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MEASURING SUSTAINABLE DEVELOPMENT

A GENUINE PROGRESS INDEX FOR ATLANTIC CANADA

THE COST OF SMOKING IN NEWFOUNDLAND & LABRADOR AND THE ECONOMICS OF TOBACCO CONTROL

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EXECUTIVE SUMMARY

Stepped-up efforts in the past few years to prevent and reduce the incidence of smoking in Newfoundland & Labrador (NL) are beginning to yield results. Rising tobacco taxes, more extensive awareness and education programs, the spread of smoking bans and restrictions, and other interventions are helping Newfoundlanders either avoid smoking in the first place, "kick the habit," or reduce their cigarette consumption. The number of ex-smokers is growing, and the incidence of teenage smoking is decreasing. On the critical public health issue of smoking, NL is heading in a direction that will save lives and health care dollars, and reduce the human and financial burden of preventable illness.

However, many challenges still remain:

- Newfoundland & Labrador's smoking rate for people aged 15 and over is still more than 18% higher than the Canadian average and about 54% higher than British Columbia, which has the lowest smoking rate in the country.
- Newfoundlanders smoked nearly 687 million cigarettes in 2001, approximately 6,075 for each of an estimated 113,080 smokers.
- Most people who have ever smoked start smoking in their teenage years; youth as young as 12 and 13 can show evidence of nicotine addiction within days of their first cigarette. There are an estimated 8,750 underage smokers in NL.
- Nearly one in three NL males and nearly three in ten females reported exposure to second-hand smoke, rates that are above the Canadian average.
- Newfoundland & Labrador has a cancer mortality rate 10% above the national rate, with the mortality rate for men 15% above the rate for all Canadian men.
- An estimated 1,000 Newfoundlanders lose their lives every year due to smoking.
- Approximately 9,000 children and teenagers in the province who smoke today or who will take up smoking will die in middle age from it, while a similar number will die prematurely later in life.
- Smoking costs Newfoundlanders an estimated $79 million (2001$) annually in medical care costs, an estimated $139.2 million (2001$) in productivity losses due to the premature deaths of smokers, and millions more in costs borne directly by NL employers.

Ironically, standard economic growth statistics count the medical care costs of smoking as contributions to the Gross Domestic Product (GDP), rather than as costs to the economy. Indeed, the more money spent on hospitals, doctors, and drugs, the more the economy will grow. Seen in this light, it is clear that measures of progress based on economic "growth" make no distinction between activities that create benefit and those that cause harm.

By contrast to the GDP, the **Genuine Progress Index** (GPI) – a new tool for conceptualizing societal progress – counts the expenditures related to smoking-related illness as costs rather than gains to the economy. Whereas measures of progress based on the GDP count all expenditures related to smoking, including funerals, as if "more" of them are "better", the GPI recognizes that less of such expenditures are "better". From the GPI perspective, money not spent on tobacco and smoking-related illness can be invested in productive activities that improve population health and overall quality of life.

Fortunately, much can be done to reduce the toll of smoking. Prevention and cessation strategies include tobacco tax increases, youth-based intervention strategies, anti-tobacco advertising, and place-based smoking bans. A comprehensive tobacco control and health promotion strategy can markedly reduce the number of smokers, the volume of cigarettes consumed, and the associated medical care costs and economic productivity losses.

This report suggests that a comprehensive tobacco control program for NL would benefit both individuals and the province as a whole.

- The average individual smoker would begin to realize a reversal of smoking effects within days or weeks of cessation, gain back 4.2 years of life that would otherwise been lost had he or she continued smoking, and save more than $100,000 (2001$) in avoided spending on cigarettes by retirement age. If Newfoundlanders smoked at the same rate as British Columbians (16.7% of the population 15 and older instead of 25.7% as at present), they would have nearly $49 million (2001$) extra in their pockets each year for more productive expenditures and investments.
- If just 10% of NL's smokers managed to quit, they would over their lifetimes save the provincial economy over $594 million (2001$) in avoided medical care costs and productivity losses. If Newfoundlanders smoked at the rate of those in British Columbia (the lowest rate in Canada), approximately $67 million (2001$) would be saved *annually* in avoided medical care costs and economic productivity losses due to the premature deaths of smokers.

The medical benefits of smoking cessation are proven, clear, and unambiguous. The strategies for achieving cessation are available. What is also known is that of *all* possible interventions to reduce illness and death in society from *any* cause, smoking cessation is among the most cost-effective. This report, part of an emerging Genuine Progress Index in Atlantic Canada, describes the savings that taxpayers, employers, individual smokers, and the economy as whole may expect from a comprehensive tobacco control strategy.

ACKNOWLEDGEMENTS

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Any errors or misinterpretations, and all viewpoints expressed, are the sole responsibility of the authors and **GPI***Atlantic.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CCHS	Canadian Community Health Survey
CCSA	Canadian Centre on Substance Abuse
COPD	chronic obstructive pulmonary disease
CTUMS	Canadian Tobacco Use Monitoring Survey
ETS	environmental tobacco smoke
GDP	Gross Domestic Product
GPI	Genuine Progress Index
SIDS	Sudden Infant Death Syndrome
USEPA	United States Environmental Protection Agency

THE COST OF SMOKING IN NEWFOUNDLAND & LABRADOR AND THE ECONOMICS OF TOBACCO CONTROL

1. Introduction

Efforts to prevent and reduce the incidence of smoking in Newfoundland & Labrador (NL), and in Canada as a whole, are beginning to pay off. Various smoking prevention and cessation initiatives in the province include:

- Smokers' help line - Newfoundland & Labrador Lung Association
- *You Can Stop By Starting With Us* - Lung Association
- Smokers web forum - Lung Association
- *Smoking Cessation Training Guide* - (train the trainer in smoking cessation)
- *Clinical Tobacco Intervention Program* (physician-based)
- *Kick the Nic* (Provincial Teen Stop Smoking Program delivered through schools/community groups)
- *Baby's Coming, Baby's Home* and *Born a Non-Smoker* – for pregnant mothers
- *Stop Smoking* - A program for women
- Heart health lifestyle clinics
- Healthy baby clubs
- Workplace cessation programs
- Workplace/school presentations (with a cessation focus)

These awareness and education programs, coupled with rising tobacco taxes and other interventions are helping Newfoundlanders[1] and their fellow Canadians either avoid smoking in the first place, "kick the habit," or reduce their cigarette consumption. The number of ex-smokers is growing, and the incidence of teenage smoking is decreasing. On the critical public health issue of smoking, NL and Canada are heading in the right direction.

This report details the potential benefits and savings that can be expected from such encouraging trends while calling attention to opportunities for further advancement towards a smoke-free NL. The report also estimates the full current cost of tobacco use in NL. That cost – which includes the unnecessary and premature loss of human life, the burden of illness both in human and

[1] Throughout this report, the word 'Newfoundlanders' is used to represent residents of both Newfoundland and Labrador, unless otherwise indicated.

economic terms, and indirect costs to the economy – is staggering. Indeed, tobacco is recognized as the most significant preventable cause of death and illness in Canada.

Paradoxically, because sales of tobacco products contribute to the Gross Domestic Product (GDP) of Canada and NL, tobacco consumption is implicitly counted as a contribution to prosperity and wellbeing when the GDP is mistakenly used to assess how "well off" we are as a society. The GDP, as originally intended by its architects, measures raw economic output (i.e., value of goods and services sold). However, it has become the indicator most widely and popularly used to communicate the "strength" of the economy. When people spend more money and when the GDP consequently rises and the economy grows, it is said "consumer confidence" is "strong" and the economy is "healthy," "robust," and "dynamic." "More" is always "better"" when progress is gauged by the GDP, regardless of *what* is growing.

By the standard of the GDP, tobacco sales make a significant contribution to economic health and societal well-being. Nationally, 45.5 billion cigarettes were smoked in 2001. This included nearly 687 million cigarettes in NL, at an estimated cost in the province of $140.5 million, or 1% of NL's GDP of $13,761 million in 2001. Tobacco continues to contribute to the GDP in spending on nicotine replacement therapy and other quitting strategies, and then adds millions more to the NL economy in spending on hospitals, doctors and drugs to treat tobacco-related illnesses.

Unfortunately, measures of wellbeing and progress based on the GDP and economic "growth" statistics make no distinction between economic activities that create benefit and those that cause harm. Tobacco use – like crime, pollution, sickness, greenhouse gas emissions, natural disasters and other liabilities – contributes to the GDP, simply because money is spent.

By contrast to the GDP that counts all expenditures such as cigarette sales as contributions to prosperity, in the Genuine Progress Index (GPI) "less" is frequently "better." Simply put, the GPI – a new tool for conceptualizing societal progress – goes up when the costs of crime, pollution, smoking, obesity, sickness and other liabilities go down. The GPI explicitly counts tobacco, cancer and other liabilities as costs rather than gains to the economy. Population health is a core component of the GPI. Therefore, from the GPI perspective, money not spent on tobacco and smoking-related illness can be invested in productive activities that improve population health and overall quality of life.

This report sets out to measure the cost of smoking explicitly. Doing so can help change attitudes and behaviours to build support for preventive measures (policies, programs and support services) that not only improve the wellbeing of Newfoundlanders, but save large sums of money in the long-term and thus contribute to genuine progress.

The report begins with an overview of smoking trends in Canada and NL (Section 2). Section 3 presents analysis of smoking and health related data, drawn from the Newfoundland Statistics Agency's Community Accounts on-line database, for the island of Newfoundland proper.

Further information on the health-related costs of smoking, as well as detailed information on the economic costs of smoking, are given in Section 4. The benefits of smoking cessation are subsequently reviewed (Section 5), followed by an economic analysis of the principal means to prevent and reduce the incidence of smoking (Section 6). Conclusions from these analyses are contained in Section 7.

2. Smoking in Canada and Newfoundland & Labrador

2.1 Smoking Trends in Canada and Newfoundland & Labrador

In the 1970s and early 1980s, Canadians were the heaviest smokers on the planet, consuming an average of 3,910 cigarettes per capita in 1970-72 and 3,800 cigarettes per capita in 1980-82. Consumption rates like this have not been seen since in any country.[2]

By 1990-92, due largely to sharp tax and price increases in the 1980s, per capita consumption in Canada had fallen to 2,540 cigarettes, and Canada had dropped from 1st to 13th in rank among all nations (World Health Organization, 1997). In 1994, major tax cuts in five provinces (ON, QC, NB, NS, PE) dramatically slowed an ongoing decline in cigarette consumption. Had the 1988-1993 nationwide trend continued at the same rate, 1998 consumption would have been 22% lower – 1,590 cigarettes per capita, instead of the actual 2,042 per capita. Due to the tax cut, Canadian cigarette consumption jumped from 35.5 billion cigarettes in 1993 (30.3 billion manufactured and 5.2 billion fine cut) to 51.6 billion in 1994 billion (45.9 billion manufactured and 5.7 billion fine cut) (Canadian Cancer Society, 1999).

Data from the Canadian Tobacco Use Monitoring Survey (CTUMS) indicates that, in 2001, the Atlantic Provinces were ranked very closely together in smoker prevalence rates for the population 15 years and older. In fact, while Newfoundland & Labrador at 25.7% ranked second only to Manitoba at 25.9%, Prince Edward Island (25.6%), New Brunswick (25%), and Nova Scotia (24.9%) also had considerably higher smoking rates than the national rate of 21.7% (CTUMS, 2001). In terms of daily cigarette consumption, smokers in NL smoked at a rate (16.7 cigarettes/day) slightly higher than the Canadian average of 16.2 cigarettes/day (CTUMS, 2001).[3]

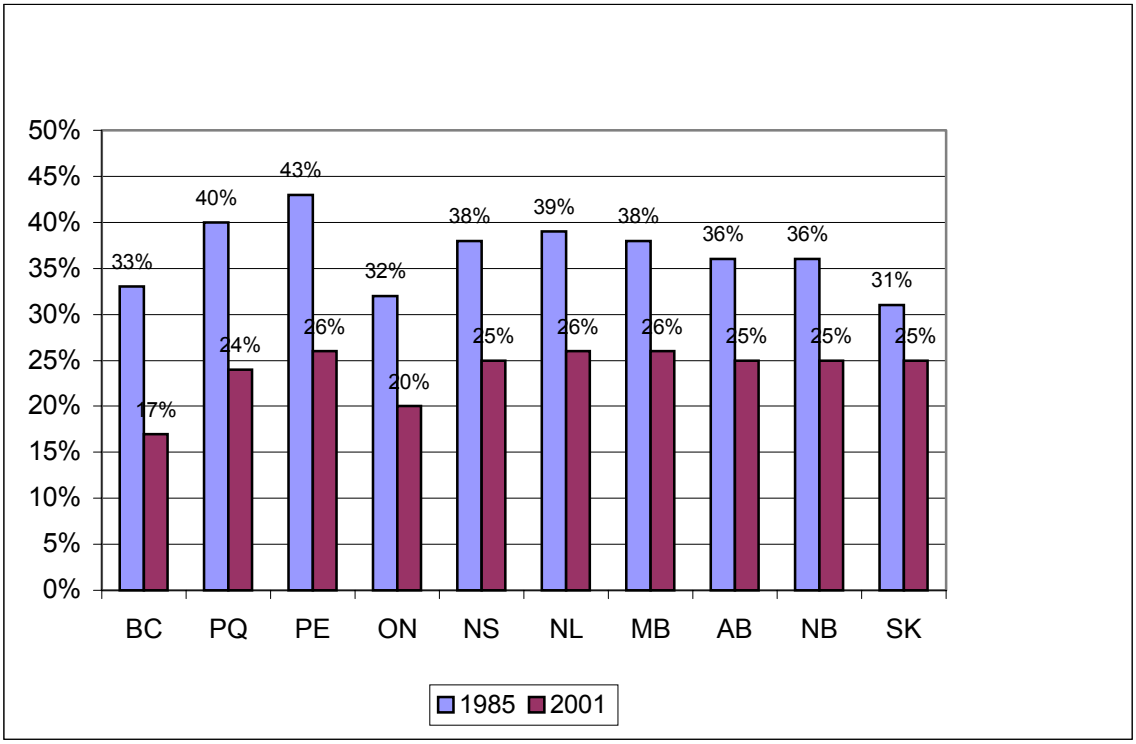
[2] The incidence of smoking worldwide is generally shifting from developed to developing countries, commensurate with greater awareness in developed nations of the health impacts of smoking. Tobacco use is rising in developing nations and the number of smokers worldwide is expected to rise from 1.1 billion in the late 1990s to 1.6 billion by 2025. The World Bank predicts that within 20 years, 70% of people killed by smoking will be in low and middle-income nations. Source: The World Bank (1999). *Curbing the Epidemic: Governments and the Economics of Tobacco Control,* The World Bank, Washington, D.C.

[3] Throughout this report, the full year 2001 numbers from the Canadian Tobacco Use Monitoring Survey are used as much as possible, as they are the most recent full year results available at time of publication of this report.

Figure 1 is a provincial comparison indicating the percentage of the population in each province that smoked in 1985 and 2001 (daily plus occasional, or non-daily, smokers). The graph is ordered from the province with the greatest rate of decline between 1985 and 2001 (British Columbia on the left) to the province with the smallest rate of decline (Saskatchewan on the right). Newfoundland & Labrador, with a smoking rate of 39% of the population above 15 years of age in 1985, dropped to a smoking rate of 26% in 2001 (CTUMS 2001).

