the U.S. National Cancer Institute.³⁷⁷

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.³⁷⁸ 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. Almost 60% of U.S. children's daily energy intake 5 days a week is consumed outside the home, with that proportion rising even higher during adolescence. As noted earlier, a Harvard University study found that children who eat more meals at home have healthier outcomes into adulthood. 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.³⁷⁹ 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.

³⁷⁵ Colman, Ronald, *The Cost of Obesity in Nova Scotia*, GPI Atlantic, Halifax, NS, 2000.

³⁷⁶ Williams, Christine, "Intervention in Childhood," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, page 441; and Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, page 545.

³⁷⁷ Williams, op. cit., page 441.

³⁷⁸ Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, pages 547-548.

³⁷⁹ Statistics Canada, *Women in the Workplace*, 2nd edition, catalogue no. 71-543E.

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 Nova Scotians watch an average of two and a half hours of television per day, the highest rate in the country, not counting the time when the TV is turned on and they are doing other activities such as eating.³⁸⁰ When the latter was included, an earlier Statistics Canada survey found that Nova Scotians watched three and a half hours of television per day.³⁸¹

The American Academy of Pediatrics reports that "increased television use is documented to be a significant factor leading to obesity,"³⁸² 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.³⁸³

What kind of interventions can effectively counter these disturbing social trends? A teacher at the former Tower Road School in Halifax 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. It is an experiment worth replicating on a wider scale throughout the province.

On a more systemic level, daily school-based physical activity, provision of healthy lunches in school cafeterias, nutritional education, and mandatory use of Nova Scotia's exemplary smoking cessation curriculum *Smoke-Free for Life*, 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 more appropriate to adult programs. In general, it has been demonstrated that curricula based on skills will be more effective than curricula based on knowledge alone.³⁸⁴

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

³⁸⁰ Statistics Canada, *General Social Survey: Overview of the Time Use of Canadians in 1998*, Table 1: Canada, regions and provinces, special tabulation, November, 1999.

³⁸¹ Statistics Canada, *Television Viewing 1992*, catalogue no. 87-208, page 21

³⁸² "Media Education," *Pediatrics*, volume 104, no. 2, August 1999, pages 341-343, available at www.aap.org/policy/RE9911.html

³⁸³ 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.

³⁸⁴ Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, page 543.

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 reduced saturated fat intake among students by 20% and sodium intake by 15-20% even without a corresponding educational component.³⁸⁵

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, both the 1990 Nova Scotia Nutrition Survey and 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.³⁸⁶ One analyst has commented:

*"Unfortunately the vagaries of current food-labeling practices often leave consumers confused or with inadequate information."*³⁸⁷

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

In the U.S., the food industry spends \$30 billion a year in advertising alone, with fast food accounting for one-third of food advertising expenditures in industrialized countries. When candy and sweetened cereals are added, unhealthy food accounts for more than half of all food advertising, dwarfing nutritional education investments in schools.³⁸⁸ Like tobacco companies, which now control an increasing proportion of the food industry, much of this advertising explicitly targets children to nurture addictions that will last into adulthood. Food commercials, largely promoting sugar-filled foods, make up half of all advertising directed at children.³⁸⁹ In an environment where children receive their primary nutritional education from the food industry, and where widespread public confusion prevails, effective school-based programs will require targeted teacher training that challenges prevailing norms.

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.³⁹⁰

³⁸⁵ Colman, Ronald, *The Cost of Tobacco in Nova Scotia*, GPI Atlantic, Halifax, October, 2000; 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.

³⁸⁶ Nova Scotia Heart Health Program, *Report of the Nova Scotia Nutrition Survey*, March 1993, page 32.

³⁸⁷ 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.

³⁸⁸ Gary Gardner 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 67-68.

³⁸⁹ Eriksen, Michael, "School Intervention," in Ockene, Ira, and Judith Ockene, *Prevention of Coronary Heart Disease*, Little, Brown, and Company, Boston, 1992, page 545.

³⁹⁰ Eriksen, op. cit., page 548.

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.³⁹¹

13. Clinical Preventive Services

Brief advice from a physician has been shown to be highly effective in preventing disease and promoting health, because physicians are regarded as the most reliable and credible source of health information by the general public. They have the opportunity to take advantage of the “teachable” moment when patients are concerned about their health, and they come into contact with 80% of Canadian adults annually, each of whom sees a doctor an average of four times a year.³⁹²

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.”³⁹³

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.³⁹⁴ 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

³⁹¹ 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.

³⁹² Stachenko, Sylvie, Director, Preventive Health Services, Health Canada, *Preventive Guidelines: Their Role in Clinical Prevention and Health Promotion*, Health Canada, Ottawa, page xxi.

³⁹³ 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.

³⁹⁴ Definition of primary care from World Health Organization (1978), “The Alma Ata Conference on Primary Health Care,” *WHO Chronicle*, 32: 409-430, page 418.

physician counselling and advice can be effective, especially if backed up by other office services and self-help materials.³⁹⁵

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.³⁹⁶ 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 information from their doctors.³⁹⁷ One 1999 U.S. survey found that 35% of smokers did not receive advice to quit when visiting a health care professional.³⁹⁸

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.³⁹⁹ Not surprisingly, 77% of surveyed physicians felt they would need additional education in order to advise patients effectively about needed dietary modification.⁴⁰⁰ Many physicians report lack of time, knowledge, financial incentives, and confidence in their counselling skills as reasons they do not provide this advice.⁴⁰¹

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).⁴⁰²

³⁹⁵ 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.

³⁹⁶ Ibid., page 175.

³⁹⁷ Brown, Allan, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, page 15.

³⁹⁸ Coffield, Ashley, et al., "Priorities Among Recommended Clinical Preventive Services," *American Journal of Preventive Medicine* 2001; 21 (1): 1-9, pages 1-2.

³⁹⁹ 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.

⁴⁰⁰ LaRosa, John, et al., "Practical Strategies for the Dietary Management of Hypercholesterolemia," cited in Province of British Columbia (1996), op. cit., page 20.

⁴⁰¹ 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.

⁴⁰² 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.

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.⁴⁰³

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.⁴⁰⁴ The American Diabetes Association has recommended third party payment for outpatient education and nutritional counselling.⁴⁰⁵ 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.”⁴⁰⁶

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

⁴⁰³ 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.

⁴⁰⁴ “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.

⁴⁰⁵ 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.

⁴⁰⁶ Brown, Allan, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, page 15.

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.⁴⁰⁷ 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.⁴⁰⁸

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.⁴⁰⁹

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.⁴¹⁰

Aside from direct counselling, the clinical setting can provide support for preventive behaviours through posters, displays, and educational materials in physicians' offices and waiting rooms.⁴¹¹ Doctors who feel unable to provide dietary advice themselves can either include registered dietitians in their clinical teams, or provide appropriate referrals.⁴¹² Dietitians can also be part of hospital ward rounds to improve awareness and patient care.⁴¹³ Indeed, balanced low calorie diets supervised by dietitians or non-medical personnel have been shown to be more cost effective per pound of weight lost than medically supervised low calorie diets.⁴¹⁴

Because physicians experience increasing time pressure to see more patients in less time, physician 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, dietitians, 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

⁴⁰⁷ 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.

⁴⁰⁸ Maciosek et al., op. cit., pages 14-15.

⁴⁰⁹ Coffield et al., op. cit., pages 1 and 5.

⁴¹⁰ Cited in Stachenko, Sylvie, Director, Preventive Health Services, Health Canada, *Preventive Guidelines: Their Role in Clinical Prevention and Health Promotion*, Health Canada, page xix.

⁴¹¹ LaRosa, John, et al., "Practical Strategies for the Dietary Management of Hypercholesterolemia," cited in Province of British Columbia (1996), op. cit., page 20; Brown, Allan, *Costs and Benefits of Preventive Medicine*, Canadian Medical Association, Department of Medical Economics, 1984, page 16.

⁴¹² Ellison, R. Curtis, "Give Diet a Chance in Lowering Cholesterol Levels," editorial in *Arch Intern Med.* 148: 1017-1019, May, 1988, cited in Province of British Columbia (1996), op. cit., page 22.

⁴¹³ Roubenoff, Ronenn, et al., "Malnutrition Among Hospitalized Patients – A Problem of Physician Awareness," *Arch Intern Med.*, 147: 1462-1465, August, 1987, cited in Province of British Columbia (1996), op. cit., page 53.

⁴¹⁴ "Ambulatory Nutrition Care; Adults – Weight Reduction and Management," *Supplement to Journal of the American Dietetic Association*, S30-34, April, 1989, cited in Province of British Columbia (1996), op. cit., page 25.

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.⁴¹⁵

Physicians can also 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. 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 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.⁴¹⁶

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.⁴¹⁷ 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.

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 \$12,542 per patient for avoided surgeries in patients with severe osteoarthritis to \$41,019 per patient in

⁴¹⁵ 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.

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 300 and 317.

⁴¹⁷ 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.

reduced hospital and nursing home days for stroke victims.⁴¹⁸ For heart disease victims, cost savings averaged \$19,483 per patient in avoided surgeries and hospital stays, and another \$26,974 in avoided productivity losses due to an increase in patients able to return to work.^{419, 420}

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 third highest overall costs of any disease, after circulatory disorders and 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.⁴²¹ Extrapolated to Nova Scotia according to population, these estimates indicate potential savings of \$40 million a year to the health care system, and \$150 million 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 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.⁴²²

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%.⁴²³

⁴¹⁸ To convert 1992US\$ to 2001Can\$, exchange rates from <http://www.x-rates.com/cgi-bin/hlookup.cgi> show \$US1 = \$Can1.1972 on 30 June, 1992. Therefore calculation (1): 1.1972 X \$9000 = \$10,775 (1992 Can\$), and calculation (2): 2001 CPI (116.4) divided by 1992 CPI (100) X \$10,775 = \$12,542. To convert 1994US\$ to 2001Can\$, exchange rates from <http://www.x-rates.com/cgi-bin/hlookup.cgi> show \$US1 = \$Can1.3825 on 30 June, 1994. Therefore calculation (1): 1.3825 X \$26,000 = \$35,945 (1994 Can\$), and calculation (2): 2001 CPI (116.4) divided by 1994 CPI (102) X \$35,945 = \$41,019.