Please note that all percentages are rounded off to the nearest whole number in the chart.

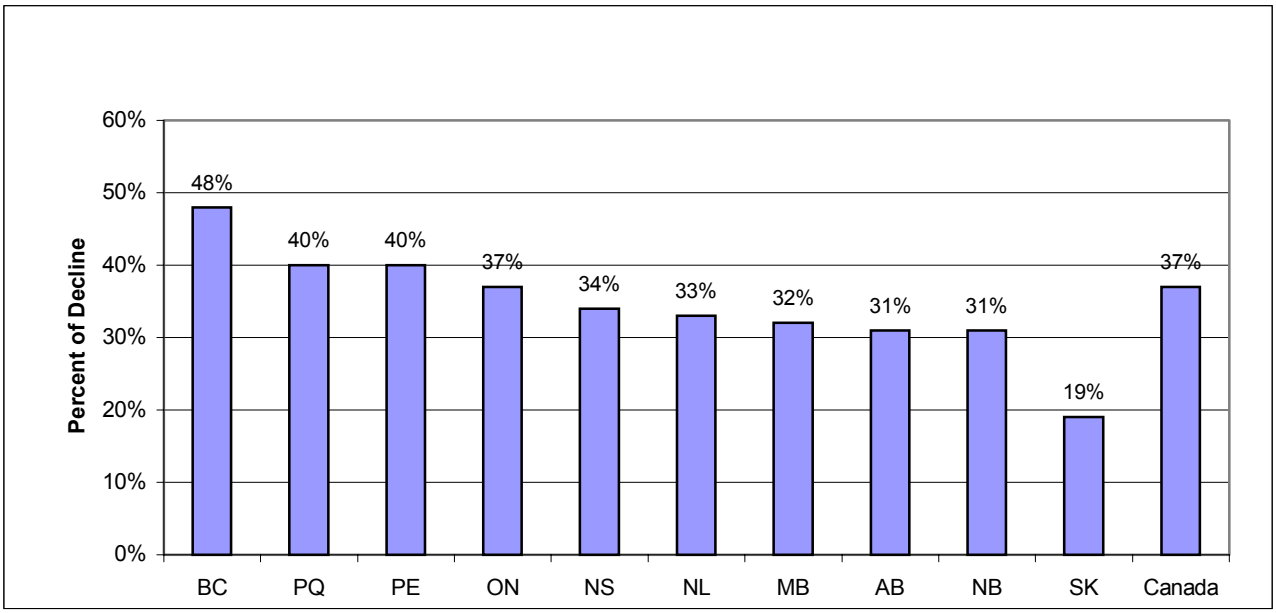
Figure 1: Percent of Population Who Smoke, Age 15 and Over, (1985 and 2001), (%)



Sources: Statistics Canada, General Social Survey 1985; CTUMS 2001

From 1985 to 2001, smoking prevalence in NL declined by 33%, compared to a 48% decline in British Columbia and a national average decline of 37% (CTUMS 2001)**. Figure 2** provides a provincial comparison of the rate of decline in cigarette smoking from 1985 to 2001, with the highest rates of decline on the left and the lowest rates on the right. Please note that all percentages have been rounded off to the nearest whole number in the chart

Figure 2: Percentage Decline in Smoking Rates, Age 15 and Over, 1985-2001, (%)



Sources: Statistics Canada, General Social Survey 1985; CTUMS 2001

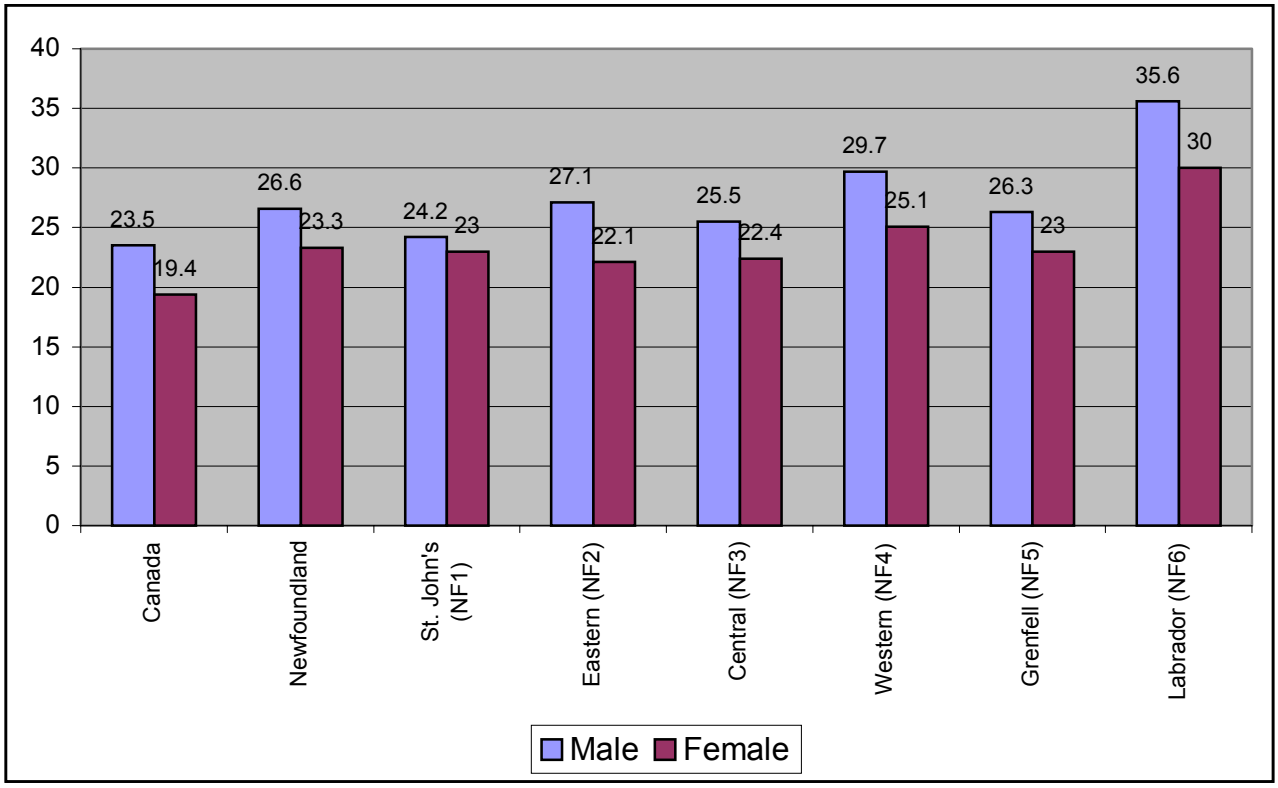
2.2 Smoking Trends in Newfoundland & Labrador Health Districts

Statistics Canada's 2000/01 Canadian Community Health Survey (CCHS) provides data for daily smokers for all 21 Atlantic region health districts.[4] Of these, 18 have higher rates of smoking for both men and women than the Canadian average, including all six in NL. The highest daily smoking rates in Atlantic Canada are in Labrador, where 36% of men and 30% of women are daily smokers. Along with higher than average suicide rates and other causes of mortality, high rates of cigarette consumption undoubtedly contribute to Labrador's comparatively low life expectancy (74.9 years compared to the national average of 78.3) (Statistics Canada, Health Indicators). The Labrador community of Nain has the lowest life expectancy (70 years) of any community in NL, where the provincial median life expectancy is 77.3 years (Newfoundland & Labrador Statistics Agency, 2003).

[4] Due to high sampling variability, data on occasional (non-daily) smokers for most health districts are not reported here. In some cases, these data on occasional smoking rates were suppressed by Statistics Canada due to extreme sampling variability. In most cases, data on occasional smoking rates by health district have a coefficient of variation from 16.6% to 33.3%, and would therefore have to be interpreted with caution.

The second highest rate of smoking in NL is in the Western health district (NF4) where 30% of men and 25% of women smoke daily. Women in all other health districts in the province have a smoking rate of 22-23%. The St. John's district has the province's lowest male rate of daily smoking at 24% (Figure 3).

Figure 3: Proportion of the Population, Aged 12 and Over, who are Daily Smokers, Canada, and Newfoundland & Labrador Health Districts, 2000/01, (%)



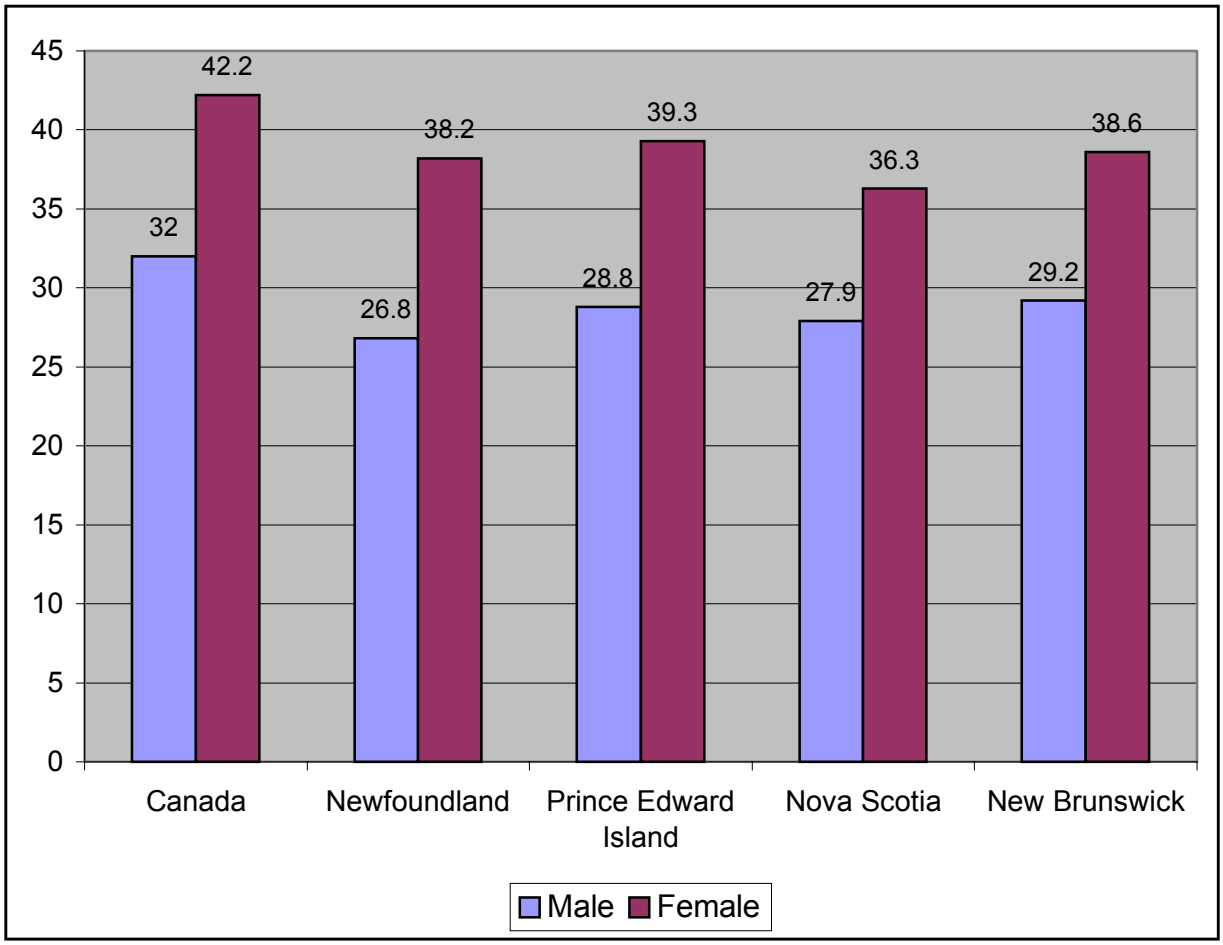
Source: Statistics Canada, *Canadian Community Health Survey*, 2000/01

The CCHS also provides data on former smokers and those who have never smoked. Not surprisingly, in light of their historically high smoking rates, the Atlantic provinces have smaller proportions of the population who have never smoked, and correspondingly higher proportions of former smokers than the Canadian average. About one in three Canadian men have never smoked, and 42% of Canadian women have never smoked, compared to about 28% of Atlantic region men who have never smoked and 38% of Atlantic region women who have never smoked (Figure 4).

In Newfoundland and Labrador, the proportion of women who have never smoked is highest in the Eastern health region at 46.5%. In all other health regions, women are more likely to have

been smokers than the Canadian average. Newfoundland and Labrador men in all NL health districts are more likely to have been smokers than the Canadian average (32%).

Figure 4: Proportion of the Population, Aged 12 and Over, Who Never Smoked, Canada and Atlantic Provinces, 2000/01, (%)



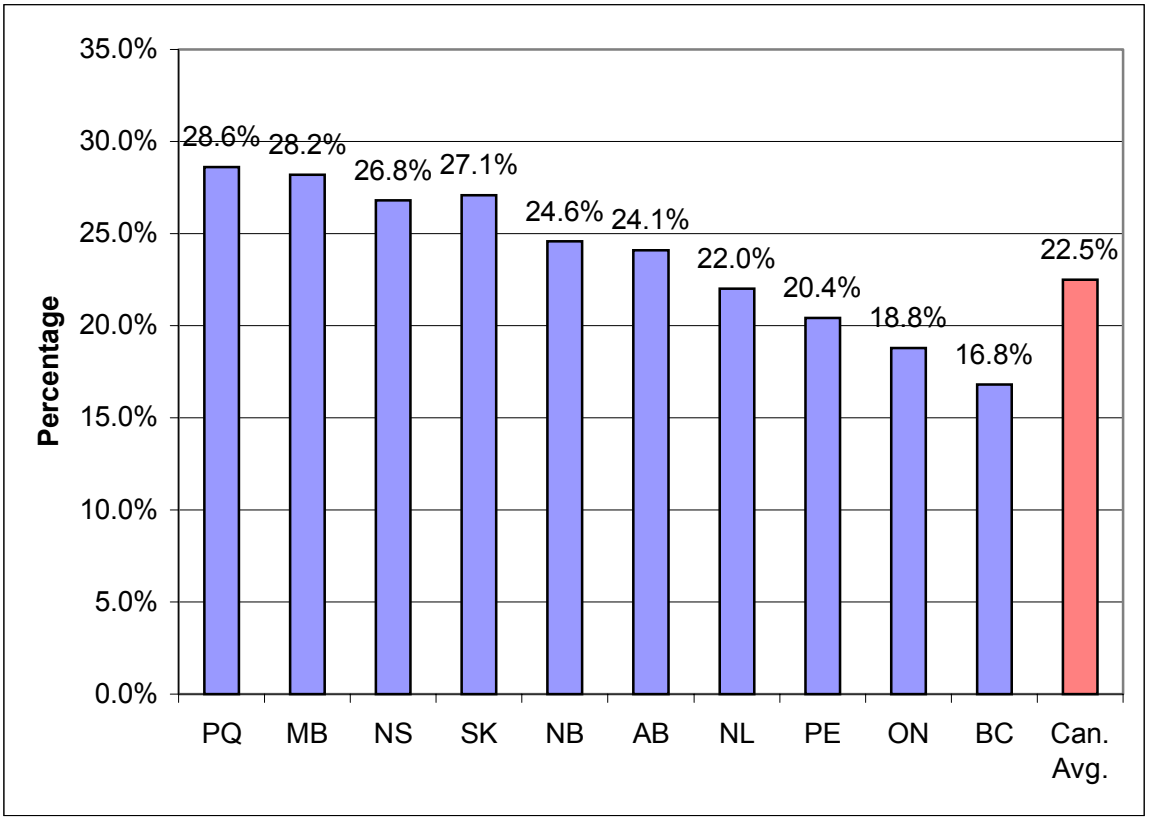
Source: Statistics Canada, *Canadian Community Health Survey,* 2000/01

2.3 Teenage Smoking

The teenage years are when potential smokers are most vulnerable to smoking initiation. Almost all persons who have ever smoked had their first cigarette some time in their teens, and at least half of all ever-smokers have tried smoking by the age of 15 (CTUMS, 2000). In NL, 13% of smokers aged 20 and over started smoking at age 12 or younger; 73% started between age 13-19 while only 14% started at age 20 or over (Newfoundland & Labrador Statistics Agency, *op cit.*).