⁴¹⁹ 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.

⁴²⁰ To convert 1996US\$ to 2001Can\$, exchange rates from <http://www.x-rates.com/cgi-bin/hlookup.cgi> show \$US1 = \$Can1.3635 on 30 June, 1996. Therefore calculation (1): 1.3635 X \$13,000 = \$17,725 (1996 Can\$), and calculation (2): 2001 CPI (116.4) divided by 1996 CPI (105.9) X \$17,725 = \$19,483. The same process is repeated for the other conversion on this page: \$18,000US(1995) = \$26,974 Can (2001),

⁴²¹ 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.

⁴²² Manga and Angus, op. cit., pages 4, and 59-61.

⁴²³ *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>.

It has been claimed that treating asthma through allergy elimination diets and nutritional supplements could save \$3 billion a year in hospital, drug, and physician costs in the U.S. Intravenous magnesium has been recommended as an alternative to clot-dispersing drugs for heart attack victims, for an estimated saving of \$1 billion a year in the U.S. And chelation therapy has been claimed as an effective alternative to bypass surgery at 10% of the cost, with considerably less pain and risk, and a faster convalescence.⁴²⁴

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.⁴²⁵ 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.⁴²⁶

⁴²⁴ Goldberg, Burton, "You Don't Have to be Sick," *Alternative Medicine Magazine*, cited at www.garynull.com and www.alternativemedicine.com.

⁴²⁵ Goldberg, Burton, "You Don't Have to be Sick," *Alternative Medicine Magazine*, cited at www.garynull.com and www.alternativemedicine.com.

⁴²⁶ 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.

APPENDIX A
THE COST OF PHYSICAL INACTIVITY
IN NOVA SCOTIA

Executive Summary

Physical activity provides proven health benefits. It protects against heart disease, stroke, hypertension, type 2 diabetes, colon cancer, breast cancer, osteoporosis, obesity, depression, anxiety, and stress. Epidemiological studies estimate that 36% of heart disease, 27% of osteoporosis, 20% of stroke, hypertension, diabetes 2, and colon cancer, and 11% of breast cancer are attributable to physical inactivity.

Regular physical activity also protects against obesity and assists weight control; fosters development of healthy muscles, bones and joints; increases strength and endurance; improves behavioural development in children and adolescents; and helps maintain function and preserve independence in older adults. Studies show that regular exercisers have much less *overall lifetime morbidity* than those who are sedentary, indicating that avoided medical costs due to physical activity are not simply deferred to older ages.

According to the Canadian Fitness and Lifestyle Research Institute, 62% of Nova Scotians and 61% of Canadians are currently too inactive to reap the health benefits of regular physical activity.

It is estimated that physical inactivity costs the Nova Scotia health care system \$66.5 million a year in hospital, physician and drug costs alone, equal to 4% of total government spending on these services. When all direct health care costs are added, including private expenditures, a sedentary lifestyle costs Nova Scotians \$107 million a year in direct medical care expenditures.

This spending is currently added to the provincial Gross Domestic Product and economic growth statistics, and is thus mistakenly taken as a sign of prosperity and progress. The Genuine Progress Index counts this spending due to physical inactivity as a cost - not a gain - to the economy.

Physical inactivity costs the Nova Scotia economy an additional \$247 million each year in indirect productivity losses due to premature death and disability. Adding direct and indirect costs, the total economic burden of physical inactivity in Nova Scotia is estimated at \$354 million annually.

More than 700 Nova Scotians die prematurely each year due to physical inactivity, accounting for 9% of all premature deaths. These premature deaths result in the loss of more than 2,200 potential years of life every year in the province before age 70. In other words, if all Nova Scotians were physically active, the province would gain 2,200 productive years of life each year, with corresponding gains to the economy.

If just 10% fewer Nova Scotians were physically inactive – that is, if the rate of physical inactivity were 56% instead of 62% - the province could save an estimated \$4.6 million every year in avoided hospital, drug, and physician costs, and \$7.5 million in total health care spending. Added to an estimated \$17 million in productivity gains, total economic savings to Nova Scotia from a 10% reduction in physical inactivity amount to \$24.7 million.

Given the enormous health care burden of a sedentary lifestyle, health campaigns aimed at promoting regular physical activity, including provision of adequate access to quality sport and recreation programs and facilities for all Nova Scotians, have the potential to reduce the enormous human and economic burden of physical inactivity.

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1. Physical Activity and Health

“If you could bottle everything you get from physical activity and sell it at a pharmacy, it would go for a hefty price.”
George Sheehan, M.D.⁴²⁷

“Physical activity is the crux of healthy aging. Nowhere is the gap wider between what we know and what we do than in the area of physical activity, and nowhere is the potential pay-off greater.” National Center for Chronic Disease Prevention and Health Promotion, USA⁴²⁸

Physical activity has been glowingly referred to as a “magic bullet” because of its proven benefits in preventing disease, improving health, and promoting independence and quality of life in old age.⁴²⁹ The United Kingdom Minister for Public Health has called physical exercise the best buy in public health.⁴³⁰ And the most substantial body of evidence for achieving healthy active aging relates to the beneficial effects of regular exercise.⁴³¹ Physical activity has been called “the most obvious of variables which might reduce overall lifetime morbidity” and the “cornerstone” of any strategy aimed at prolonging disability-free life expectancy.⁴³²

In 1992, the American Heart Association officially recognized physical inactivity as one of the four major modifiable risk factors for cardiovascular disease, along with smoking, high blood pressure, and elevated blood cholesterol.⁴³³ However, 24% of Canadians smoke, 11% have high blood pressure, and 18% have high blood cholesterol, while 61% of Canadians are not active enough to reap health benefits.⁴³⁴ An increase in physical activity, therefore, has the greatest potential to reduce the incidence of heart disease in Canada. In Nova Scotia, the comparable prevalence rates for the major modifiable risk factors are: smoking – 30%; high blood pressure – 17%; high blood cholesterol – 19%; physical inactivity – 62%.⁴³⁵

⁴²⁷ Canadian Fitness and Lifestyle Research Institute, *The Research File*, 2000, Reference No. 00-01.

⁴²⁸ National Center for Chronic Disease Prevention and Health Promotion, “Healthy Aging: Preventing Disease and Improving Quality of Life Among Older Americans,” Atlanta, July, 2001, available at <http://www.cdc.gov/nccdphp/aag-aging.htm>.

⁴²⁹ Canadian Fitness and Lifestyle Research Institute, *The Research File*, 2000, Reference No. 00-01.

⁴³⁰ Cooper, Y. Royal College of Physicians, London, June, 2000, cited in Simey, Piers and Dawn Skelton, “Older people need to be encouraged to exercise,” *British Medical Journal* 322 (7289), 31 March, 2001, page 796.

⁴³¹ Andrews, Gary, “Promoting Health and Function in an Ageing Population,” *British Medical Journal* 322 (7288), 24 March, 2001, pages 728-729.

⁴³² Fries, James, “Physical Activity, the Compression of Morbidity, and the Health of the Elderly,” *Journal of the Royal Society of Medicine* 89, 1996, pages 64 and 67.

⁴³³ American Heart Association, “Statement on Exercise: Benefits and recommendations for physical activity programs for all Americans, a statement for health professionals by the Committee on Exercise and Cardiac Rehabilitation of the Council on Clinical Cardiology, American Heart Association, *Circulation* 86, 1992, pages 340-344.

⁴³⁴ Statistics Canada and Health Canada, *Canadian Tobacco Use Monitoring Survey 2000*; Blood pressure from Statistics Canada, *Health Statistics 1999*, CD-Rom, Table 0060121.IVT; Cholesterol prevalence from Logan, Alexander, *Lowering the Blood Total Cholesterol Level to Prevent Coronary Heart Disease*, Canadian Task Force on Preventive Health Care, June, 1994, available at: http://www.ctfphe.org/Full_Text/Ch54full.htm; Inactivity prevalence from Canadian Fitness and Lifestyle Research Institute, *2000 Physical Activity Monitor*, available at: <http://www.cflri.ca/cflri/pa/surveys/2000survey/2000survey.html>.

⁴³⁵ Statistics Canada, *Canadian Tobacco Use Monitoring Survey 2000*. (Note: Initial data from the first six months of 2001 indicate a potentially significant drop in Nova Scotia smoking rates to 24%, but full year data for 2001,

A Harvard Medical School meta-analysis estimated that 22% of coronary heart disease in the U.S. could be attributed to physical inactivity.⁴³⁶ 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 Nova Scotia economy \$960 million a year, promotion of physical activity could potentially save substantial sums of money.

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.⁴³⁷

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.⁴³⁸ 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.⁴³⁹

In addition, physical activity provides protection against anxiety and depression. Statistics Canada found that sedentary Canadians are 60% more likely to suffer from depression than those who are active, and concluded that “physical activity has protective effects on heart health and mental health that are independent of many other risk factors.” Regular physical activity has also been shown to foster development of healthy muscles, bones and joints; to improve strength, endurance, and weight control; to improve behavioural development in children and adolescents; and to help maintain function and preserve independence in older adults.⁴⁴⁰

which should be available in July, 2002, are needed to confirm this trend); High blood pressure from Statistics Canada, *Health Statistics 1999*, CD-Rom, Table 0060121.IVT; High blood cholesterol from Heart Health Nova Scotia and Nova Scotia Department of Health, *The Nova Scotia Health Survey, 1995*, Halifax, 1995, page 40; Physical inactivity from Canadian Fitness and Lifestyle Research Institute, *2000 Physical Activity Monitor*, available at: <http://www.cflri.ca/cflri/pa/surveys/2000survey/2000survey.html>.

⁴³⁶ 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.

⁴³⁷ 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.