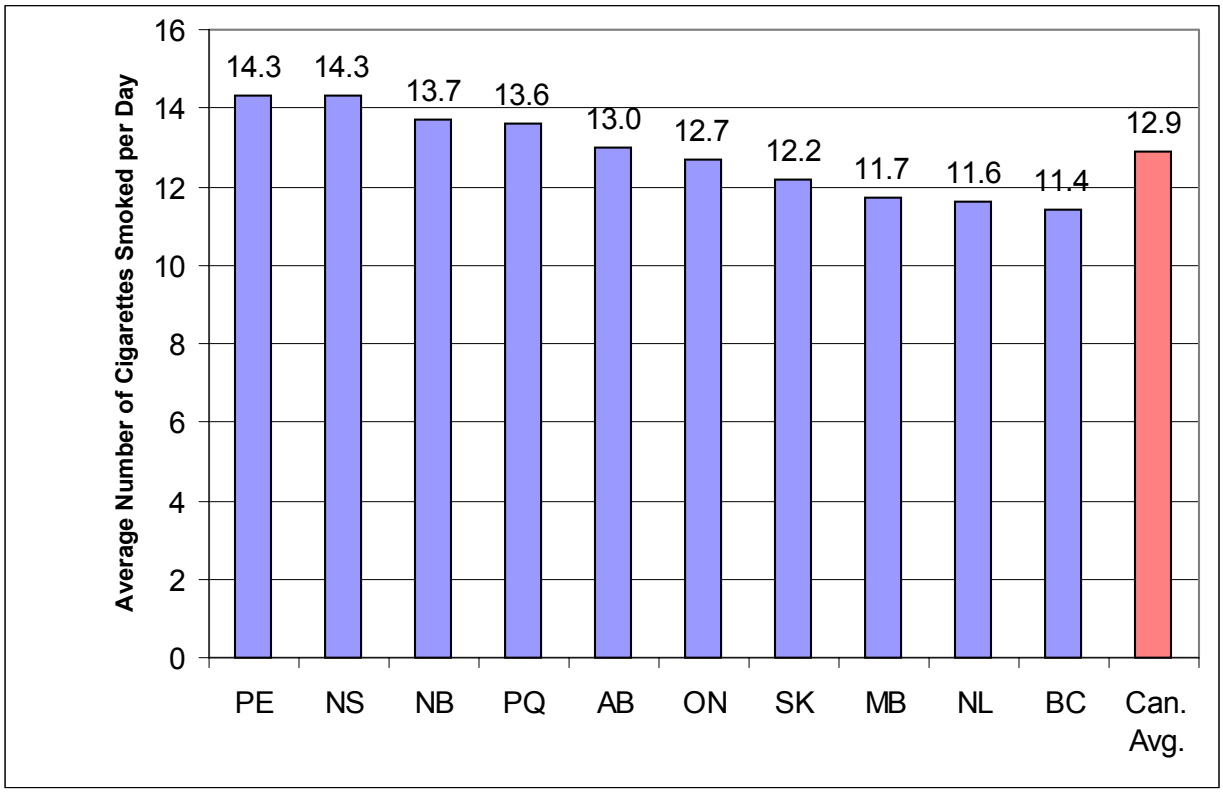
The percentage of Canadian teens aged 15-19 who smoked reached a high of 49% in 1981, dropped by about half by 1989, then rose again in the early 1990s to stabilize around 27% by 1994. In the past few years there has been an encouraging downward trend again, with 22.5% of 15-19 aged teens reported as smokers in 2001 (CTUMS, 2001, 2000). In the CTUMS 2001, 22% of NL's 15-19 year olds reported being current smokers, compared to the national average of 22.5%. This is the fourth lowest rate of teen smoking in the country, after (in order) British Columbia, Ontario, and Prince Edward Island. Quebec had the highest rate of teen smoking with 28.6% of teenagers smoking (**Figure 5**). Newfoundland & Labrador youth also smoke less heavily – 11.6 cigarettes/smoker per day – than their counterparts in any other province except British Columbia, where teen smoke 11.4 cigarettes/smoker per day (CTUMS, 2001) (**Figure 6**).

Figure 5: Percentage of Current Smokers, Age 15-19, Canada, Provinces, 2001, (%)



Source: CTUMS 2001

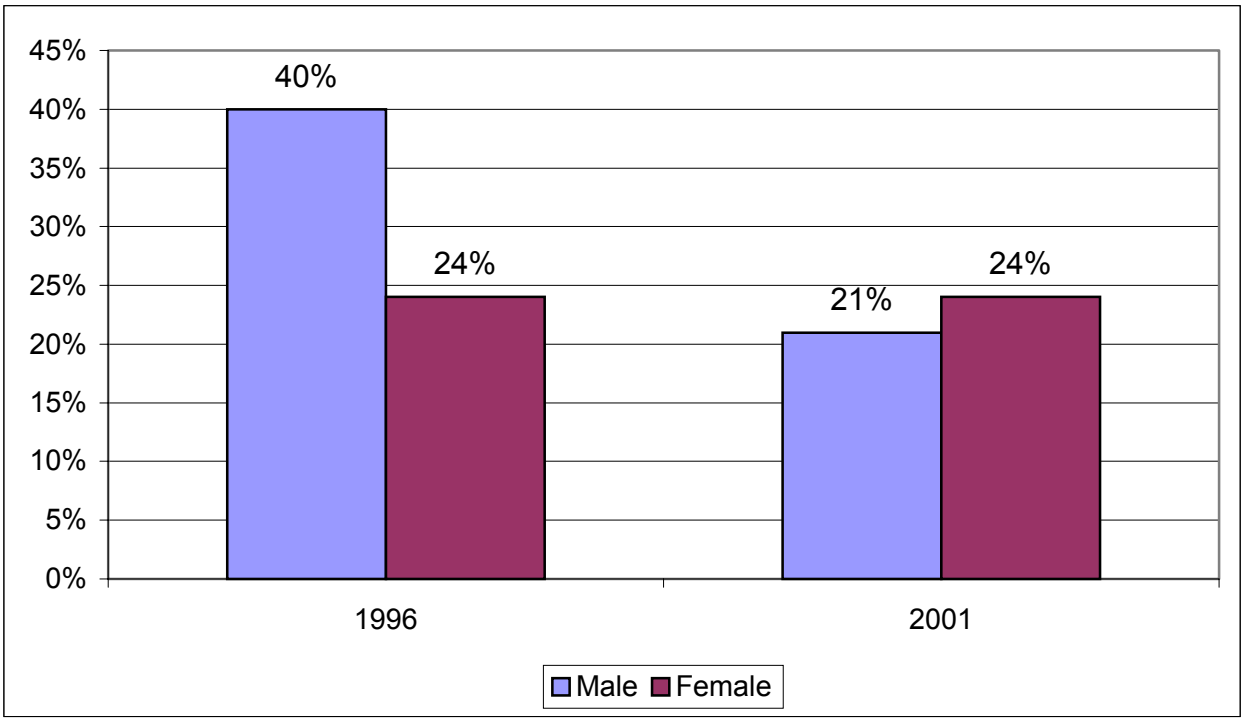
Figure 6: Average Number of Cigarettes Smoked per Day, Age 15-19, Canada, Provinces, 2001.



Source: CTUMS 2001

The overall trend of decreased prevalence of smoking among teens aged 15-19 hides changes in the smoking habits of teenage boys compared to girls. Between 1996 and 2001, smoking among 15 to 19-year-old Canadian boys dropped from 40% to 21%, while it held steady at 24% among 15 to 19-year-old girls (CTUMS, 2001) (Figure 7).

Figure 7: Smoking Rates by Sex, Age 15-19, Canada, 1996 and 2001, (%)



Source: CTUMS 2001

2.4 Causes of Smoking

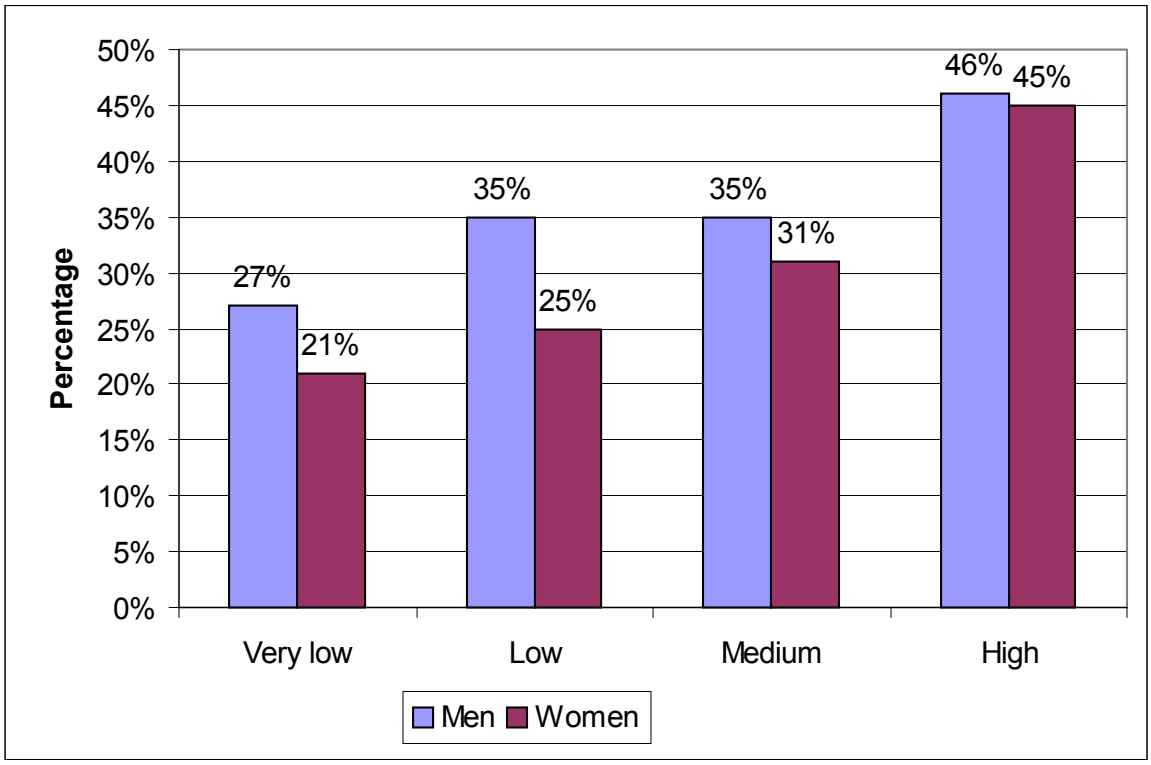
Smoking prevalence and consumption are inversely related to both education and income. The 1999 CTUMS showed that 29 of 100 Canadians who did not finish high school were smokers, compared to 25 of 100 who had at least a high school education, and 18 of 100 who had post-secondary education. As well, those smokers with less than a high school education consumed an average of 20 cigarettes per day, compared to 16 for smokers with a college or university degree (CTUMS 1999a).[5] Those in the lowest income bracket are two and a half times as likely to smoke (38%) as those in the highest income bracket (15%) (Health Canada and Statistics Canada, 1999).

[5] The 1996-97 National Population Health Survey found the disproportion to be nearly three to one (39% less than high school; 14% university graduate). Source: Health Canada, 1999.

2.4.1 Stress and Smoking

The correlation between high stress and tobacco use is well documented. The 1994 National Population Health Survey found that 46% of Canadian men who experienced high levels of chronic stress were smokers, while only 27% of men with a very low level of chronic stress were smokers. The relationship was even more pronounced for women, whose smoking rates ranged from 21% among those with a very low stress level to 45% for those with high stress (Figure 8) (Statistics Canada, National Population Health Survey 1994-95; Colman, 2000a).

Figure 8: Proportion of Canadian Population (18+) Who Are Smokers, by Gender, Chronic Stress Levels, (%)



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

Statistics Canada also reports that the proportion of "severely time-stressed" youth, aged 15-24, increased by 25% across the country between 1992 and 1998, to 22% among young women and 10% among young men (Frederick, 1995; Statistics Canada, 1999b; Statistics Canada, 1998). During the same period, teenage smoking rates also increased dramatically, particularly among young women (Health Canada and Statistics Canada, 1999).

The 2001 Newfoundland Adult & Community Health Survey found that 16% of adults living in Newfoundland proper (the island) experienced lives that were "extremely" to "quite a bit" stressful. The highest stress rates were in the St. John's district.[6] For all four health regions, the greatest stress rates were registered by Newfoundlanders aged 20-39. Women in the 20-39, 40-59, and 60+ age brackets were in almost all regions likely to experience greater stress than men (Newfoundland & Labrador Statistics Agency, *op cit.*).

By contrast to national trends, however, high stress levels in Newfoundland proper do not appear to correlate strongly with smoking rates. This may be related to the fact that in Statistics Canada's population health surveys, Newfoundlanders register lower levels of stress than Canadians in any other province.

In Canada as a whole, the increase in chronic stress, particularly among women, appears related to changing employment patterns. Seventy percent of families are now dual earners, and the combined burden of paid and unpaid work time is increasing across the country. Working mothers now invest an average of 74 hours a 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 use survey.

Women have 20% higher levels of time stress than men in every age group. However, figures from 1998 show that the gap may be narrowing. In the prime working-age group, 50% more men felt time-stressed in 1998 than in 1992, compared to one-third more women (Colman, 2000b; Statistics Canada, 1999b).

In the 1996/97 National Population Health Survey, more women also reported higher *work* stress levels than men in every age category. Women aged 20-24 were almost three times as likely to report high work stress than the average Canadian worker (Health Canada and Statistics Canada, *op cit.*).

A recent Statistics Canada study for the first time examined the relationship between work hours and smoking rates. After controlling for other factors, the study found that men who moved from standard to long hours were more than twice as likely to increase their rate of daily smoking compared to those working standard hours. Women moving to long hours were more than *four* times as likely to increase their smoking rates than women working standard hours (Shields, 1999).

Smoking has also been linked to irregular work hours. Health Canada found that smokers are far more likely than non-smokers to work weekends, evening shifts, and night shifts. There is

[6] It should be noted that the 2001 Newfoundland Adult and Community Health Survey collected data from four of the province's six health regions, with no data available for the Grenfell or Labrador health regions. The St. John's rates are therefore by comparison with the Eastern, Central, and Western health regions only.