⁴³⁸ Colditz (1999), in CFLRI, op. cit.

⁴³⁹ Canadian Fitness and Lifestyle Research Institute, “The Burden of Inactivity,” *The Research File*, reference no. 98-01.

⁴⁴⁰ Chen and Millar, op. cit., pages 21-30; U.S. Department of Health and Human Services, *Physical Activity and Health: A Report of the Surgeon-General*, Atlanta, Georgia, 1996, pages 7-8; Prof. Robert Malina (University of Texas), “Physical Activity and Behavioural Development,” in Norgan, op. cit., pages 101-120; Prof. Andrew Steptoe (St. George's Hospital Medical Centre, London), “Physical Activity and Psychological Well-being,” in Norgan, op. cit., pages 207-229; William P. Morgan (ed.), *Physical Activity and Mental Health*, Taylor and Francis, Washington D.C., 1997.

In sum, a very wide range of chronic diseases could be avoided through increased levels of physical activity in the population. Since the need and demand for medical services and their associated costs are directly linked to the prevalence of illness in society, a reduction in chronic ailments through higher levels of physical activity has the potential to reduce health care costs. Studies have demonstrated that regular exercisers have much less *overall lifetime morbidity* than those who are sedentary, indicating that avoided medical costs due to physical activity can be saved absolutely rather than simply deferred to older ages.⁴⁴¹

United States health authorities have identified increasing physical activity as a key factor in controlling health care costs in that country, through the prevention of unnecessary illness, disability and premature death, and the maintenance of an improved quality of life into old age.⁴⁴² And the U.S. Surgeon-General has issued a "national call to action" to put increased physical activity on the same level as the use of seat belts and the discouragement of tobacco use, because of the strong evidence that it will produce comparable "clear and substantial health gains."⁴⁴³

1.1 Biological Pathways

The beneficial effects of physical activity on health have been confirmed by clinical studies identifying the potential biological mechanisms whereby physical activity can influence health. For example, 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.⁴⁴⁴

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.⁴⁴⁵

⁴⁴¹ Fries, James, C. 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; Fries, James, "Physical Activity, the Compression of Morbidity, and the Health of the Elderly," *Journal of the Royal Society of Medicine*, 89, 1996, page 67.

⁴⁴² David Satcher, M.D., Ph.D, Director, U.S. Centers for Disease Control and Prevention, and Philip R. Lee, M.D., Assistant Secretary for Health, in Forward to *Physical Activity and Health: A Report of the U.S. Surgeon-General*, op. cit.

⁴⁴³ Audrey F. Manley, M.D., Preface to *Physical Activity and Health: A Report of the U.S. Surgeon-General*, op. cit.

⁴⁴⁴ This summary is from Slattery, Martha, "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.

⁴⁴⁵ Idem.

2. Physical Activity Trends in Nova Scotia

2.1 Definitions

There are a number of definitions of physical activity and inactivity that produce varying results when assessing trends in physical activity. Because of the wide range of definitions of physical activity and inactivity, the different types of surveys, and the lack of standardization that currently exists, the following analysis provides three measures of physical activity.

- Statistics Canada's National Population Health Surveys (NPHS) 1994/95 and 1996/97 considered Canadians physically inactive or "sedentary" if they reported a usual daily leisure-time energy expenditure of less than 1.5 kilocalories per kilogram of body weight per day (kcal/kg/day). Individuals were defined as moderately active if they expended 1.5-2.9 kcal/kg/day, and as "active" if they expended 3.0 or more kcal/kg/day. Calculations were made based on individuals' reporting of the frequency and duration of different types of physical activity, using independently established values for the energy demands of each activity. In this analysis, "regular" physical activity (at the levels indicated) is defined as at least 15 minutes of leisure time physical activity 12 or more times per month. The NPHS results apply to Canadians 12 and older.⁴⁴⁶
- Other surveys have assessed physical activity levels according to whether respondents reported exercising three or more times weekly, once or twice weekly, less than once weekly or never.⁴⁴⁷
- Health Canada's 1998 publication, *Canada's Physical Activity Guide to Healthy Active Living*, calls for an hour of low-intensity activity every day, or 30-60 minutes of moderate-intensity activity, or 20-30 minutes of vigorous-intensity activity 4-7 days a week.⁴⁴⁸ Only 34% of Canadians aged 25-55 currently meet these recommendations.⁴⁴⁹
- The Canadian Fitness and Lifestyle Research Institute's "physical activity profiles" rate Canadians according to whether their physical activity levels are sufficient for "optimal health benefits." Physical inactivity, according to this measure, is defined as less than 12.6 kilojoules (kJ)/kg of body weight per day of physical activity, the minimum judged necessary to obtain health benefits from physical activity.⁴⁵⁰ The CFLRI results apply to Canadians 18 and older. The most recent 2000 Physical Activity Monitor Survey ranked 61% of Canadians and 62% of Nova Scotians as not active enough to reap the health benefits of a physically active lifestyle.⁴⁵¹

⁴⁴⁶ Health Canada, *Statistical Report on the Health of Canadians*, 1999, Ottawa, page 189; Heart and Stroke Foundation of Canada, *The Changing Face of Heart Disease and Stroke in Canada 2000*, Ottawa, 1999, page 107; 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, definitions on page 23.

⁴⁴⁷ Statistics Canada, *CANSIM database*, Matrix #M1011.

⁴⁴⁸ Health Canada, *Canada's Physical Activity Guide to Healthy Active Living*, Ottawa, 1998.

⁴⁴⁹ Canadian Fitness and Lifestyle Research Institute, *Meeting Guidelines. Progress in Prevention Bulletin 31*, Ottawa, 1998, available at: http://www.cflri.ca/cflri/resources/pub_pip.php.

⁴⁵⁰ Katzmarzyk, Peter, Norman Gledhill, and Roy Shephard, "The Economic Burden of Physical Inactivity in Canada," *Canadian Medical Association Journal* 163 (11), November 28, 2000, page 1437.

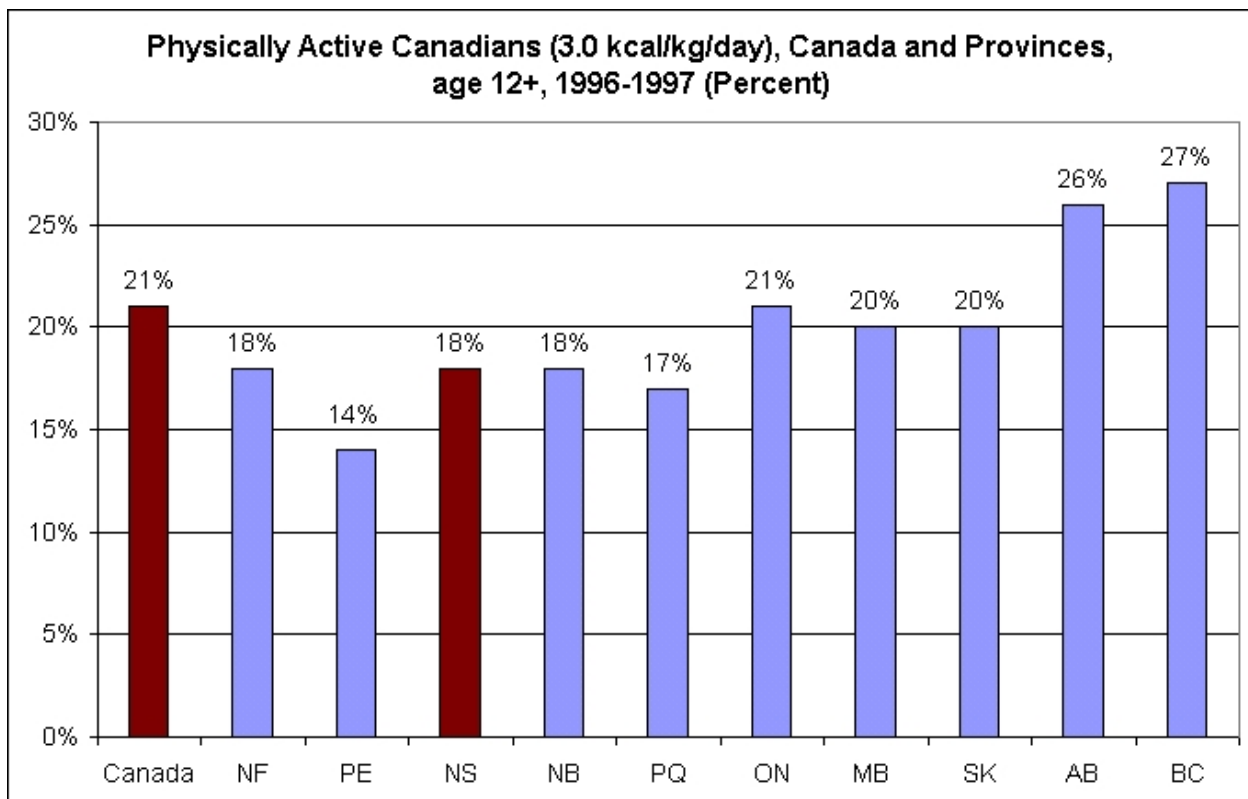
⁴⁵¹ Canadian Fitness and Lifestyle Research Institute, *2000 Physical Activity Monitor*, available at: <http://www.cflri.ca/cflri/pa/surveys/2000survey/2000survey.html>.