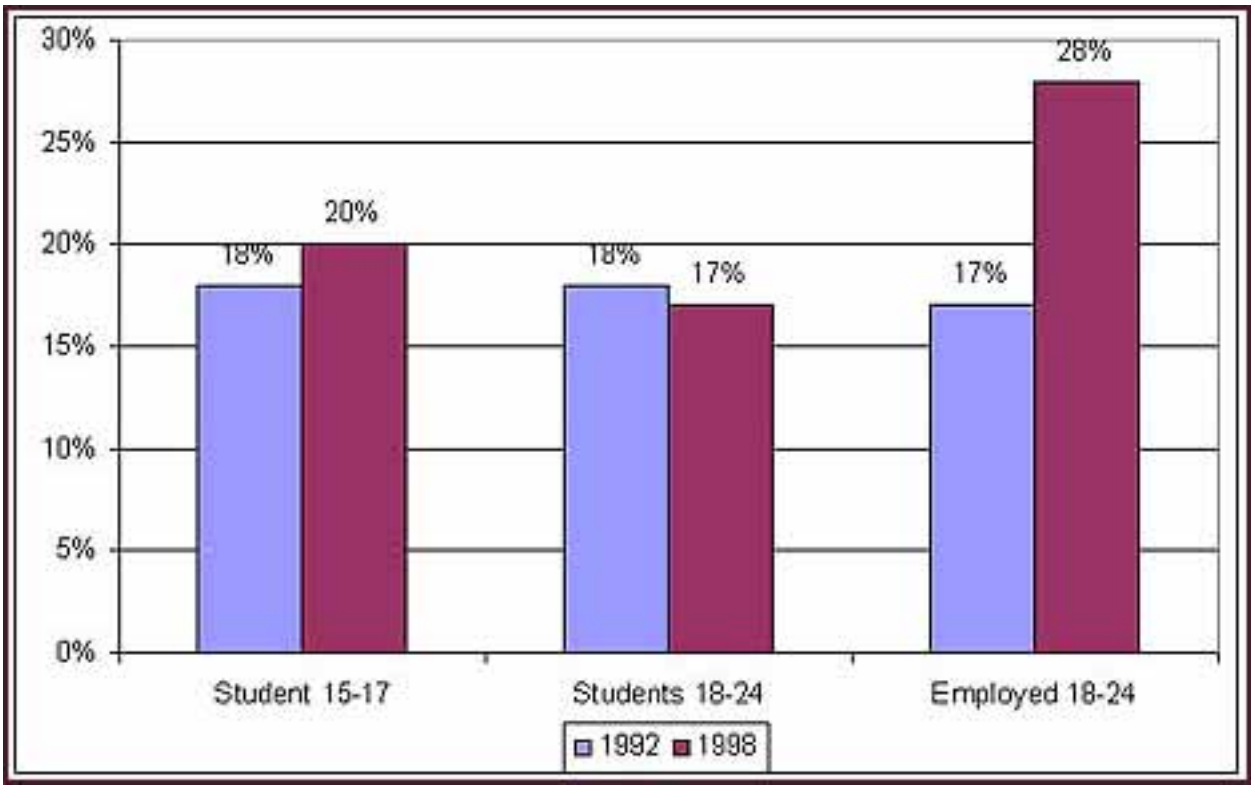
currently insufficient evidence to establish a causal relationship between work hours and smoking, but with employment patterns shifting in the last 20 years to higher rates of casual, on-call and temporary work, this correlation merits further study. Other indicators point to a clear relationship between smoking and job insecurity. Among all socio-demographic groups, smoking prevalence is highest among the unemployed who are looking for work, at 46% overall and 52% for females (Health Canada, no date[a]; Colman, 1999).

Since the relationship between stress and smoking is statistically confirmed for both sexes (Figure 8 above), it is essential to give attention to the deeper societal patterns that may be responsible for smoking rates in NL. The concept of what is included in cessation promotion activities may need expansion, for example, to include stress management or self-esteem initiatives.[7]

Surveys have found that stress relief and weight loss are the two primary reasons that teenage girls take up smoking; and that female students suffer from significantly higher stress levels than male students. The number of severely time-stressed young women is also increasing at a significant rate (Figure 9). Programs, brochures, materials and counselling that acknowledge these motivations explicitly are more likely to be effective than blanket statements about the health effects of smoking. The hypothesis of a relationship between rising stress levels and rising rates of smoking among teenage girls is highly plausible in light of earlier evidence associating smoking directly with chronic stress, particularly among women. The relationship between smoking and weight is much less clear. Evidence demonstrates that the average weight gain for quitters is just 2.3 kg, undoubtedly a much smaller amount than many teenage girls imagine, especially when weighed against the health risks of smoking (Health Canada, no date[b]).

[7] There is an interesting sidebar to the relationship between smoking and stress. One study found that, while smoking withdrawal is undoubtedly stressful, "completely stopping smoking tends to lead to reduced stress, with stress increasing if smoking is resumed." See: Townsend, J., P. Roderick and J. Cooper (1994). Cigarette Smoking by Socioeconomic Group, Sex, and Age: Effects of price, income, and health publicity, *British Medical Journal,* Vol. 309, Oct. 8, 1994, p. 927.

Figure 9: "Severely Time Stressed" Young Women, by age and status, 1992 and 1998, (%)



Source: Statistics Canada, General Social Surveys, 1992 and 1998

Increases in time stress among youth since 1992 parallel tuition increases and rising student debt levels that may produce greater pressure to work longer hours while at school. Other stresses in the 1990s include high youth unemployment rates, and job insecurity. These stresses affect both genders and parallel increases in cigarette smoking during the same period for both young men and young women. Overall, young women are still more than twice as likely to be time-stressed as young men; young women under 18 are five times as likely to be squeezed for time.

More research is necessary to understand the links between teenage stress, weight concerns, and high rates of smoking among young women. The issue is of particular concern in light of rising rates of lung cancer mortality among women (five times the rate of 30 years ago), and recent findings that female smokers are more than twice as susceptible to lung cancer as male smokers (National Cancer Institute of Canada, 1999).[8]

[8] Also, see the *Halifax Chronicle-Herald,* January 5, 2000, p. 1-2, reporting on study published in the *Journal of the U.S. National Cancer Institute* on Pennsylvania State University research findings on genetic susceptibility to lung cancer.

As the tobacco industry has long understood, teen smoking predicts adult behaviour. Among 21 to 39-year-old daily smokers, 86% began smoking as teenagers. Those who start smoking between ages 14 and 17 are 2.3 times as likely to smoke more than 20 cigarettes a day as those who start smoking at age 20 or older. Within 10 years, 42% of those who started smoking at age 20 or older had quit, compared to only 22% of those who started between ages 14 and 17, and just 18% of those who started smoking at age 13 or less (Chen and Millar, 1998).

Evidence published recently in the British Medical Association Journal, *Tobacco Control*, shows that teenagers can become addicted to smoking much more quickly than previously thought, with some 12- and 13-year-olds showing evidence of addiction within days of their first cigarette. Adolescents may be more sensitive to nicotine than those who start smoking at a later age. The lead researcher in the study supporting this evidence, Dr. Joseph Di Franzia of the University of Massachusetts, has commented:

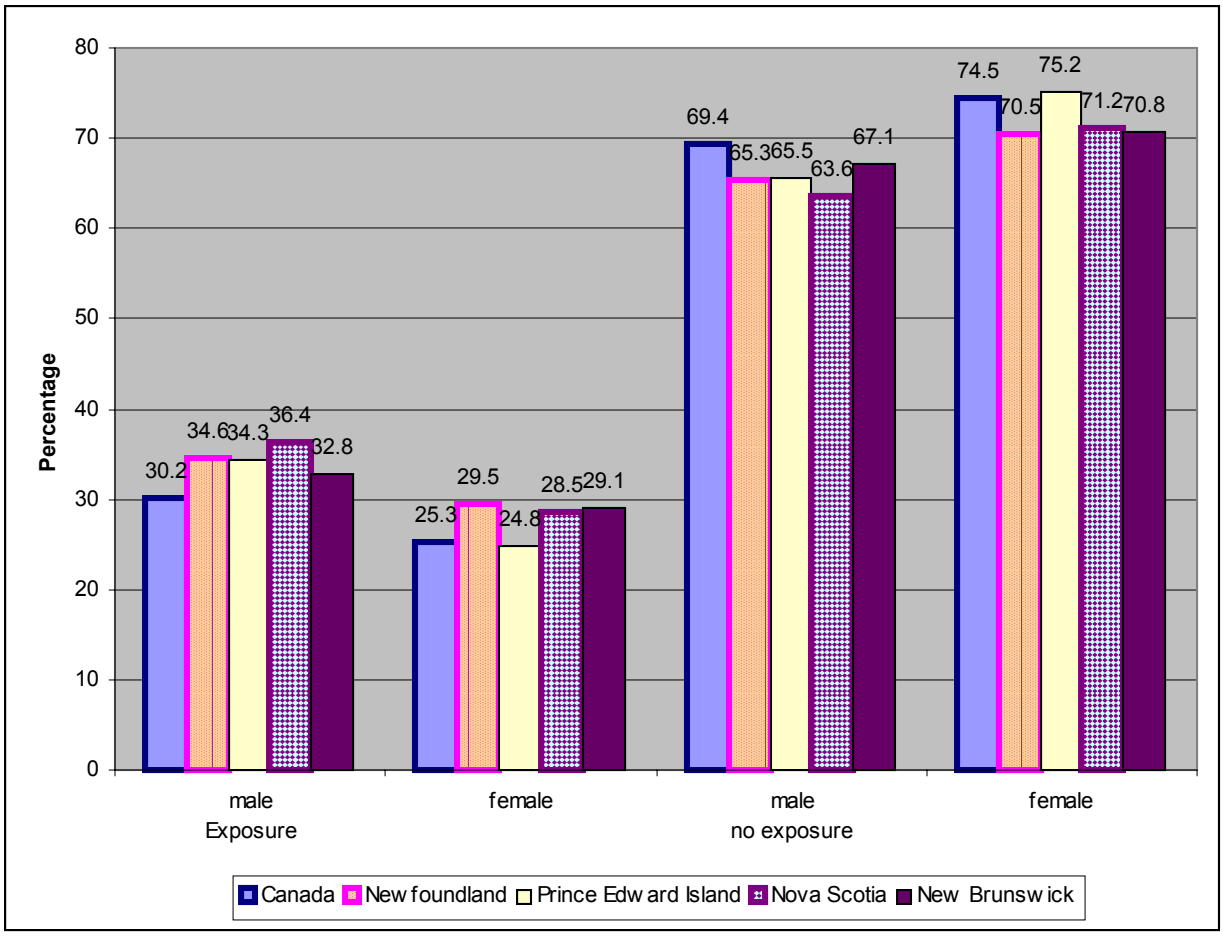
> *...[W]e have to warn kids that you can't just fool around with cigarettes or experiment with cigarettes for a few days and then give it up. If you fool around with cigarettes for a few weeks, you may be addicted for life* (Halifax Daily News, 2000).

2.5 Exposure to Second-Hand Smoke in Newfoundland & Labrador

Passive smoking or second-hand smoke involves non-smokers who, exposed within particular environments (e.g. houses, restaurants, bars etc.), inadvertently breathe the tobacco smoke of others. The health risks of environmental tobacco smoke (ETS) are now irrefutable (see sub-section 4.2, and separate GPI Atlantic report on *The Economic Impact of Smoke-Free Workplaces*).

The 2000/01 Canadian Community Health Survey provided the first systematic, comprehensive data on second-hand smoke exposure at the health district level, by assessing the proportion of the "non-smoking population aged 12 and over who were exposed to second-hand smoke on most days in the month preceding the survey" (Statistics Canada, Canadian Community Health Survey 2000/01). The survey found that, in Canada as a whole, more men than women are exposed to second-hand smoke on a regular basis, with 30.2% of men and 25.3% of women reporting ETS exposure. Residents of the four Atlantic provinces are considerably more likely to be exposed to second-hand smoke than most other Canadians. In 2000/01, 34.6% of males and 29.5% of females in NL reported being exposed to second-hand smoke on most days (Figure 10).

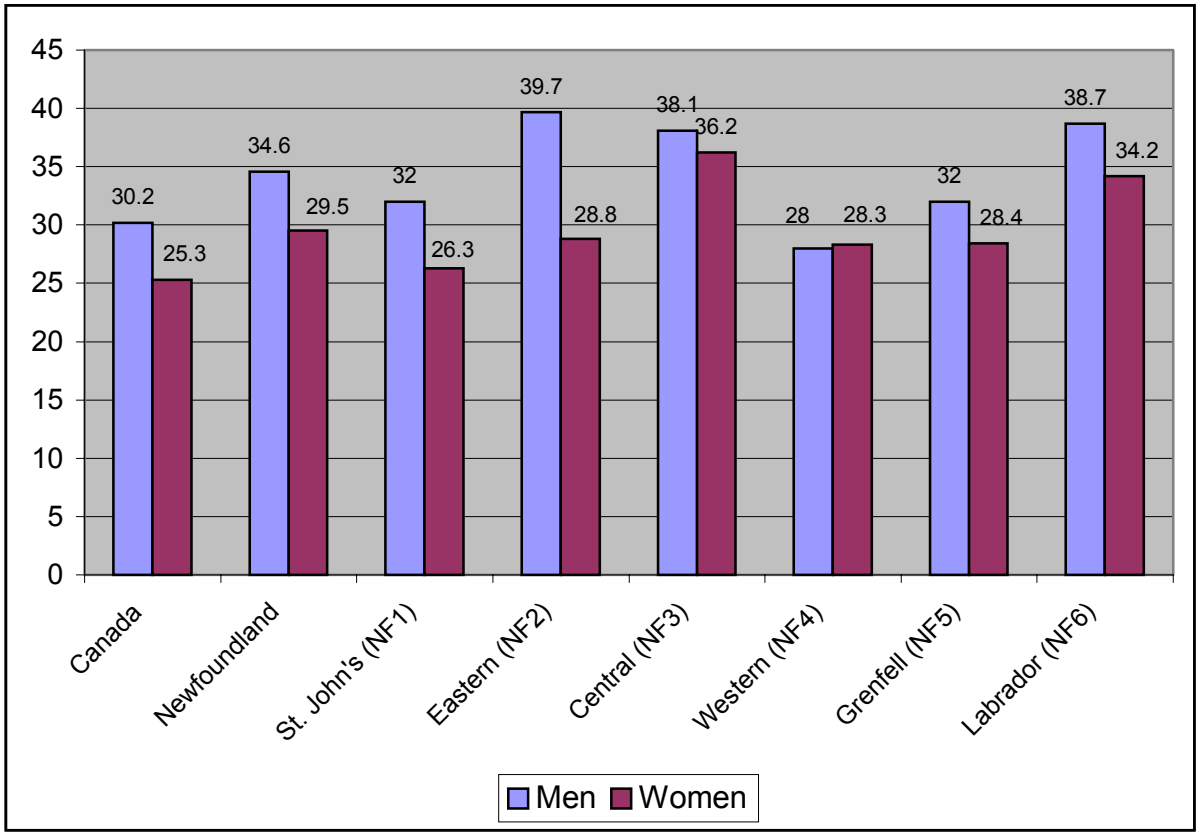
Figure 10: Proportion of the Population, Aged 12 and Over, Reporting Exposure to Second-hand Smoke on Most Days in the Last Month, Canada and Atlantic Provinces, 2000/01 (%)



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

In NL, the St. John's health district (NF1) and Western district (NF4) have the lowest levels of exposure to second-hand smoke in the province. The highest rates of regular exposure to second-hand smoke, particularly for men, are in the Eastern (NF2), Central (NF3), and Labrador (NF6) health districts, where close to four in ten men are exposed to second-hand smoke on most days of the month. The highest level of female exposure to second-hand smoke is in the Central district (NF3), where 36.2% of women are exposed to second-hand smoke on a regular basis (Figure 11).

Figure 11: Proportion of the Population, Aged 12 and Over, Reporting Exposure to Second-hand Smoke on Most Days in the Last Month, Newfoundland & Labrador Health Districts, 2000/01 (%)



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

Data from the 2001 Newfoundland Adult & Community Health Survey confirm these Canadian Community Health Survey results. Of four of six health districts surveyed (St. John's, Eastern, Central, Western), 41% of adults reported ETS exposure within the last month preceding the survey, with 44% of men reporting exposure compared to 39% for women. In that survey, the Central region reported the lowest overall exposure, followed by the St. John's region. As for the CCHS survey, men invariably reported greater exposure than women across the three age groups studied (20-39, 40-59, 60+). Exposure for both men and women was also typically greatest in the 20-39 age bracket (Newfoundland & Labrador Statistics Agency, *op cit.*).

3. Analysis of Smoking-Related Data from Community Accounts

Smoking and other health-related data from NL's Community Accounts[9] provide further knowledge and insight into rates of smoking in the province, and health issues associated with smoking. The Accounts are sets of data and information on 11 "domains of interest" (e.g. health, education, income) pertaining to the social development of Newfoundlanders. The Accounts were developed to translate the vision, values, and goals of the province's 1998 Strategic Social Plan "into measurable indicators that provide quantitative evidence for identifying social development needs and opportunities, tracking social well-being, and evaluating specific programs". The Strategic Social Plan expresses a vision for Newfoundlanders "of a healthy, educated, distinctive, self-reliant and prosperous people living in vibrant, supportive communities within sustainable regions" (Government of Newfoundland & Labrador, 2003).

The Accounts capture health data drawn from two surveys, a 1995 survey of over 12,000 residents, aged 20 and over, by Memorial University of Newfoundland's Faculty of Medicine, Division of Health, and a 2001 survey of 8,000 residents, aged 18 and over, by the Newfoundland Statistics Agency in partnership with Memorial University and the Department of Health & Community Services. As well, data on illness requiring hospitalization are also captured for the period 1994-1999.

The 1995 and 2001 surveys gathered data specific to 15 and 14 of the province's 20 economic zones, respectively. These zones are areas relating to the delivery of economic development services by 20 community agencies in NL. Figure 12 shows the delineation of the 15 economic zones in the island of Newfoundland. The 2001 health survey did not generate data specific to Economic Zone 6, covering much of the Great Northern Peninsula, and neither survey generated data for any of the five economic zones in Labrador.

Data are also specific to four of NL's six health regions, relating to six health boards delivering health care services in NL. Figure 13 shows the delineation of the five health regions in the island of Newfoundland. The 2001 health survey did not generate data specific to the Grenfell Health Region, overlapping with Economic Zone 6 and continuing into Labrador. And, again, neither survey generated data for the Labrador Health region.

The following analysis of 1995-2001 health survey data and 1994-1999 hospitalization data therefore pertains to the 14 economic zones and four health regions in Newfoundland proper, for which data are available.

[9] http://www.communityaccounts.ca, accessed March 2003

Figure 12: Economic Zones of Newfoundland

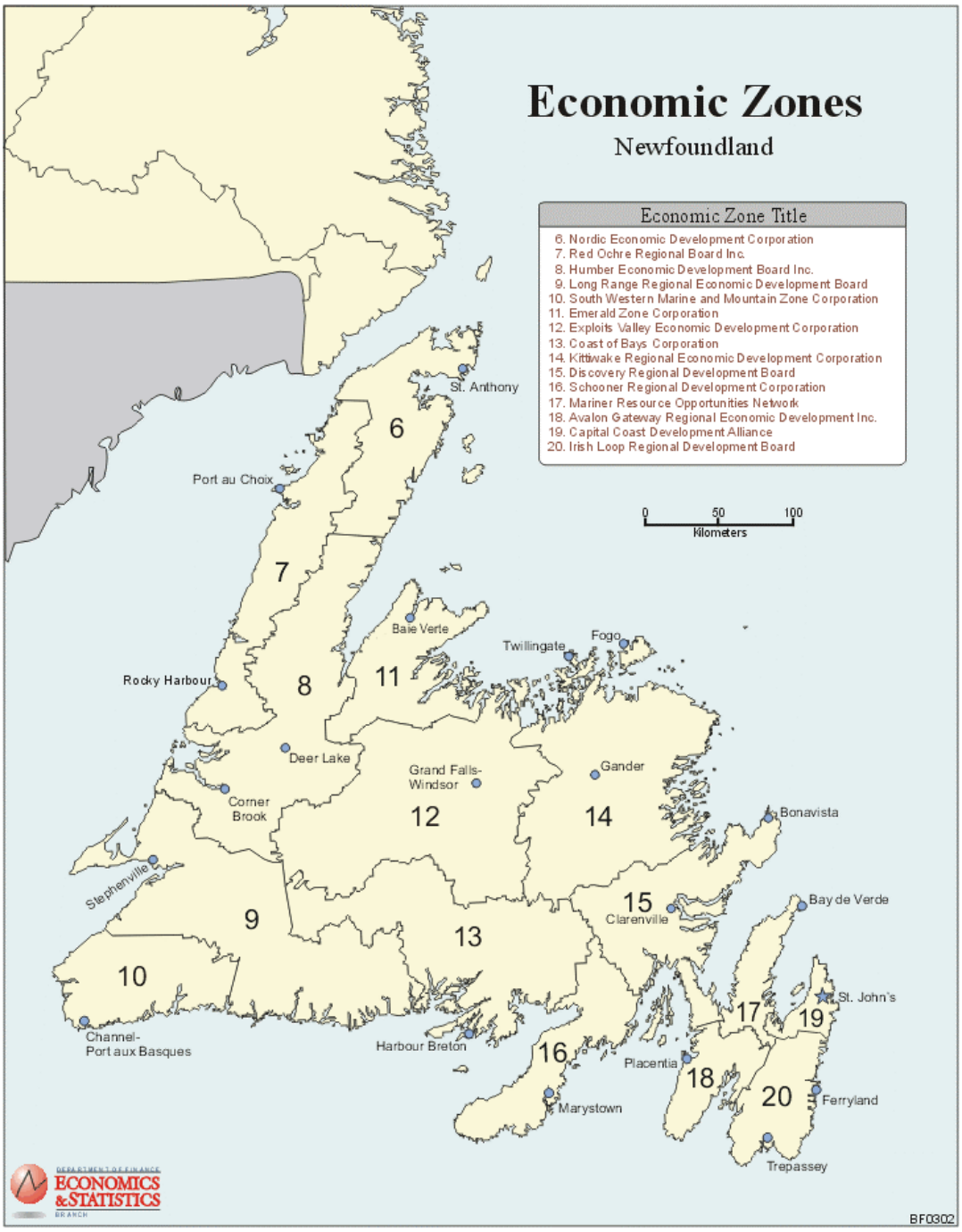
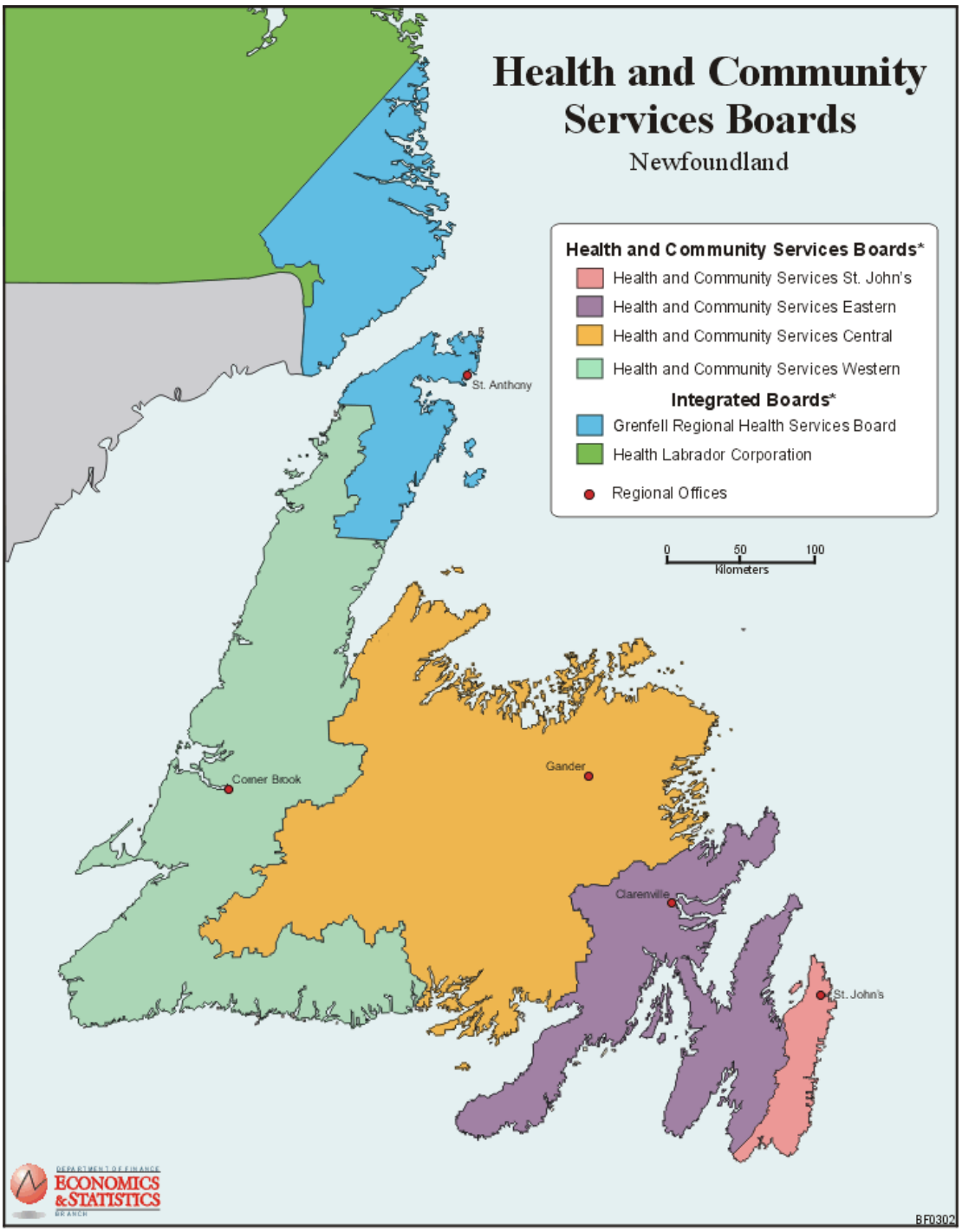


Figure 13: Health Regions of Newfoundland



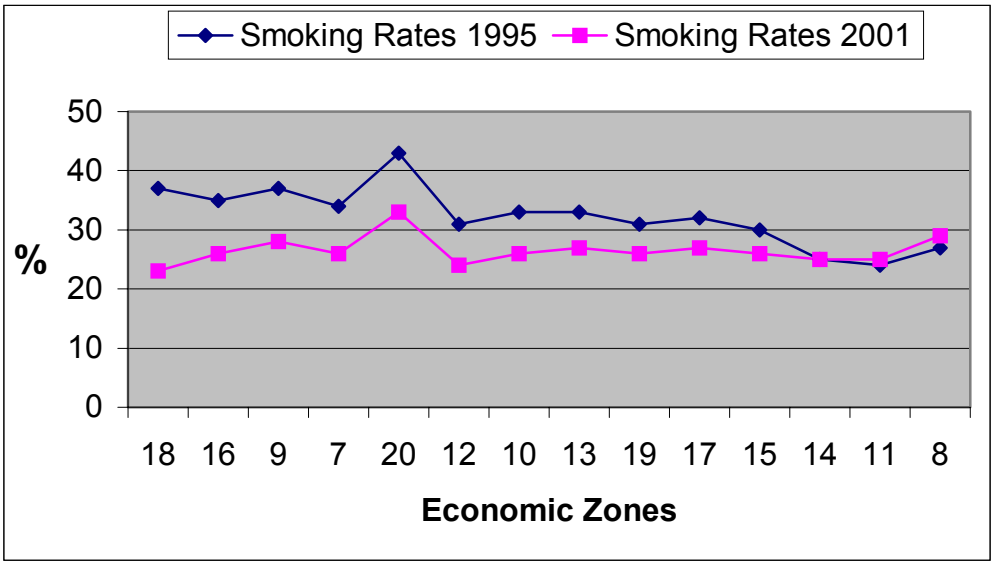
* The Health and Community Services Boards provide health and community services. The Integrated Boards provide institutional, and health and community services.

3.1 Smoking Rates, Economic Zones and Health Regions

The 1995 and 2001 surveys reinforce data from the CTUMS in showing that an impressive drop in smoking rates has occurred in Newfoundland in recent years. Whereas in 1995 the overall smoking rate was 31% for adults 20 and over (including 34% for males, 29% for females), by 2001 the rate had dropped to less than 26% (including 27% for males, and 25% for females).[10] Among adults, the decrease in smoking was most pronounced for the 20-39 age group – from 37% in 1995 to 31% in 2001 (a 16.2% decrease).

Figure 14 and Figure 15 reflect the overall decrease or increase in smoking rates between 1995 and 2001, for 14 economic zones and four health regions. Zones and regions are ordered left to right starting with areas of greatest decrease in smoking rates and moving to areas of least decrease, or even increases in smoking rates. The biggest decreases in smoking within economic zones were realized in zones 18-Avalon Gateway (38% decrease) and 16-Schooner (26% decrease), and within the St. John's and Eastern health regions (19% and 18% decreases, respectively). A slight increase in smoking rates happened in economic zones 8-Humber and 11-Emerald (7% and 4% increases, respectively). In both years, Zone 20-Irish Loop registered the highest smoking rates (43% in 1995 and 33% in 2001), although its rate of decrease between the two years was fifth highest of the 14 economic zones.