- Because there are so many definitions of physical activity and inactivity, an “international consensus group” was formed in 1998 to develop an internationally agreed upon set of measures of physical activity participation. The group has now developed and pilot-tested a set of International Physical Activity Questionnaires (IPAQ), with Canada one of 12 countries participating in the validation and reliability phase of the project.⁴⁵²

2.2 National Population Health Surveys

According to Statistics Canada’s 1996/97 National Population Health Survey, only 18% of Nova Scotians can be classified as physically active, expending 3.0 or more kilocalories of energy per kilogram of body weight per day. This compares to 21% of Canadians, and 27% of British Columbians (the most active in the country). Another 22% of Nova Scotians are moderately active (1.5-2.9 kcal/kg/day), and 61% are inactive (less than 1.5). By contrast, 57% of Canadians and 50% of Albertans and British Columbians are inactive. Figure 1 demonstrates an east-west gradient, with western Canadians generally more active than easterners.⁴⁵³

Figure 1: Physically Active Canadians (3.0 kcal/kg/day), Canada and Provinces, age 12+, 1996-1997 (Percent)

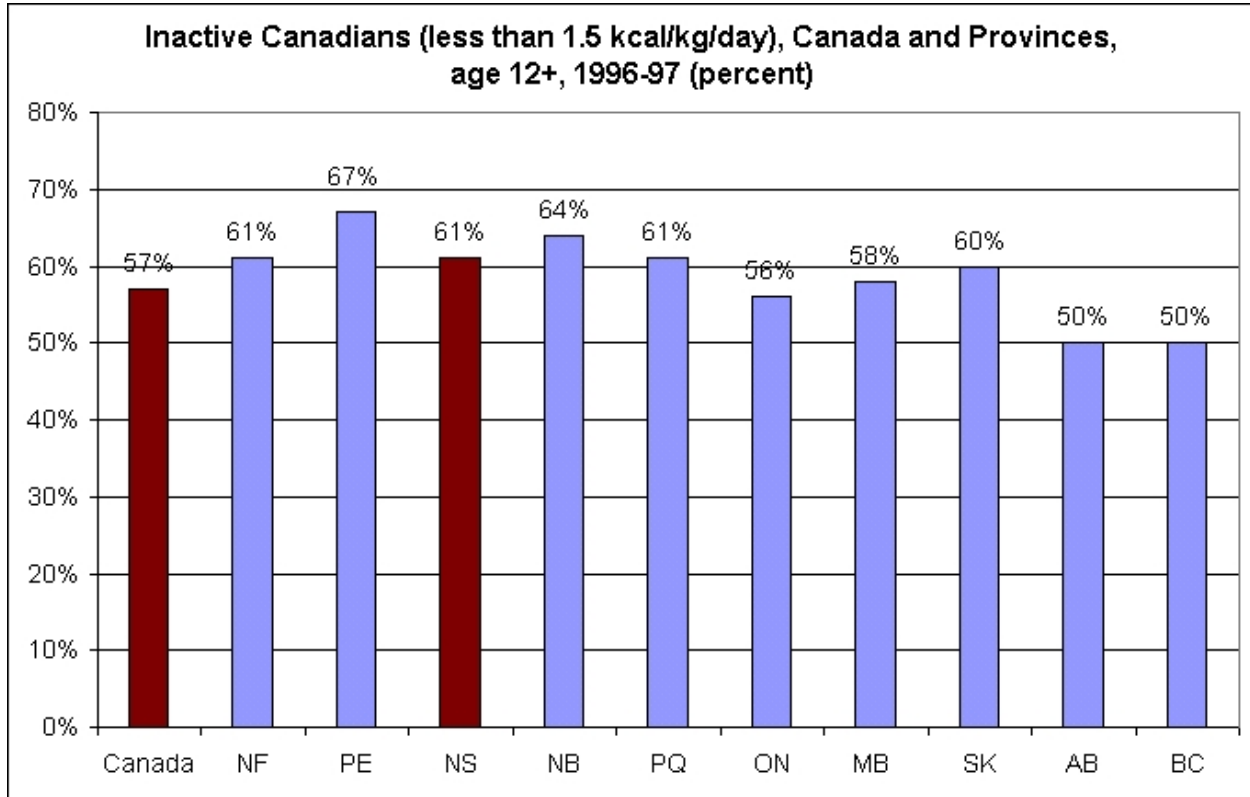


Source: Health Canada, *Statistical Report on the Health of Canadians*, 1999

⁴⁵² Canadian Fitness and Lifestyle Research Institute, *International Consensus Project on Physical Activity Measurement*, Ottawa, available at: <http://www.cflri.ca/cflri/research/ipaq.html>.

⁴⁵³ Health Canada, *Statistical Report on the Health of Canadians*, 1999, page 190

Figure 2: Inactive Canadians (less than 1.5 kcal/kg/day), Canada and Provinces, age 12+, 1996-97 (percent)



Source: Health Canada, *Statistical Report on the Health of Canadians*, 1999.

2.3 Regular Exercise 1985-1996

Statistics Canada's *CANSIM* database provides information on trends over time for the number of Canadians who exercise regularly. The data indicate an increase in physical activity among Canadians as a whole, while the proportion of the population exercising regularly in Nova Scotia has remained stagnant. Fifteen years ago Maritimers were more physically active than most Canadians, exercising more frequently in their leisure time. Today all four Atlantic provinces rank significantly *below* the Canadian average (Figure 3).⁴⁵⁴

Interestingly, the averages conceal some important gender differences. Women have generally *increased* their rates of leisure time physical activity quite dramatically since 1985, by 24% in Newfoundland, 15% in Nova Scotia, and 8% in New Brunswick. Overall this is a good prognosis

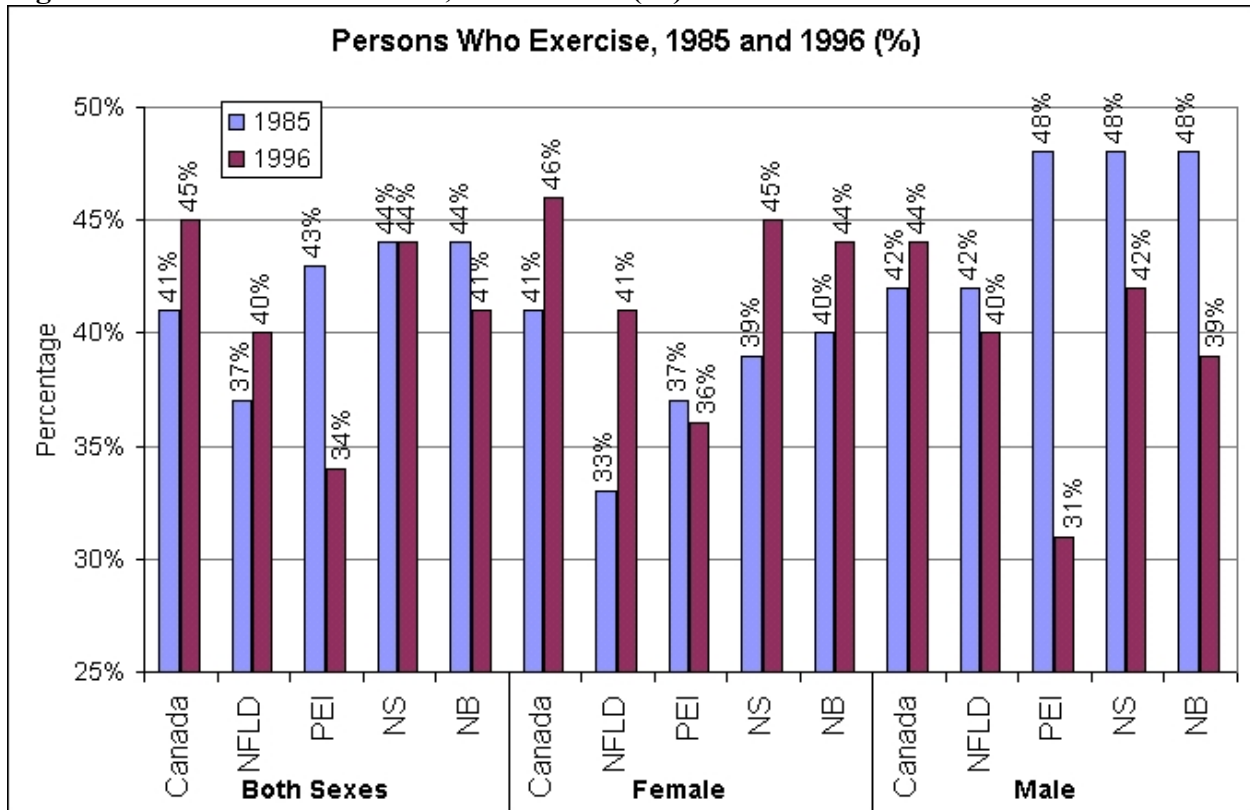
⁴⁵⁴ Statistics Canada, *CANSIM Database Matrix #M1011*, Tables H501100 - H501212. Percentages calculated by the author using population figures for 1985 and 1996 from Statistics Canada, *CANSIM Database*, Matrices #M6367 - M6371 inclusive, and selected Tables from C892268 to C893542. In this, as in all provincial tables, caution must be exercised in interpreting trends for Prince Edward Island, as sample sizes are frequently small and produce a larger margin of error than for the other provinces.

for women's health in this region, and should help decrease the rate of cardiovascular disease and other chronic ailments among women.

By contrast, while more Canadian men than ever are exercising in other parts of the country, more Atlantic region males are becoming sedentary. In all four Atlantic provinces, there has been a dramatic decline in physical activity by men. By this measure, fully six out of ten Atlantic region men do not exercise regularly in their free time, with declines in male activity rates of 36% in P.E.I., 18% in New Brunswick, 13% in Nova Scotia, and 4% in Newfoundland. Fifteen years ago, in every Atlantic province, more men than women exercised on a regular basis, by a significant margin. Today, in every Atlantic province, more women exercise than men.

In the long term, the trends indicate that while Atlantic Canadian men had a relatively lower risk of heart disease in 1985 compared to other Canadians, they now have a significantly higher risk, the costs of which will gradually become evident over time.