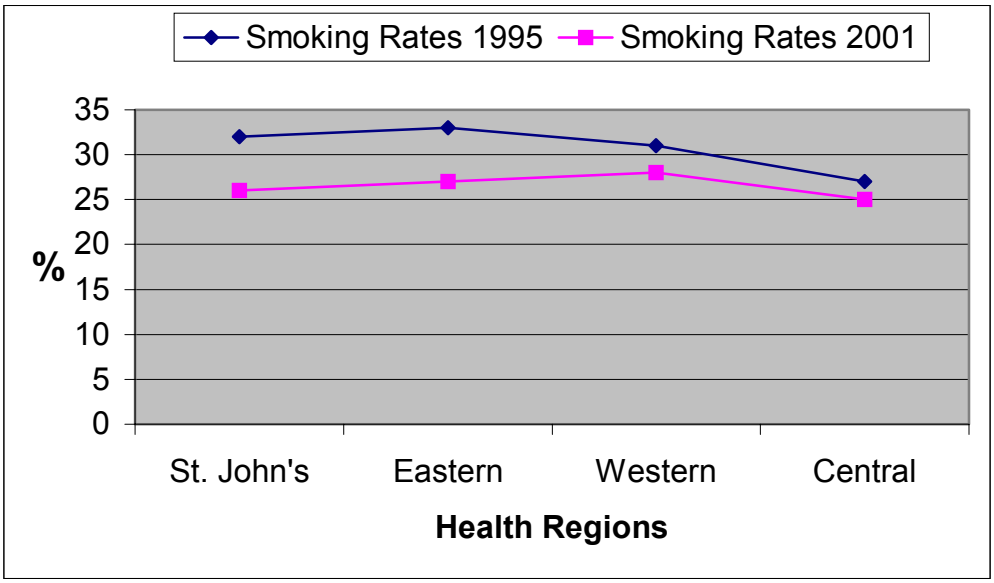
Figure 14: Smoking Rates by Economic Zone, 1995 and 2001



Source: Newfoundland Community Accounts, available at www.communityaccounts.ca.

[10] The 2001 CTUMS reported a 25.7% smoking rate for that year for the province as a whole.

Figure 15: Smoking Rates by Health Region, 1995 and 2001



Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

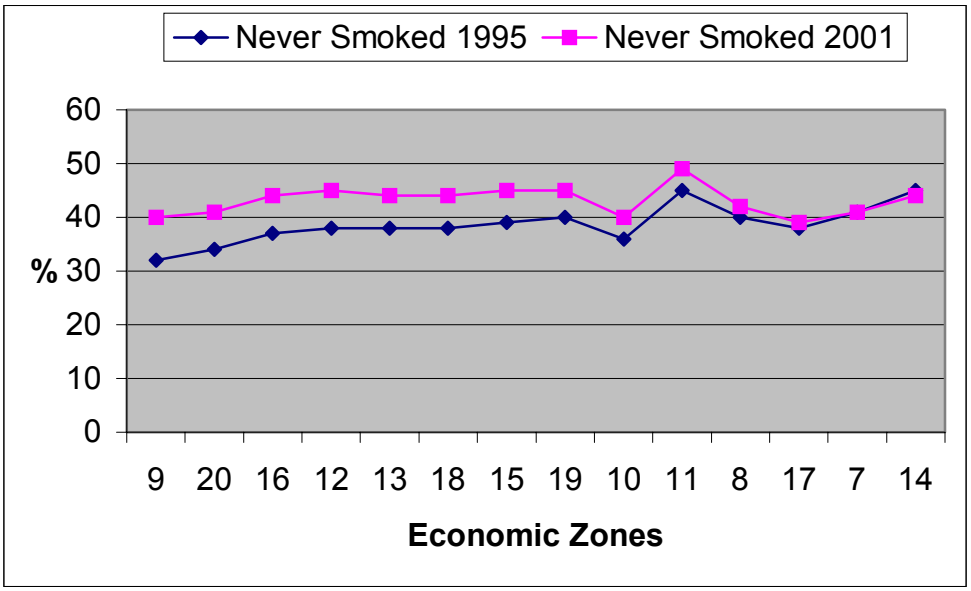
Smoking rates fell in all four health regions between 1995 and 2001, but decreases were largest in the St. John's and Eastern health regions. The 2001 adult smoking rates in the four health regions, as assessed by the 2001 Newfoundland Health Survey, correlate closely with rates for Newfoundlanders 12 years of age and over as documented in the 2000/01 Canadian Community Health Survey (see sub-section 2.2). In the latter survey, among the St. John's, Eastern, Central, and Western regions, the Western region also showed the highest smoking rate in 2001, followed by the Eastern region and then the other two regions which had closely comparable rates.

3.2 Adults Who Have Never Smoked, Economic Zone and Health Region

Corresponding with a significant decrease in smoking rates across Newfoundland, there was also a general increase between 1995 and 2001 in the rates of adults who have never smoked. Island-wide, the proportion of adults who never smoked increased from 39% in 1995 to 44% in 2001. The increase in never-smokers was greater for males, from 30% who had never smoked in 1995 to 38% in 2001, than for females (47% in 1995 to 49% in 2001).

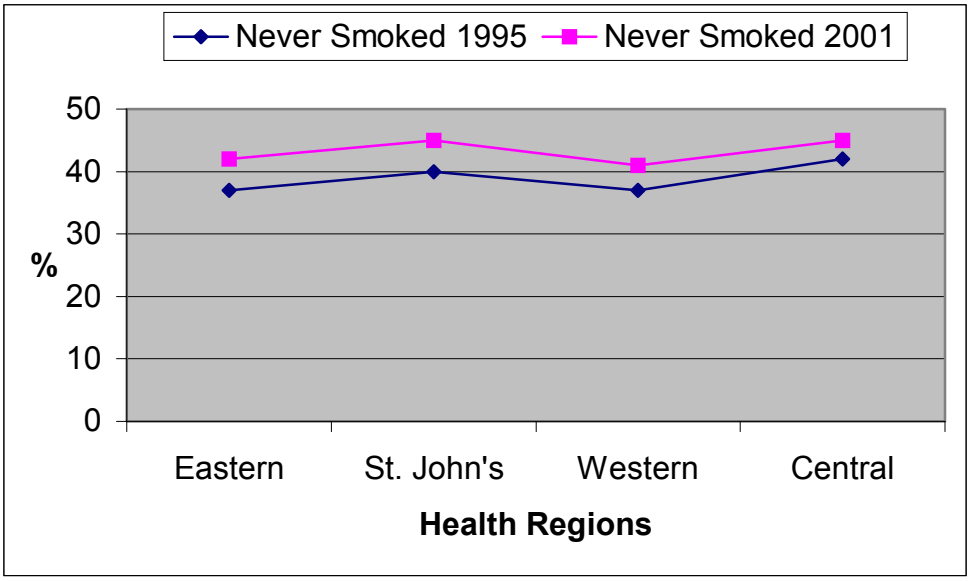
Figure 16 and 17 reflect the overall increase (or in Zone 14-Kittiwake, a decrease) in the rates of adults who have never smoked, by economic zone and health region. Zones and regions are ordered left to right, with areas of greatest increase in rates of "never smokers" on the left and moving to areas of least increase on the right. The biggest increases within economic zones were realized in zones 9-Long Range (25% increase) and 20-Irish Loop (21% increase), and within the Eastern and St. John's health regions (14% and 13% increases, respectively).

Figure 16: Adults Who Never Smoked, By Economic Zone, 1995 and 2001



Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

Figure 17: Adults Who Never Smoked, By Health Region, 1995 and 2001

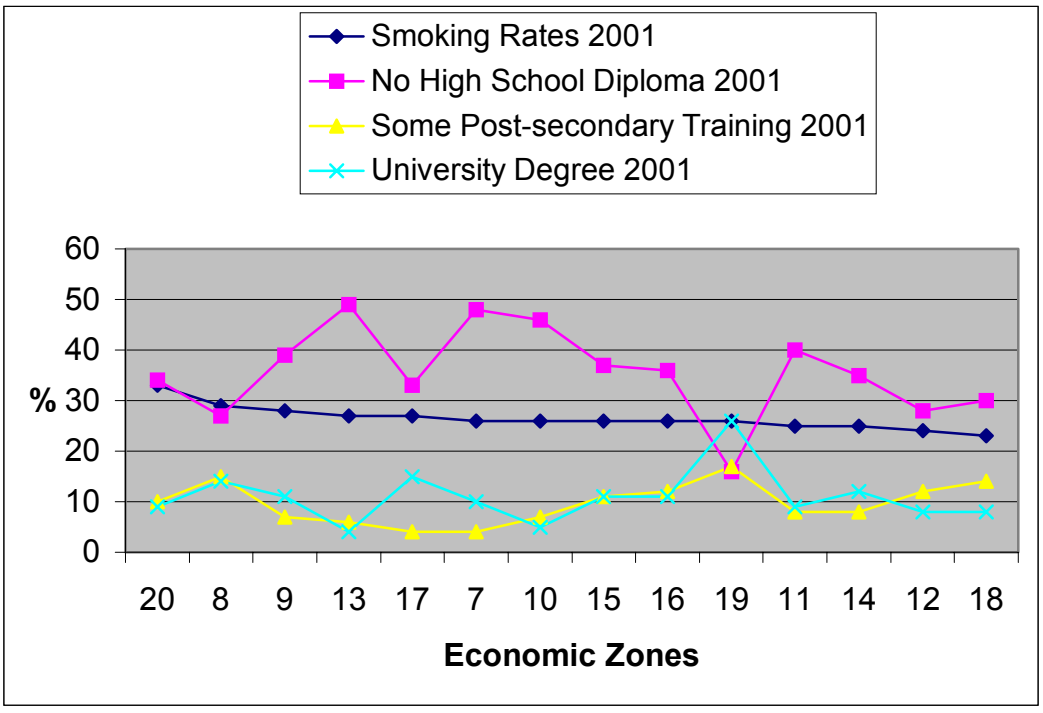


Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

3.3 Smoking Rates and Educational Attainment, Economic Zones

Sub-section 2.4 above notes how smoking rates often show an inverse relationship to levels of educational attainment. That is, the lower the level of education the higher the smoking rate, and vice-versa. Evidence from the Community Accounts suggests that educational attainment may not be as critical a determinant in shaping smoking rates in Newfoundland as it may be in other places (Figure 18). For example, Zone 20-Irish Loop had the highest smoking rate in 2001 (33%). However, its rate of adults who do not have a high school diploma (34%) was below that of eight other economic zones. Conversely, Zone 19-Capital Coast registered a significantly higher rate of university graduates than all other zones (26%), and the lowest rate of adults lacking a high school diploma (16%). However, its smoking rate (26%) was comparable to the island-wide average and greater than four other zones that each had much higher rates of adults lacking high school diplomas and much lower rates of adults with university degrees.

Figure 18: Smoking Rates and Education Attainment, 2001

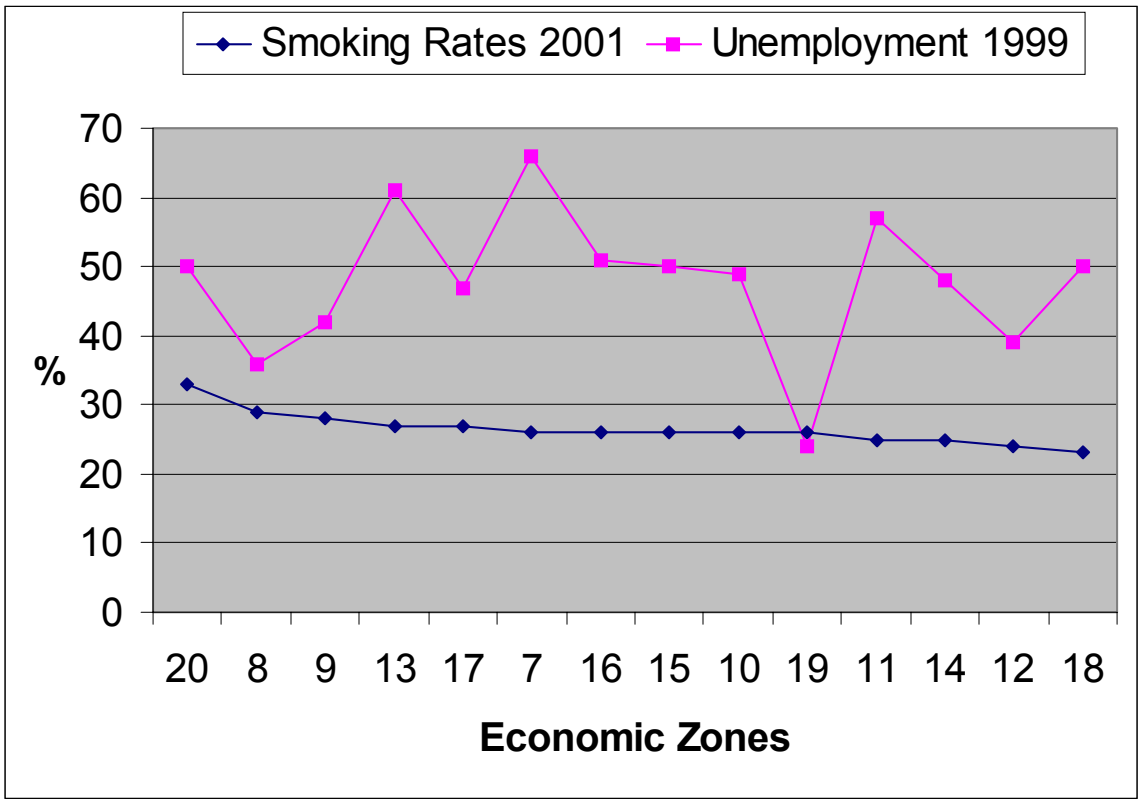


Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

3.4 Smoking Rates and Unemployment Rates, Economic Zones

As is evident from Figure 19, smoking rates in Newfoundland in 2001 also correlated weakly with unemployment rates as of 1999 (2001 data not available). Zone 19-Capital Coast had a significantly lower unemployment rate in 1999 than all other economic zones (24%), yet its smoking rate in 2001 (26%) – that of the island rate – was greater than four other zones that had significantly greater unemployment rates in 1999. Conversely, Zone 20-Irish Loop had the highest smoking rate in 2001 (33%) – 27% greater than the island rate – but an unemployment rate in 1999 below four other economic zones.

Figure 19: Smoking Rates, 2001, and Unemployment Rates, 1999, Newfoundland Economic Zones, (%)

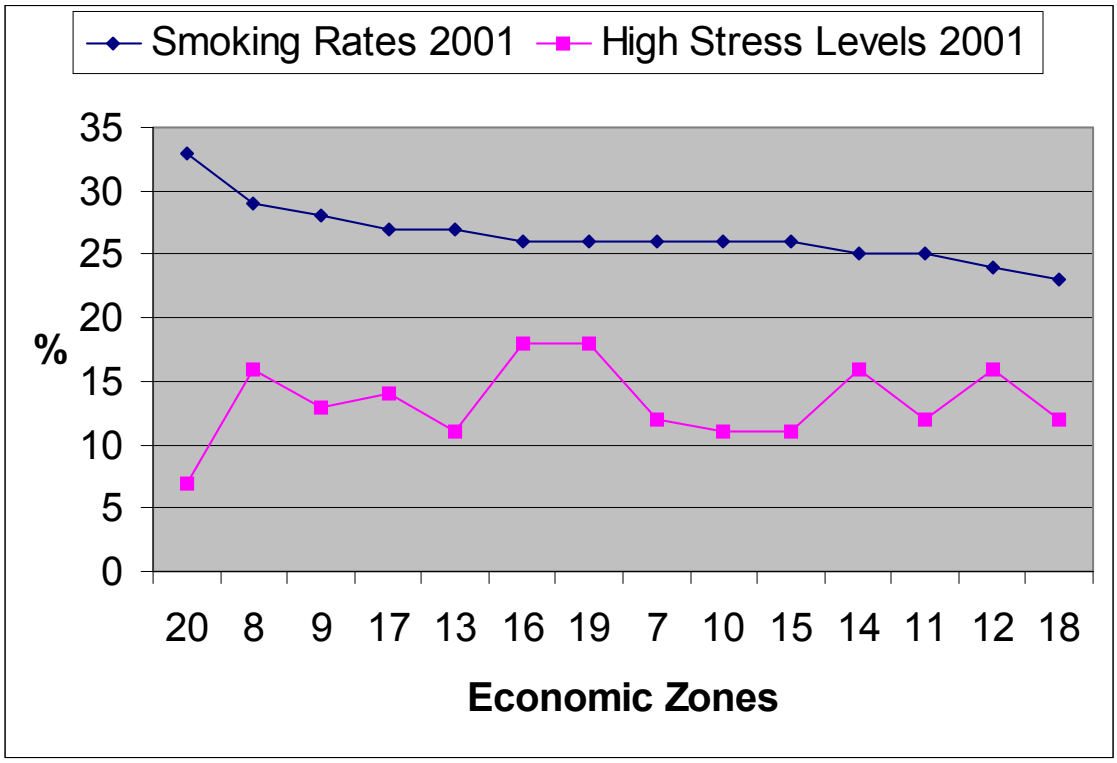


Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

3.5 Smoking Rates and Stress, Economic Zones

In contrast to the 1994/95 National Population Health Survey results described in sub-section 2.4, where smoking is correlated with high stress, zonal results from the 2001 health survey do not appear to confirm that correlation within Newfoundland (Figure 20). This may be related to the fact that Newfoundlanders in general regularly register the lowest stress levels in Canada. For example, whereas Zone 20-Irish Loop had the highest smoking rate in 2001 (33%) – 27% greater than the island rate – it had by a considerable margin the lowest rate of adults reporting high levels of stress (7%). Conversely, the zones with the highest rates of adults reporting high levels of stress – zones 16-Schooner and 19-Capital Coast (18% each) – had smoking rates equal to that for the island as a whole, but below that of five other economic zones.

Figure 20: Smoking Rates and Stress Levels, Economic Zones, 2001 (%)

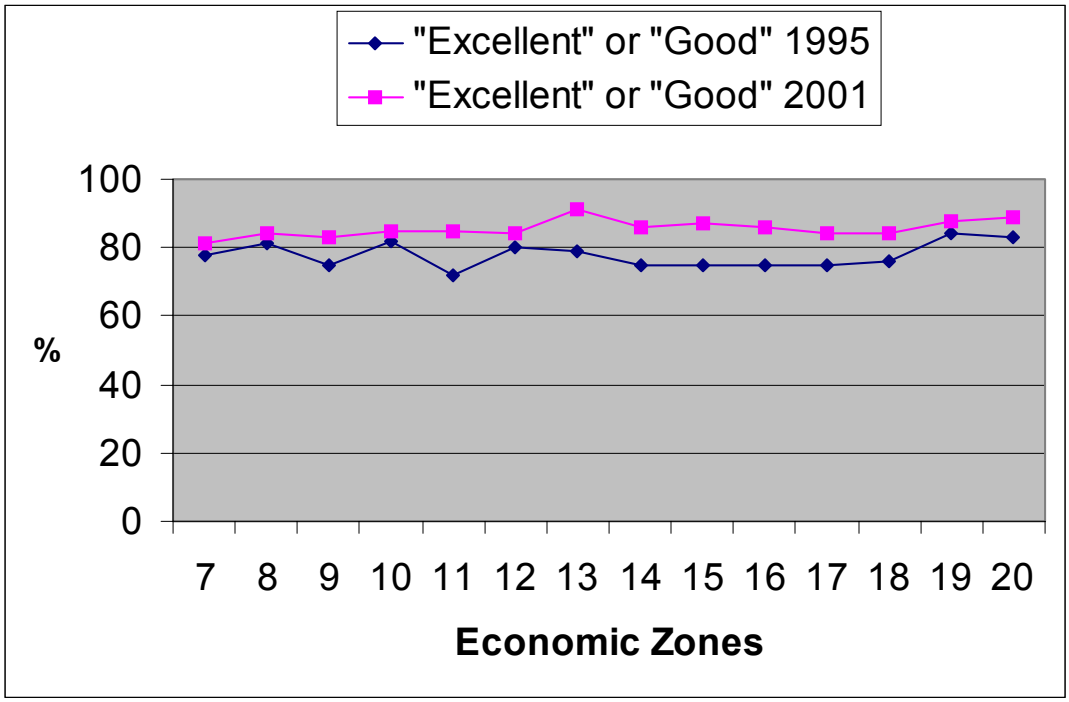


Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

3.6 Smoking Rates and Self-Assessed Health Status, Economic Zones

The overall decline in smoking rates in Newfoundland from 1995 to 2001 corresponds with an across-the-board increase between those years in the rate of adults self-assessing their health as "excellent" to "good" (Figure 21). In 2001, 86% of adults in Newfoundland characterized their health as either excellent to good, up from 79% in 1995. Interestingly, whereas Zone 20-Irish Loop had the highest smoking rate in 2001 (33%) – 27% greater than the island rate – it also had the second highest rate of adults who in 2001 self-assessed their health as "excellent" to "good" (89%). This self-assessment may relate, in part, to the very low rate of adults in this zone reporting high stress levels.

Figure 21: Self-assessed Health Status, Economic Zones, 1995 and 2001 (%)



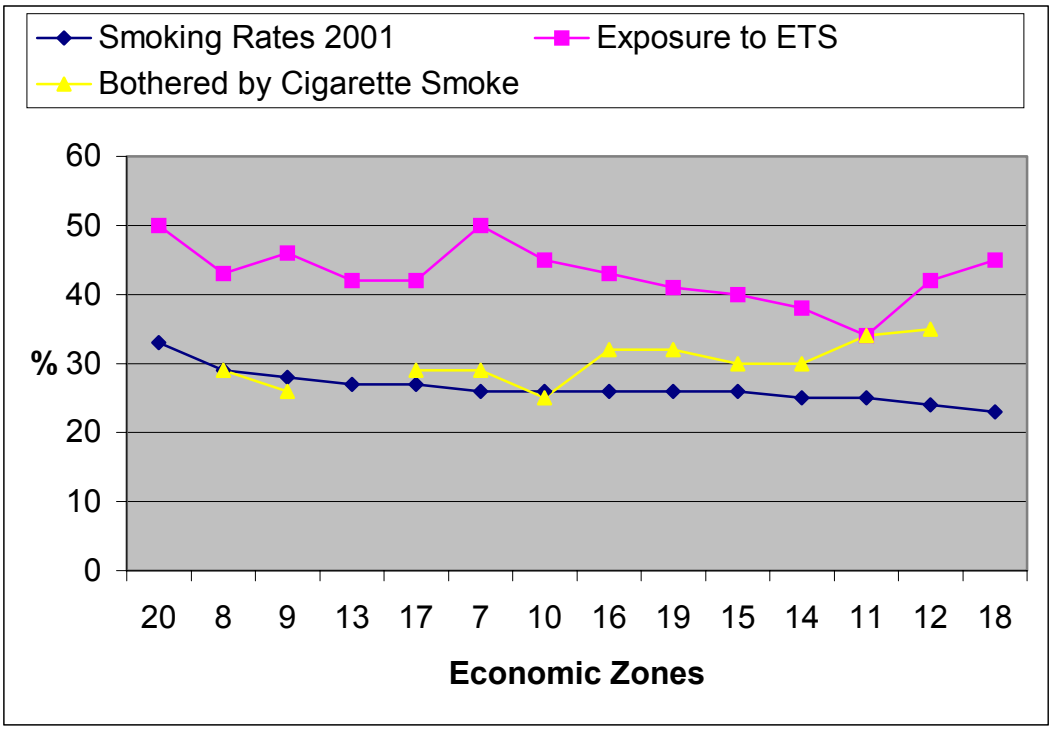
Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

3.7 Smoking Rates, Second-hand Smoke, and Cigarette Smoke Sensitivity, Economic Zones

Overall for the island, there was a 41% rate of exposure to second-hand smoke (ETS) among adults in 2001, including 44% exposure for men and 39% exposure for women. Figure 22 shows that Zone 20-Irish Loop had the highest smoking rate in 2001 (33%) – 27% greater than the island rate – and, along with Zone 7-Red Ochre (26% smoking rate, the same as for the island as a whole), the highest rates of adult exposure to ETS (50%). The next highest exposure rate (46%) was in Zone 9-Long Range, which had the third highest smoking rate (28%), 7.6% greater than for the island as a whole. Interestingly, whereas Zone 18-Avalon Gateway had the lowest smoking rate (23%) – 11.5% less than for the island as a whole – its second-hand smoke exposure rate was the third highest of all zones (45%), along with Zone 10-Southwest Marine and Mountain.

Rates of Newfoundland adults "bothered by cigarette smoke" show fairly close correlation with rates of smoking. Overall, 31% of Newfoundland adults reported being bothered by cigarette smoke, with women showing greater sensitivity to cigarette smoke than men (35% rate for women, 26% rate for men). With both genders, sensitivity appears greatest in zones 12-Exploits Valley, 11-Emerald, 16-Schooner, and 19-Capital Coast.

Figure 22: Smoking Rates, Exposure to Second-hand Smoke, and Sensitivity to Cigarette Smoke, Economic Zones, 2001 (%)



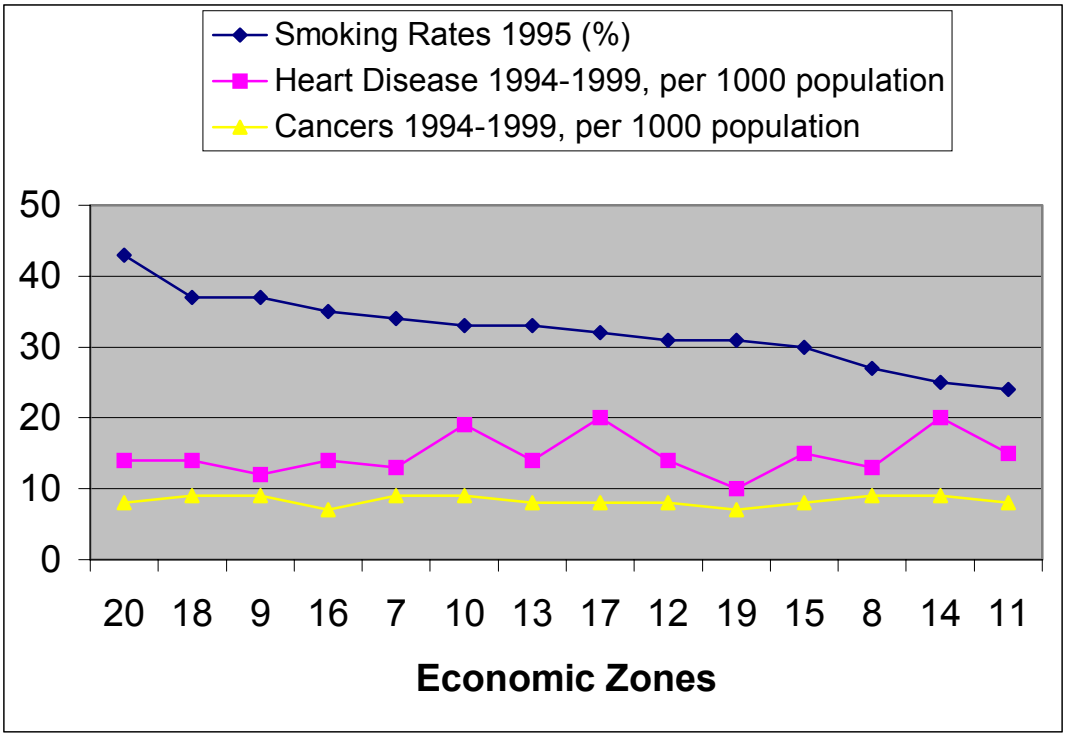
Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

3.8 Smoking Rates and Rates of Heart Disease and Cancers

Figure 23 presents smoking rates from 1995 along with rates of heart disease and cancers (all forms) for 1994-1999. No direct correlation between the two can be made as rates of heart disease and cancers should be interpreted in light of longer-term historical data on smoking rates. That is, the rates of heart disease and cancers for 1994-1999 may be related to smoking rates 20 years earlier, as opposed to smoking rates from 1995 only. As well, data available on cancers pertain to all cancers, with no breakout of the cancers most associated with smoking, notably lung cancer.

Nonetheless, it is worth assessing whether rates of smoking in individual economic zones might bear some association with rates of heart disease and cancers in individual zones. The overall heart disease rate for Newfoundland proper over 1994-1999 was 14 per 1,000 population, while the overall rate for cancers was 8 per 1,000 population. As is seen in Figure 23, five of the zones had rates of heart disease higher than the Newfoundland rate, but none of these had particularly high smoking rates relative to other zones. The highest rate of heart disease was in zones 14-Kittiwake and 17-Mariner (20 per 1,000 population each). Cancer rates per 1,000 population were very evenly distributed across the 14 economic zones.

Figure 23: Smoking Rates 1995, and Cancer and Heart Disease Incidence, Economic Zones, 1994-1999 (%)



Source: Newfoundland Community Accounts, available at www.communityaccounts.ca

4. The Cost of Smoking in Newfoundland & Labrador

Tobacco is the only substance sold legally that causes illness and death when used exactly as intended (Moore and Mikhail, 1996). The health consequences to smokers of smoking—for example, that smoking is the largest preventable cause of heart disease in the United States (U.S. Public Health Service, 1983)—are extremely well documented, and only a cursory review is needed here. The health consequences of environmental tobacco smoke (ETS), or second-hand smoke, are less well known and thus this section provides greater detail in relation to these health costs. Later in the section, analysis is given of (1) the financial expense of medical care costs associated with smoking and (2) the financial expense of losses in economic productivity attributed to smoking.