Figure 3: Persons Who Exercise, 1985 - 1996 (%)



Source: Statistics Canada, *CANSIM Database*

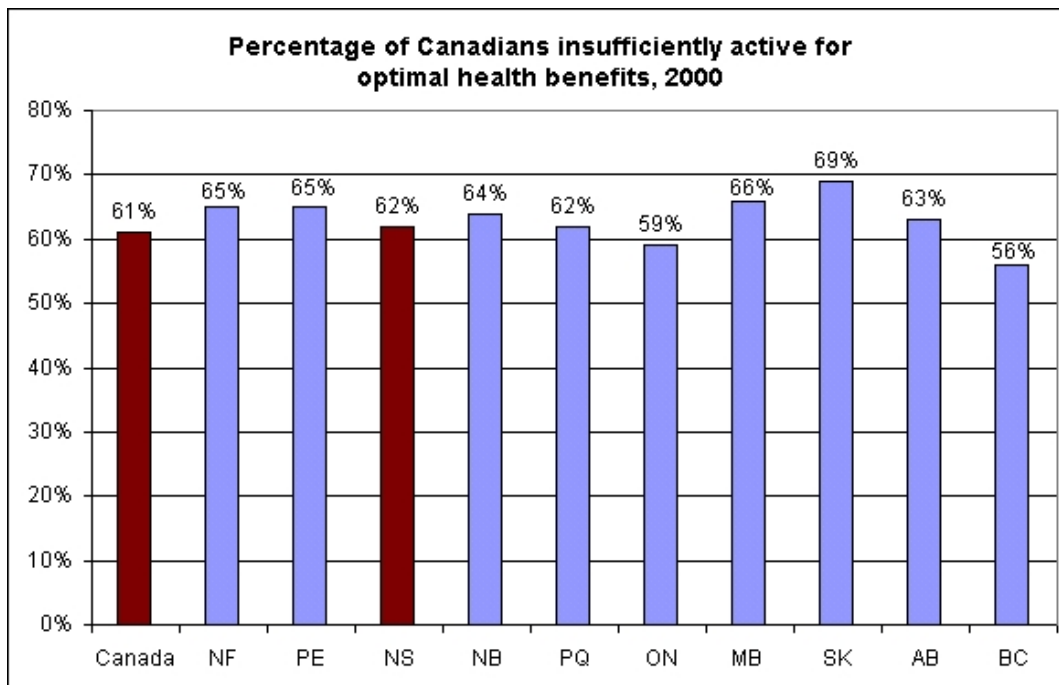
2.4 CFLRI: Physical Activity Monitor

Since 1998, the Canadian Fitness and Lifestyle Research Institute (CFLRI) has produced provincial survey data on rates of physical activity and inactivity in Canada. Unlike the Statistics Canada data on regular exercise above, the CFLRI data show rates of inactivity in Nova Scotia declining from 69% in 1998 to 65% in 1999 to 62% in 2000.

In Canada as a whole longer trend lines are possible, because nationwide data sets are available at irregular intervals since the first Canada Fitness Survey in 1981. They show considerable progress being made over 15 years, with physical inactivity rates falling from 79% in 1981 to 63% in 1995, and physical activity rates rising by an average of one percentage point each year, as awareness of the health benefits of physical activity spread. Since 1995, however, this progress has stalled, with little improvement since that time.⁴⁵⁵

Figure 4 below gives rates of physical inactivity in Canada from the CFLRI Physical Activity Monitor for 2000. These results are not comparable to those provided by the National Population Health Survey (NPHS) in Figure 2 above. Even using comparable years, the 1996-97 CFLRI Physical Activity Monitor found that 66% of Canadians were not sufficiently active to reap the benefits of physical activity, while the NPHS data for those years reported a physical inactivity rate of 57% for Canadians. The difference is due to the fact that CFLRI evaluation criteria are markedly different from those in the NPHS, as noted in the discussion on definitions in section 2.1 above.

Figure 4: Percentage of Canadians insufficiently active for optimal health benefits, 2000



Source: Canadian Fitness and Lifestyle Research Institute, *2000 Physical Activity Monitor*

⁴⁵⁵ Canadian Fitness and Lifestyle Research Centre, *Physical Activity Monitors and Surveys, 1981-2000*, available at: <http://www.cflri.ca/cflri/pa/surveys/>.

15. The Economic Cost of Physical Inactivity

3.1 Methodology

To estimate the economic costs of physical inactivity (or of any other risk factor) in Nova Scotia, the following steps are necessary:

- 1) The epidemiological evidence is examined to ascertain the relationship between physical inactivity and various diseases. This is expressed as the “relative risk” (RR) of developing a particular disease for a physically inactive person compared to an active person.⁴⁵⁶ The relative risk is determined by dividing the rate of the disease among sedentary people by the rate of disease among active people. For example, if sedentary people are twice as likely to develop heart disease, then the relative risk (RR) is 2.

In this case, the relative risks for seven chronic diseases, and the methodology for assessing the economic cost of physical inactivity, are taken from an analysis by Katzmarzyk, Gledhill, and Shephard in the *Canadian Medical Association Journal (CMAJ)*, 28 November, 2000.⁴⁵⁷ GPI Atlantic used the same method in early 2000, also based on a CMAJ analysis, to assess the cost of obesity in Nova Scotia.⁴⁵⁸ To the best of our knowledge the November, 2000, CMAJ article is the first Canadian study to use previously published meta-analyses and large prospective epidemiological studies to estimate the relative risks attributable to physical inactivity for various chronic diseases. This now makes it possible, for the first time, to assess the economic cost of physical inactivity in Nova Scotia.

- 2) The second step is to ascertain the prevalence of a risk factor within a given population. Because the CMAJ article uses the Canadian Fitness and Lifestyle Research Institute’s Physical Activity Monitoring Survey results (2.4 above), this analysis does the same in order to obtain comparable results and maintain the same methodology. However, the CMAJ article used 1997 survey results, while this Nova Scotia analysis uses the most recent 2000 results. Coincidentally, the 2000 Nova Scotia rate of physical inactivity (62%) is identical to the 1997 Canadian physical inactivity rate, so that the population attributable fraction of each disease is also identical. (see step 3 below.)
- 3) To assess the public health burden of sedentary living, or of any other risk factor, the relative risk (step 1) is combined with the absolute frequency of physical inactivity (or other risk factor) in the population. The resulting population attributable fraction (PAF) of a disease is an estimate of the effects of an individual risk factor on a given disease, and the extent to which each disease is attributable to the risk factor. The population attributable fraction

⁴⁵⁶ Methodological explanation from Canadian Fitness and Lifestyle Research Institute (CFLRI) “The Burden of Inactivity,” *The Research File*, reference no. 98-01; “Health Care Savings,” *The Research File*, reference no. 97-02; “An Economic Case for Physical Activity,” *The Research File*, reference no. 95-03.

⁴⁵⁷ Katzmarzyk, Peter, Norman Gledhill, and Roy Shephard, “The Economic Burden of Physical Inactivity in Canada,” *Canadian Medical Association Journal*, 163 (11), November 28, 2000.

⁴⁵⁸ Colman, Ronald, *The Cost of Obesity in Nova Scotia*, Halifax, March, 2000. That study used the methodology of C. Laird Birmingham et al., in the *Canadian Medical Association Journal* 160 (4), 23 February, 1999.

(PAF) of a disease is, therefore, the proportion of each chronic disease that could theoretically be prevented by eliminating physical inactivity.⁴⁵⁹

The population attributable fraction (PAF) for each disease is calculated as $[P(RR - 1) / [1 + P(RR - 1)]]$, where P is the prevalence of physical inactivity in the population (in this case 62%), and RR is the relative risk for the disease in an inactive person. The results from steps 1-3 are presented in Table 1 below.

- 4) The fourth step is to multiply the population attributable fraction (PAF) for each disease by the total cost of treating that particular disease, using Health Canada's *Economic Burden of Illness in Canada* (EBIC), which describes illness costs by diagnostic category. In other words, we estimate the direct health care costs of treating the particular diseases that are linked to physical inactivity by using the population attributable fraction (PAF) of each disease to estimate the fraction of those costs that are attributable to physical inactivity.

This analysis is based on the basic methodology of Katzmarzyk et al. in assigning costs to particular diseases, but the costs are updated and adjusted for Nova Scotia specific data whenever possible. Katzmarzyk et al. used the 1993 EBIC results, inflated to 1999 values. In this analysis Nova Scotia specific results from the 1998 EBIC (scheduled for release in May, 2002) are used. Also, the provincial incidence of particular diseases is used wherever such data are available.

Another difference is that this study includes a category of "other" direct costs, following the new 1998 EBIC classification. This includes costs for other institutions, home care, and a range of private medical expenditures, in addition to the four direct cost categories used in the 1993 EBIC (hospitals, drugs, physicians, and research). In assessing the costs of medical care attributable to physical inactivity as a percentage of total Nova Scotia health care expenditures, two estimates are therefore given in this report. The first is a percentage of total direct health care costs, public and private. The second reflects a percentage of the Nova Scotia taxpayer-funded health care budget (and thus excludes private expenditures and most "other" costs).

Katzmarzyk et al. used costs specific to coronary heart disease and stroke from the 1993 EBIC. The 1998 EBIC does not yet provide Nova Scotia specific data for these illnesses separate from the broader category of cardiovascular diseases. Therefore, the proportion of heart disease and stroke as a percentage of total cardiovascular disease from the 1993 EBIC is applied to the provincial data from the 1998 EBIC. By this estimate coronary heart disease accounts for 28.2% of the direct health care costs for all cardiovascular diseases, and stroke accounts for 19.6% of cardiovascular disease direct costs. These overall percentages are used to estimate the "other" cost category. For hospital, drug, physician, and research costs, the 1993 EBIC estimates the proportion of total cardiovascular medical costs that are attributable to heart disease and stroke; and these percentages are then applied to the 1998 cardiovascular disease cost estimates for Nova Scotia, as indicated in the notes to Table 2 below.

⁴⁵⁹ Methodological explanation from CFLRI, "The Burden of Inactivity" and "The Economic Case for Physical Activity," op. cit.; and Katzmarzyk et al., op. cit., page 1437.

The EBIC diabetes estimates are adjusted to account for the fact that type 2 diabetes constitutes 92.5% of diabetes cases. Again, the Nova Scotia specific cost estimates from the 1998 EBIC include diabetes in the endocrine and related disorders diagnostic category. In the 1993 EBIC, diabetes constituted 43.3% of all direct endocrine and related disorder health care costs, and type 2 diabetes would constitute 40.0% of costs for this diagnostic category.

Colon cancer and breast cancer costs are estimated in this report by using the incidence of these two cancers relative to all cancers in Nova Scotia, using the National Cancer Institute of Canada's *Canadian Cancer Statistics 2001*. Colorectal cancers account for 13.3% of all cancers in Nova Scotia. According to Katzmarzyk et al., colon cancers constitute 67.1% of total colorectal cancers, so that colon cancers would amount to about 8.9% of all cancer incidence in Nova Scotia. This is very close to the 8.6% estimate used by Katzmarzyk et al. for Canada. As Nova Scotia has the second highest rate of colorectal cancers in Canada, this slightly higher estimate makes sense. Breast cancer accounts for 12.7% of all cancers in Nova Scotia.

Hypertension costs are assessed relative to total cardiovascular disease costs according to the proportions used by Katzmarzyk et al., based on U.S. estimates. This assigns 5.7% of hospital costs attributable to cardiovascular diseases, 50.6% of drug costs, and 28.7% of physician costs to hypertension treatment. Because heart disease and stroke together account for less than 3% of all health science research in cardiovascular diseases, we have assigned 80% of cardiovascular research costs to hypertension. The total amount here is small, but this figure may require readjustment as new evidence becomes available. For other direct costs, including other institutions, home care and a range of private medical expenditures, we arbitrarily use the average of the hospital, drug, and physician percentages given here – namely, 28.3% of the other direct health care costs attributable to cardiovascular diseases are assigned to hypertension treatment.

Osteoporosis costs are not separated out in the EBIC from the general musculoskeletal disease diagnostic category. Katzmarzyk et al. therefore use an independent assessment of the burden of illness due to osteoporosis in Canada, pegged at \$1.3 billion annually. For this disease, we assign costs according to the Nova Scotian proportion of the Canadian population, on the assumption that the prevalence of osteoporosis is similar.

- 5) Indirect productivity losses due to premature mortality and disability for each of these diseases are estimated as follows. For coronary heart disease, stroke, and diabetes, the ratio of indirect to direct costs from the 1993 EBIC is applied to the direct cost estimates in Table 3 below. Costs for those more specific diagnostic categories are given in the 1993 EBIC but are not yet available at the provincial level in the forthcoming 1998 EBIC results. For colon cancer and breast cancer, the ratio of indirect to direct costs for all cancers in Nova Scotia is used from the 1998 EBIC.

Similarly, since productivity losses due to hypertension were not separately available, the ratio of indirect to direct costs for all cardiovascular disease in Nova Scotia is used from the 1998 EBIC. Likewise, productivity losses due to osteoporosis are estimated by using the ratio between indirect and direct costs for all musculoskeletal disorders in Nova Scotia from the

1998 EBIC. Katzmarzyk et al. did not attempt estimates of these wider economic losses, but they have been included in this study, just as they were in earlier GPI Atlantic estimates of the costs of obesity and tobacco in Nova Scotia.

- 6) An important category of illness related to physical inactivity has been omitted in the Katzmarzyk et al. cost estimates – namely mental illness. As noted above, Statistics Canada has estimated that sedentary Canadians are 60% more likely to suffer from depression than physically active Canadians. Physical activity also protects against stress, which has been assessed in meta-analyses of medical costs as the most expensive risk factor, accounting for about 8% of health care costs.⁴⁶⁰ For this reason, a rough estimate is added in this study, based on the 1998 EBIC figures for Nova Scotia, of the possible costs of mental illness attributable to physical inactivity in the province. Although it is not possible at this stage to derive an accurate population attributable fraction (PAF) for mental illness in relation to physical inactivity, it is considered more accurate to attempt an estimate for this category than to assign it an arbitrary value of zero.

Other cost estimates omitted by Katzmarzyk et al. relate to association of physical activity with dyslipidemia, poorer quality of life, and premature admission to an institution or geriatric care. No attempt has been made here to provide cost estimates for these conditions or situations. Some costs of physical inactivity related to obesity are also omitted. Since obesity is linked to diseases such as gallbladder disease and pulmonary embolism in addition to those described here, physical inactivity may indirectly contribute to ailments that are not included in the costs estimates in Table 2 below.

- 7) The number of premature deaths attributable to physical inactivity in Nova Scotia is estimated by multiplying the number of deaths attributable to each inactivity-related disease by the population attributable fraction (PAF) for that disease. Deaths from heart disease and stroke in Nova Scotia are taken from Health Canada's *Statistical Report on the Health of Canadians*. Deaths from colon cancer and breast cancer in Nova Scotia are from the National Cancer Institute of Canada's *Canadian Cancer Statistics 2001*, taking 67.1% of the colorectal cancer mortality figures for colon cancer deaths, as described above. Deaths due to diabetes, hypertension, and osteoporosis are derived from Katzmarzyk et al., and assume the same proportion of deaths due to these three conditions in Nova Scotia, as a percentage of total physical inactivity related deaths, as in Canada. A similar method is used to estimate potential years of life lost due to physical inactivity.
- 8) Finally, the savings that could potentially be realized from a 10% reduction in physical inactivity are derived from the estimates of Katzmarzyk et al. who recalculated the population attributable fractions (PAF) of each disease and corresponding costs by assuming a 56% prevalence of inactivity instead of a 62% prevalence. Katzmarzyk and his colleagues then estimated savings according to the difference between the two sets of costs. The 56% prevalence is 62% minus 6.2% (representing a 10% reduction in physical inactivity). As the current Nova Scotia physical inactivity rate (62%) is identical to that used by Katzmarzyk et

⁴⁶⁰ Aldana, Steven, "Financial Impact of Health Promotion Programs: A Comprehensive Review of the Literature," in Goetzel, Ron, (ed.) "The Financial Impact of Health Promotion," *American Journal of Health Promotion* 15 (5), May/June, 2001.

al. for Canada in 1997, the Nova Scotia savings are assumed to be proportional to the results derived by Katzmarzyk et al.

3.2 Direct Costs of Physical Inactivity, Nova Scotia

Table 1 gives the relative risk (RR) estimates for each of seven chronic diseases that have been associated with physical inactivity, based on epidemiological studies reviewed by Katzmarzyk et al., and the population attributable fractions for each disease based on Nova Scotia's physical inactivity prevalence rate of 62%. This table corresponds with Table 2 in Katzmarzyk et al (CMAJ 163 (11), page 1437).

A relative risk of 1.9 for coronary heart disease (or coronary artery disease as it is also called) means that physically inactive people have a 90% greater chance of having that disease than those who are physically active. As noted above, this is a conservative estimate by comparison with the Statistics Canada analysis of National Population Health Survey results reported above. The bracketed numbers following the relative risk ratios represent the possible range of results based on a 95% confidence interval (CI).

A population attributable fraction (PAF) of 35.8% for heart disease means that more than one-third of heart disease in Nova Scotia could be avoided if all Nova Scotians were physically active. This is higher than the 22% estimate for the U.S. reported above. Table 1 also indicates that about 20% of stroke, hypertension, colon cancer, and type 2 diabetes, as well as 27% of osteoporosis and 11% of breast cancer, could be eliminated if Nova Scotians who are presently sedentary became physically active.

The most likely explanation for the differences in population attributable fractions (PAF) between these results and those reported earlier for the U.S., is that different methods are used to estimate prevalence of inactivity. Some of these differences are noted in the discussion of definitions in 2.1 above. The relative risk ratios do not differ markedly, and U.S. studies are included in the epidemiological meta-analyses conducted both by Colditz at the Harvard Medical School and by Katzmarzyk and his colleagues. But the method of assessing inactivity prevalence will produce markedly different population attributable fractions (PAF) for each disease.

It has not been possible in this study to conduct sensitivity analyses based on alternative methods of assessing physical inactivity prevalence, but Katzmarzyk and his colleagues did perform sensitivity analyses that varied each population attributable fraction (PAF) and disease-specific health care cost by 20% above and below the mean estimate. That range is also presented in this study, but GPI Atlantic suggests that the lower range may be more accurate, since it does appear that the Canadian Fitness and Lifestyle Research Institute standard, on which the 62% inactivity rate used in this study is based, is a fairly high standard.

The disparity between the Nova Scotia results in the 1996-97 National Population Health Survey, and in the 1998 Canadian Fitness and Lifestyle Research Institute Physical Activity Monitor – the two closest years available for comparison purposes – demonstrates the variance in standards. The 1998 CFLRI results for Nova Scotia show a 69% inactivity rate, whereas the National

Population Health Survey (NPHS) results for 1996-97, the nearest comparable years, show a 61% inactivity rate. Given that rates of physical inactivity have been declining in the province, according to the CFLRI surveys, from 69% in 1998 to 65% in 1999 to 62% in 2000, it is unlikely that the inactivity rate according to these standards would be less in 1996-97 than in 1998. If anything, the trend line indicates that we would expect the inactivity rate to be higher in 1996-97 than in 1998.

In other words, the CFLRI standard indicates a potential 13% higher rate of physical inactivity than would be derived using the National Population Health Survey standard of <1.5kcal/kg/day. Using the NPHS standard would therefore produce lower population attributable fractions (PAF) for each disease, more in line with the U.S. figures, and would also produce correspondingly lower medical cost estimates.

Table 1: Relative risk and population attributable fraction due to physical inactivity for major chronic diseases, Nova Scotia, 2000.

Disease	RR (and 95% CI)	PAF (%)
Coronary heart disease	1.9 (1.6 – 2.2)	35.8
Stroke	1.4 (1.2 – 1.5)	19.9
Hypertension	1.4 (1.2 – 1.6)	19.9
Colon cancer	1.4 (1.3 – 1.5)	19.9
Breast cancer	1.2 (1.0 – 1.5)	11.0
Type 2 diabetes	1.4 (1.2 – 1.6)	19.9
Osteoporosis	1.6 (1.2 – 2.2)	27.1

Note: Based on a prevalence of physical inactivity of 62% in Nova Scotia in 2000 according to the Canadian Fitness and Lifestyle Research Institute
 Source: Katzmarzyk et al., *Canadian Medical Association Journal* 163 (11), Nov. 28, 2000, page 1437.

Even though these relative risk (RR) and population attributable fraction (PAF) estimates reported by Katzmarzyk and his colleagues in the *Canadian Medical Association Journal* differ from some of the U.S. results reported earlier, theirs is the first Canadian effort to derive medical care costs attributable to physical inactivity. For this reason we have used the relative risk and population attributable fraction (PAF) estimates reported by Katzmarzyk et al. in Table 1 above, and applied these to the Nova Scotia cost estimates in Table 2 below.

Table 2 presents estimated direct health care costs attributable to physical inactivity in Nova Scotia. About \$94.7 million are spent annually in direct health care costs due to physical inactivity. Theoretically, this is the annual amount that could be saved if all Nova Scotians were physically active. Physical inactivity accounts for 25% of the total costs of treating heart disease, stroke, hypertension, colon cancer, breast cancer, diabetes 2, and osteoporosis in Nova Scotia.

The \$94.7 million cost estimate includes private spending on medical care, which includes spending on institutions other than hospitals, and on home care. Looking only at hospital, physician and drug costs, total spending attributable to the seven chronic illnesses in Table 2 is

\$235 million.⁴⁶¹ Applying the population attributable fractions from Table 1 for these seven illnesses, physical inactivity would account for \$58.4 million in hospital, physician and drug costs. This amounts to 3.6% of total spending on hospitals, physicians, and drugs in Nova Scotia in 1998. If this percentage is applied to a total provincial health care budget of \$1.9 billion, it indicates that physical inactivity costs the taxpayer-funded Nova Scotia health care system about \$68.7 million annually.⁴⁶²

Table 2: Health Care Costs for Chronic Diseases Linked to Physical Inactivity in Nova Scotia 1998 (2001\$ thousands), and estimated direct economic cost of physical inactivity

	Hosp.	Doctor	Drugs	Research	Other ⁴⁶³	Total ⁴⁶⁴ Direct	Direct cost due to inactivity
Heart Disease ⁴⁶⁵	52,183	8,053	9,721	17	38,849	108,823	38,958
Stroke ⁴⁶⁶	41,795	2,286	4,535	6	27,001	75,624	15,049
Hypertension	9,208	7,628	32,187	647	38,986	88,657	17,643
Colon cancer	6,352	1,047	671	8	4,415	12,493	2,486
Breast cancer	9,067	1,495	958	11	6,300	17,827	1,961
Type 2 diabetes	7,407	2,869	11,744	137	12,026	34,183	6,802
Osteoporosis	NA	NA	NA	NA	NA	43,690	11,840
Total						381,298	94,739

Sources: Katzmarzyk et al., *Canadian Medical Association Journal*; Health Canada, *The Economic Burden of Illness in Canada 1998* (forthcoming May, 2002); Health Canada, *Statistical Report on the Health of Canadians*; National Cancer Institute of Canada, *Canadian Cancer Statistics 2001*; Health Canada, *The Economic Burden of Illness 1993* (for derivations of ratios of heart disease and stroke costs to total circulatory disease costs; and of diabetes costs to total endocrine disorder costs.)

⁴⁶¹ Though not separately available, osteoporosis costs for hospitals, drugs, and physicians are attributed here in the same proportion as for all direct health care costs.

⁴⁶² Note that this \$68.7 million estimate applies only to taxpayer funded health-care costs, whereas the \$94.7 million total in Table 2 below includes private health care expenditures.

⁴⁶³ Hospital, physician, drug, and research costs are currently available for Nova Scotia by diagnostic category. However, at the present time, other direct health care costs in Nova Scotia, 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 health expenditures combined. More precise information on these other costs may become available later this year, when the electronic version of *The Economic Burden of Illness in Canada 1998 (EBIC 1998)* is released. If provincial information on other costs is not provided at that stage, other costs by diagnostic category at the provincial level can be extrapolated from national data on the ratio of other costs to total health care costs by diagnostic category. In the meantime, the absence of direct information for this column should not substantially affect the total results, since the figures given here do reflect the actual proportional breakdown for all diagnostic categories for the province.

⁴⁶⁴ "Total" refers to hospital, physician, drug, and health science research costs plus other medical expenses, including privately funded services, home care, and costs of other institutions.

⁴⁶⁵ According to the 1993 EBIC, coronary heart disease accounts for 32.3% of hospital costs attributable to cardiovascular diseases; and 30.3% of physician costs; 15.3% of drug costs; and 2.2% of research costs attributable to cardiovascular diseases (Health Canada, *Economic Burden of Illness in Canada 1993*, Ottawa, 1997, table 2, page 10). These percentages are applied to the 1998 EBIC figures for Nova Scotia (forthcoming, May, 2002).

⁴⁶⁶ According to the 1993 EBIC, stroke accounts for 25.9% of hospital costs attributable to cardiovascular diseases; and 8.6% of physician costs; 7.1% of drug costs; and 0.8% of research costs attributable to cardiovascular diseases. These percentages are applied to the 1998 EBIC figures for Nova Scotia.

Paradoxically, these direct expenditures on hospitals, doctors, drugs and other medical services are conventionally counted in the Gross Domestic Product (GDP) and related economic growth statistics, and are therefore mistakenly taken as contributions to prosperity and well-being. In the Genuine Progress Index, by contrast, the \$94.5 million in health care costs attributable to physical inactivity is counted as a cost, not a gain to the economy. If all Nova Scotians were physically active, the \$94.5 million would presumably be available to be spent on more productive activities, including sport and recreation, that contribute to well-being.

Katzmarzyk et al. conducted sensitivity analyses that varied each population attributable fraction (PAF) and disease-specific health care cost by 20% above and below the mean estimate. This exercise has not been repeated here. But if the results of Katzmarzyk et al. are applied to the estimates in Table 2, then the direct health care costs attributable to physical inactivity could be as low as \$63 million or as high as \$130.3 million. As noted above, the Canadian Fitness and Lifestyle Research Institute standard is higher than that used in the National Population Health Survey to define physical inactivity. Applying the NPHS standard would lead to a cost estimate of about \$82.7 million attributable to physical inactivity, rather than the \$94.7 million estimate given here.

3.2.1 Accounting for Mental Health Costs due to Physical Inactivity

Katzmarzyk and his colleagues omit estimates of mental illness costs attributable to physical inactivity. As noted above, Statistics Canada estimates, based on the 1996-97 National Population Health Survey results, indicate that sedentary Canadians are 60% more likely to suffer from depression than physically active Canadians. Physical activity also protects against stress and anxiety.

Mental illness costs Nova Scotia \$249.2 million in direct health care expenditures.⁴⁶⁷ If just 5% of these costs could be avoided through physical activity that reduces the incidence of depression, anxiety, and stress, then \$12.5 million a year in mental health care costs might be ascribed to physical inactivity. Including mental illness costs therefore raises the estimate of total direct health expenditures due to physical inactivity in Nova Scotia from \$94.7 million to \$107 million annually.

Similarly, if 5% of the \$160 million currently expended on treating mental health through hospitals, drugs, and physician services can be attributed to physical inactivity, then physical inactivity would account for a total of \$66.5 million in hospital, drug, and physician costs. This amounts to 4% of total provincial spending on hospitals, drugs, and doctors that can be attributed to physical inactivity.

It must be emphasized that population attributable fractions for mental ailments like depression, anxiety, and stress were not available for this study, and the 5% attribution here is an arbitrary, if conservative, estimate. However, since mental health has been reliably linked to physical activity, it is more accurate to include some estimate of mental illness costs due to physical

⁴⁶⁷ Colman, Ronald, *The Cost of Chronic Illness in Nova Scotia*, GPI Atlantic, Halifax, 2002, based on 1998 EBIC estimates for Nova Scotia.

inactivity than to assign such costs an arbitrary value of zero, which is implied by omitting the diagnostic category entirely.

3.3 Indirect Costs of Physical Inactivity, Nova Scotia

Table 3 adds estimates for indirect productivity losses due to premature mortality and disability for each of the diseases that are related to physical inactivity. Productivity losses due to premature mortality are estimated according to the ratio of indirect to direct costs from the 1993 EBIC for heart disease, stroke, and diabetes. For heart disease, productivity losses due to disability are also according to the ratios provided in the 1993 EBIC.

For stroke, the 1993 EBIC provides estimates of productivity losses due to premature death, but not due to disability. The latter are therefore extrapolated from the 1998 EBIC for Nova Scotia, according to the following reasoning. Productivity losses due to premature death as a result of coronary heart disease account for 62% of all premature death costs due to all cardiovascular diseases. By contrast, heart disease accounts for just 28% of direct costs for all cardiovascular diseases, and just 15% of all indirect costs due to disability resulting from all cardiovascular diseases. In other words, a disproportionately high share of total heart disease costs result from premature death. Stroke would therefore occupy a correspondingly smaller proportion of productivity losses due to premature death resulting from all cardiovascular diseases and a correspondingly larger proportion of productivity losses due to disability. The estimates in Table 3 reflect these assumptions and are extrapolated from the totals provided for all cardiovascular diseases in the EBIC.

Disability costs due to diabetes are estimated using the ratio of productivity losses due to disability to productivity losses due to premature death for all endocrine diseases (from the 1998 EBIC for Nova Scotia). For the other illnesses, indirect costs due to productivity losses are estimated according to the ratio of indirect to direct costs from the 1998 EBIC results for Nova Scotia for cardiovascular diseases (for hypertension), for all cancers (for colon cancer and breast cancer) and for musculoskeletal disorders (for osteoporosis). For the latter three diseases, the ratio of productivity losses due to premature death and due to disability are extrapolated from the totals for all cancers and for all musculoskeletal disorders. For hypertension, a total indirect cost estimate is given without any attempt to make this distinction, the assumption being that indirect costs due to hypertension are likely due to disability losses.

Table 3 indicates clearly that the greatest costs of chronic illness are due to the premature death and disability they produce, resulting in substantial productivity losses to the economy. Physical inactivity is responsible for \$241 million annually in productivity losses. In other words, the Nova Scotia economy would be worth \$241 million more each year than it currently is if it had the productive services of the hundreds of Nova Scotians disabled or killed prematurely by a sedentary lifestyle. When direct medical costs and economic productivity losses are added, Table 3 shows that the total economic burden of physical activity to Nova Scotia exceeds \$322 million annually.

Table 3: Productivity Losses due to Physical Inactivity (2001\$ thousands), and Total Economic Costs of Physical Inactivity in Nova Scotia, 1998

	Direct Costs (Table 2)	Premature death	Disability	Total Indirect Costs	Total economic cost of physical inactivity
Heart Disease	38,958	86,262	13,060	99,321	138,280
Stroke	15,049	12,762	50,999	63,761	78,811
Hypertension	17,643	29,669		29,669	47,312
Colon cancer	2,486	7,568	257	7,824	10,310
Breast cancer	1,961	5,968	202	6,170	8,130
Type 2 diabetes	6,802	6,592	4,054	10,646	17,448
Osteoporosis	11,840	276	23,917	24,193	36,033
Total	94,739			241,586	336,324

Sources: Table 2 above, and Health Canada, *The Economic Burden of Illness in Canada*, 1993 and 1998.

Productivity losses due to mental illness that is attributable to physical inactivity would add an estimated \$4.4 million to the indirect costs in Table 3, again on the assumption that 5% of mental illness could be avoided through physical activity.⁴⁶⁸ Added to the estimated \$12.5 million in direct health care expenditures on mental illness that can be attributed to physical inactivity, the total economic cost of physical inactivity in Nova Scotia can be estimated at \$353 million annually.

3.4 Premature Deaths due to Physical Inactivity in Nova Scotia

The indirect costs and productivity losses due to premature death in section 3.3 above are a function of two variables:

- 1) the number of premature deaths attributable to each diagnostic category that could have been avoided if all Nova Scotians were physically active; and
- 2) age at death, which determines the potential years of life lost due to physical inactivity.

Table 4 identifies the first of these two variables explicitly by applying the population attributable fractions for physical inactivity to five key illnesses. Osteoporosis and hypertension are not included in this estimate because they are rarely direct causes of death, but are rather implicated in other causes of death. For example, an osteoporotic fracture can result from a fall, but the consequent death may be reported as due to injury rather than to osteoporosis, which is the underlying cause.

Heart disease and stroke deaths in Table 4 are from Health Canada's 1999 *Statistical Report on the Health of Canadians*; colon and breast cancer deaths are based on the National Cancer Institute of Canada's *Canadian Cancer Statistics 2001*; and diabetes deaths are extrapolated to

⁴⁶⁸ Based on 1998 EBIC estimates for Nova Scotia.

Nova Scotia from U.S. data reported by the U.S. Centers for Disease Control. Table 4 is based on Table 4 in Katzmarzyk et al., *Canadian Medical Association Journal* 163 (11), page 1438.

Table 4 shows that if all Nova Scotians were physically active, life expectancy could be increased in the province, and 711 premature deaths could be avoided each year. This is 9.2% of all deaths among Nova Scotians.

Table 4: Number of Deaths Attributable to Physical Inactivity, Nova Scotia

Disease	# of deaths	% of total NS deaths	Deaths attributable to physical inactivity	% of deaths attributable to physical inactivity (=PAF)
Heart disease	1,504	19.4%	534	35.5%
Stroke	504	6.5%	100	19.9%
Colon cancer	134	1.7%	27	19.9%
Breast cancer	200	2.6%	22	11.0%
Diabetes 2 ⁴⁶⁹	139	1.8%	28	19.9%
All causes	7,751	100%	711	9.2%

Sources: Katzmarzyk et al., *Canadian Medical Association Journal* 163 (11), page 1438; Health Canada, *Statistical Report on the Health of Canadians*, page 291; National Cancer Institute of Canada, *Canadian Cancer Statistics 2001*, page 27; U.S. Centers for Disease Control and Prevention “Chronic Diseases and Their Risk Factors: The Nation’s Leading Causes of Death,” Atlanta, 1999, page 34.

Katzmarzyk and his colleagues attribute 10.3% of all premature deaths in Canada to physical inactivity, and state that we could theoretically save 21,340 Canadian lives that are lost prematurely each year if all Canadians were physically active. Proportionately, this is a slightly higher estimate than the one in Table 4 above. The difference is due to the fact that different data sources were used for death statistics, and that Katzmarzyk and his colleagues based their estimate on total *adult* deaths, while Table 4 above is based on total Nova Scotian deaths, regardless of age.

Table 5 estimates the potential years of life lost annually due to physical inactivity. These estimates take into account both the number of deaths and the average age of death attributable to various illnesses. Health Canada’s *Statistical Report on the Health of Canadians* considers deaths before age 70 as “early” deaths, and it counts the difference between these early deaths and age 70 as potential years of life that have been lost.⁴⁷⁰

Potential years of life lost due to heart disease, stroke, and cancer are taken from Health Canada’s *Statistical Report on the Health of Canadians*. Potential years of life lost due to colon cancer and breast cancer are assumed here to be the same as for all cancers.

⁴⁶⁹ Based on U.S. data, there are estimated to be 150 deaths in Nova Scotia each year that are directly attributable to diabetes, but diabetes is a contributing cause to about 300 more deaths annually. Because it is a complicating factor in other serious illnesses, diabetes is frequently under-reported as the cause of death on death certificates. The estimate in Table 4 counts only those deaths directly attributable to diabetes 2, accounting for the fact that type 2 diabetes accounts for 92.5% of all diabetes cases.

⁴⁷⁰ Health Canada, *Statistical Report on the Health of Canadians*, page 319.

Comparable estimates for diabetes were not available at time of publication. Health Canada reports that “approximately 25,000 potential years of life lost (PYLL) were lost as a result of diabetes prior to age 75 in 1996,”⁴⁷¹ signifying an average of 4.6 years lost per death. However, it has not been possible to convert this figure to the 70-year age baseline at this time, and an extrapolated estimate is therefore provided here. Since heart disease is the most frequent cause of death among people with diabetes, the average years of life lost prior to age 70 per heart disease death (3.5 years) is also used here for diabetes.⁴⁷²

Table 5 shows that Nova Scotians each year lose about 2,200 potential years of life due to physical inactivity. This constitutes 6.5% of all potential years of life lost each year in the province due to all causes. If all Nova Scotians were physically active, society and the economy would benefit from an additional 2,200 productive person-years each year. It should be noted that this is a conservative estimate, as the average life expectancy for Nova Scotians is 78 years. If years of life lost were assessed against this average, the loss would be very much larger.

Table 5: Potential Years of Life Lost (PYLL) due to Physical Inactivity, Nova Scotia

Disease	PYLL	% of total NS PYLL	PYLL attributable to physical inactivity	% of PYLL attributable to physical inactivity (=PAF)
Heart disease	5,257	15.4%	1,866	35.5%
Stroke	573	1.7%	114	19.9%
Colon cancer	332	1.0%	66	19.9%
Breast cancer	734	2.1%	81	11.0%
Diabetes 2	487	1.4%	97	19.9%
All causes	34,235	100%	2,224	6.5%

Sources: Health Canada, *Statistical Report on the Health of Canadians*, page 321; National Cancer Institute of Canada, *Canadian Cancer Statistics 2001*, page 28.

3.5 Potential Savings from Higher Rates of Physical Activity

Katzmarzyk and his colleagues, in the *Canadian Medical Association Journal*, recalculated the direct health care costs attributable to physical inactivity with a reduction of 10% in the prevalence of inactivity. That is, they assumed the rate of physical inactivity to be 56% of the adult population instead of the current rate of 62%. This is in line with the 1996 public health objective proclaimed by Canadian federal, provincial, and territorial governments to achieve a 10% reduction in physical inactivity by 2003.⁴⁷³

⁴⁷¹ Health Canada, “Diabetes in Canada,” available at http://www.hc-sc.gc.ca/hpb/lcdc/publicat/diabet99/d02_e.html.

⁴⁷² Health Canada, *Statistical Report on the Health of Canadians*, pages 291 and 321.

⁴⁷³ Health Canada, Federal, Provincial and Territorial Fitness and Recreation Committee, *Physical Inactivity: A Framework for Action*, Ottawa, 1996.

Katzmarzyk et al. found that a 10% reduction in physical inactivity would reduce health care costs attributable to physical inactivity by 7%, resulting in health care savings of \$161 million nationwide. Applying the same percentage saving to the Nova Scotia cost estimates above (including mental health) yields estimates of savings as follows⁴⁷⁴:

- Hospital, physician, and drug costs \$4.6 million less per year
- Total direct health care costs \$7.5 million less per year
- Economic productivity gains (avoided early death and disability) \$17.2 million
- Total annual economic savings \$24.7 million

A 10% reduction in physical inactivity could also save 50 lives a year in Nova Scotia, and avoid 156 potential years of life lost annually.

Needless to say, even a 56% rate of physical inactivity is very high. Smoking is still regarded as a major avoidable health problem even with a prevalence rate half as high as that of physical inactivity. Therefore, the potential for far more substantial long-term savings through promotion of sports, exercise, and recreation is very large indeed.

Katzmarzyk and his colleagues conclude their *Canadian Medical Association Journal* analysis with a strong recommendation:

*“Given the considerable efforts that have been aimed at curbing the prevalence of smoking in Canada, public health campaigns directed at increasing physical activity in the population should be no less aggressive and persistent.”*⁴⁷⁵

⁴⁷⁴ These savings are not realized immediately following a reduction in inactivity, because the benefits of regular exercise accrue gradually.

⁴⁷⁵ Katzmarzyk et al., op. cit., page 1439.