4.1 Illness and Death to Smokers

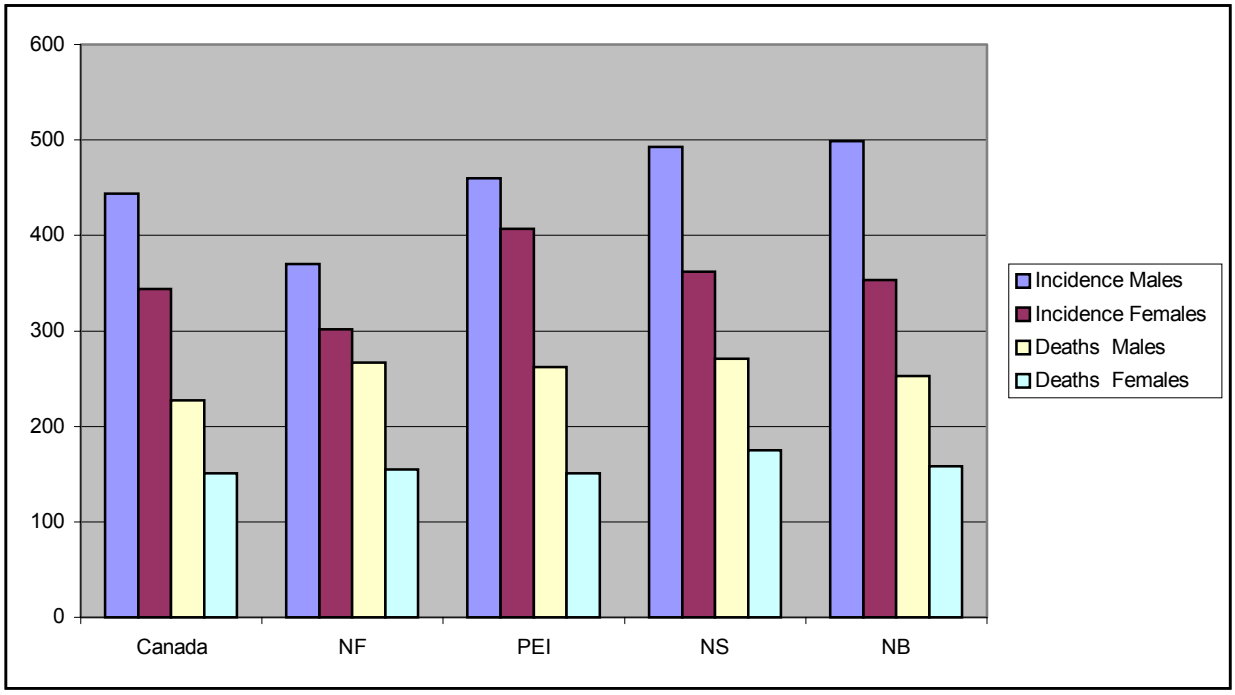
Tobacco smoke contains over 4,000 different chemicals, of which 1,200 are known to be harmful to humans, including more than 50 known carcinogens and 103 chemicals identified as poisonous to humans. It is therefore not surprising that inhalation of tobacco smoke causes illness—often lengthy, painful, and/or debilitating illness—and premature death. The chemical compounds in tobacco smoke include toxic heavy metals, pesticides, and dangerous chemicals like carbon monoxide, vinyl chloride, formaldehyde, hydrogen cyanide, radionuclides, benzene and arsenic (Ontario Tobacco Research Unit, 2001; Smoke-Free Kings, 2000; Hasbach, 1998).

The Canadian Centre on Substance Abuse (CCSA) estimated that tobacco-related illness in 1992 required 206,095 hospitalizations and over three million hospital days in Canada that year, or about 732 hospitalizations and 10,635 hospital days for every 100,000 people. Of these, 4,664 hospitalizations (803 per 100,000 people) and 54,404 hospital days (9,362 per 100,000 people) were estimated for NL (Single *et al.*, 1996.).

The principal causes of death for smokers are cancer (all forms), accounting for 41% of all smokers' deaths, and heart disease (19%), followed by respiratory illness (Single, *op cit.*) Lung cancer is the most predictable outcome of smoking, although smoking also causes other cancers (oral, larynx, etc.). Smoking causes a decline in lung function that is irreversible, with an average annual decline in lung volume two to three times as great as the normal decline in volume that occurs with age in non-smokers (Oster *et al.,* 1984). Ninety percent of lung cancers are attributable to smoking, and smokers are 22 times as likely to suffer from lung cancer as non-smokers (Single, *op cit.*).

Newfoundland & Labrador has an overall cancer incidence rate 15% below the national rate. However, its cancer mortality rate is 10% above the national rate, with the mortality rate for men 15% above the rate for all Canadian men (Figure 24).

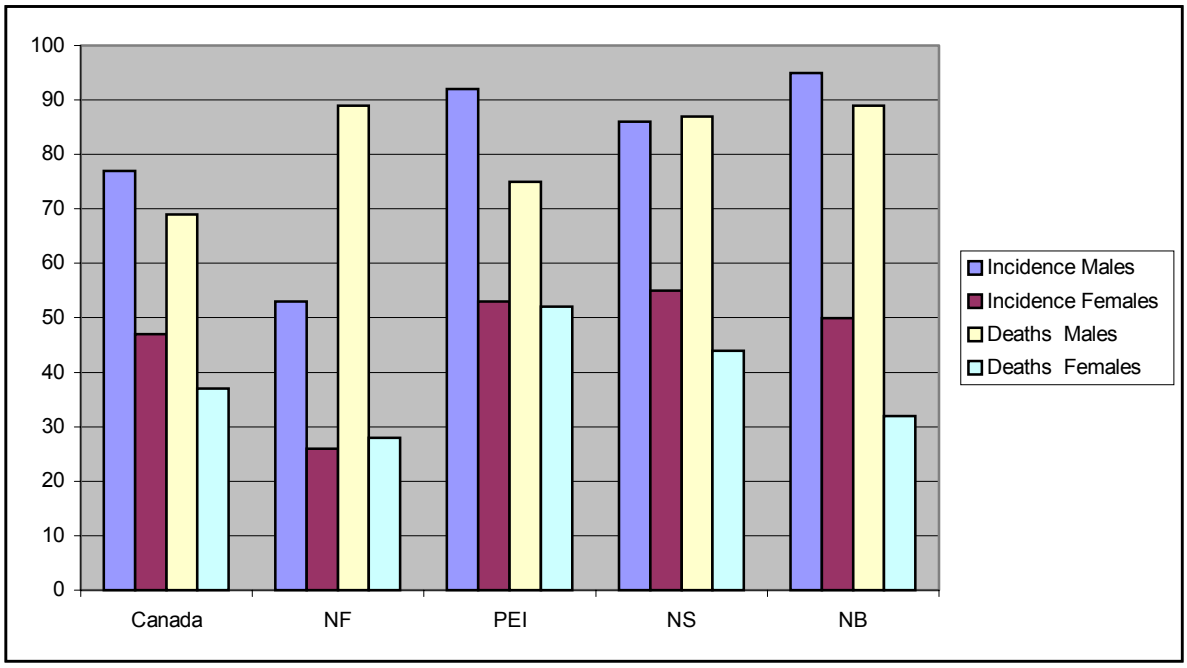
Figure 24: Cancer Incidence and Deaths, Age-standardized rate per 100,000 population, 2001 (rate)



Source: National Cancer Institute of Canada: Canadian Cancer Statistics 2001

Regarding lung cancer specifically, NL again has an *incidence* rate (36%) well below the national rate, with the incidence rate for women 45% below the rate for all Canadian women. However, while the lung cancer *mortality* rate for women is 24% below the national rate, the mortality rate for men is 22% above the rate for all Canadian men (Figure 25).

Figure 25: Lung Cancer Incidence and Deaths, Age-standardized rate per 100,000 population, 2001 (rate)



Source: National Cancer Institute of Canada: Canadian Cancer Statistics 2001

Besides cancers, smoking poses additional health concerns for women. Pregnant women who smoke, or who are regularly exposed to second-hand smoke, put their babies at risk of miscarriage, stillbirth, premature birth, low birth weight, Sudden Infant Death Syndrome (SIDS), and respiratory problems that are exacerbated because infant lungs are large relative to body size. More than one-third of Canadian women under 40 who smoke daily also smoked during their last pregnancy, despite the considerable health risks to new-born babies (Health Canada, 1999).

Worldwide, smoking results in one in 10 adult deaths per year. By 2030, it will result in one in six adult deaths annually, or 10 million people a year – more than any other single cause (The World Bank, 1999). Table 1 presents various estimates from 1985 to 2000, primarily from Health Canada, of the number of deaths in Canada, Atlantic Canada, and NL attributable to smoking. Currently, Health Canada reports that 21% of all deaths in Canada are attributable to smoking – 45,000 preventable deaths a year. For NL, the provincial Department of Health & Community Services estimates 1,000 deaths per year.

Table 1: Estimates of Canadian and Newfoundland & Labrador Deaths Attributable to Smoking*

Source	Focus Year	Deaths in Canada	Deaths in Atlantic Canada	Deaths in Newfoundland & Labrador
Health Canada (1991)[11]	1985	37,531	-	-
Health Canada (1991)[12]	1989	38,357	-	-
Health Canada (1992)[13]	1989	-	3,625	816*
CCSA (1996)[14]	1992	33,498	-	648
Health Canada (1996)[15]	1991	41,408	3,934	885*
Health Canada (1999)[16]	1991	45,000	-	-
Health Canada (1999)[17]	1994	45,472	4,530	1,019*
Health Canada (1999)[18]	1996	45,215	4,305	969*

* GPI*Atlantic* extrapolation factoring population and assuming same smoking-attributable mortality rate in all four Atlantic provinces. Newfoundland & Labrador's population is approximately 22.5% that of Atlantic Canada's.

One-half of all long-term smokers will die early as a result of smoking, and one-half of those will die in middle age, losing 20-25 years of life (Canadian Cancer Society, *op cit.*). The CCSA estimated that, in 1992, approximately 496,000 years of life in Canada would be lost to smoking (1,743 years per 100,000 people), with 9,650 of these years being lost in NL (1,661 years per 100,000 people) {Single *op cit.*}. These estimates would be 35% higher extrapolating to the NL Department of Health and Community Service's estimate of 1,000 deaths.

A study reported on in a 1995 issue of the *British Medical Journal* indicated that one out of every four to five children and teenagers in the United Kingdom who would become smokers would die in middle age, losing about 22 years of non-smoker life expectancy, while a similar number would die prematurely in later life (Foulds and Godfrey, 1995). Extrapolating from these UK figures and from total population figures for the U.K. to total population for NL, the same percentage of premature mortality (22.5%) attributable to smoking means that

[11] Collishaw, N. and K. Leahy (1991). Mortality Attributable to Tobacco Use in Canada, 1989. *Chronic Diseases in Canada,* July-August, 1991, p. 46-49.
[12] *Ibid.*
[13] Morin, M., M. Kaiserman and K. Leahy (1992). Regional Mortality Attributable to Tobacco Use in Canada, 1989. *Chronic Diseases in Canada,* Vol. 13, No. 4, July-August, 1992, p. 64-67.
[14] Single, *op cit.*.
[15] Health Canada (1996). Deaths in Canada Due to Smoking. Accessed from http://www.hc-sc.gc.ca'english/archives/96-97/deathe.htm, April 2002.
[16] Ellison, L., H. Morrison, M. de Groh and P. Villeneuve (1999). Health Consequences of Smoking Among Canadian Smokers: An Update. *Chronic Diseases in Canada,* Vol. 20, No. 1, 1999. Accessed from http://www.hc-sc.gc.ca/pphb-dgspsp/publicat/cdic-mcc/index.html, February 2003. This study found that one-third of current male smokers and one-quarter of current female smokers were expected to die before age 70, more than double the rate of premature death among non-smokers.
[17] Makomaski Illing, E., and M. Kaiserman (1999). Mortality Attributable to Tobacco Use in Canada and its Regions, 1994 and 1996. *Chronic Diseases in Canada,* Vol. 20, No. 3, 1999, p. 111-117.
[18] Makomaski Illing, *op.cit.*.

approximately 9,000 children and teenagers in NL who smoke today or who will take up smoking will die in middle age from it, while a similar number will die prematurely later in life. Looking at teens aged 15-19 specifically and applying the above percentage to the 8,800 who were smokers as of 2001 (CTUMS 2001), about 1,980 of these teens – one in 222 Newfoundlanders 15 years of age and over – will be killed by their addiction in middle age, and a further 2,800 prematurely later in life.

4.2 The Health Consequences of Second-hand Smoke

Second-hand smoke (environmental tobacco smoke or ETS) causes more mortality than all other known environmental toxins combined (U.S. Environmental Protection Agency, 1992). The more the health impacts of ETS are studied, the greater those impacts appear to be: Recent studies have found that the risk of cerebrovascular disease (stroke) is twice as high for those living with smokers than for those living with non-smokers, after adjustment for active smoking, education, heart disease, hypertension and diabetes (You *et al.*, 1999; Bonita *et al.*, 1999).

Second-hand smoke consists of "mainstream" and "sidestream" smoke. Mainstream smoke is first drawn through the cigarette into the smoker's lungs, and then exhaled. Sidestream smoke is emitted from the burning end of a cigarette and enters directly into the environment. Exposure to sidestream smoke may be proportionately more toxic to the heart than exposure to mainstream smoke. Among other factors, there are more carbon monoxide and nicotine breakdown products in dilute sidestream smoke than in mainstream smoke. Sidestream smoke also contains higher concentrations of several known carcinogens than the smoke inhaled by the smoker (National Research Council, 1986; U.S. Department of Health and Human Services, 1986; Collishaw *et al.*, 1984). Overall, laboratory experiments have shown that condensate of sidestream smoke is more carcinogenic than that of mainstream smoke (World Health Organization, 1999). There are also consistently higher levels of other known toxic agents in sidestream smoke than in mainstream smoke (Ontario Tobacco Research Unit, *op cit.*).

Heart disease, stroke, several forms of cancer, and various respiratory and developmental diseases or conditions are known to or may be caused by exposure to ETS (Ontario Tobacco Research Unit, *op cit.*). The following summarizes the evidence.

4.2.1 ETS and Heart Disease

Second-hand smoke has both short-term toxic effects and long-term permanent effects on heart health, and contributes to the development of atherosclerosis. Passive smoking also reduces the ability of the heart muscle to convert oxygen into the energy molecule adenosine triphosphate. These effects reduce exercise capability in people breathing ETS (Nova Scotia Department of Health, 1997).

Second-hand smoke also increases platelet activity, accelerates atherosclerotic lesions, and increases tissue damage following ischemia or myocardial infarction. Increased platelet activity increases the likelihood of acute thrombus (blood clot) formation, can damage the lining of the coronary arteries, and is an independent risk factor for recurrent or more serious myocardial infarction (Gold, 1995).

Passive smokers have significantly thicker carotid artery walls, in a dose-response relationship, than people who are not exposed to ETS. As well, free radicals induced by passive smoking are also extremely destructive to the heart muscle cell membrane. Other studies have demonstrated that exposure to ETS may lower levels of high-density lipoprotein cholesterol and increase fibrinogen, which in turn can lead to increased thrombogenesis (Gold, 1995.; Steenland, 1992).

Recent evidence has confirmed, for the first time, direct biological links between ETS and artery damage and demonstrates that ETS leads to an accumulation of fat in the arteries. The evidence is particularly troubling because that damage is extremely difficult to reverse, and because clogging and hardening of the arteries leads to heart attacks and strokes and is the single leading cause of death in North America (Langreth, 1998; Gold, *op cit.*).

Accordingly, the American Heart Association has determined that passive smoking is an important risk factor for heart disease, and the U.S. Occupational Safety and Health Administration has included the effects of ETS on the heart in its risk assessments of passive smoking (Glantz and Parmley, 1995; Taylor *et al.*, 1992). The California Environmental Protection Agency has concluded that both heart disease mortality, and acute and chronic heart disease morbidity are causally associated with ETS exposure (Ontario Tobacco Research Unit, *op cit.*).

Pooling the available statistical evidence from 12 different epidemiological studies, researchers have concluded that one can be "more than 97.5% confident that passive smoking increases the risk of death from heart disease" (Glantz and Parmley, *op cit.*). Observation of 11 more studies of non-fatal cardiac events, including three demonstrating dose-response relationships, with higher exposures of ETS associated with larger increases in risk, led the researchers to conclude:

> *"The fact that passive smoking increases the risk of nonfatal coronary events is consistent with what we know about the physiology and biochemistry of how passive smoking affects the heart….In addition, the fact that the observed risks are of comparable magnitude across studies done in many countries and controlling for a variety of the other risk factors for heart disease strengthens the confidence once can have in reaching the conclusion that passive smoking causes heart disease"* (*Glantz and Parmley,* op cit.).

4.2.2 ETS and Cancer

Second-hand smoke was classified as a "Group A carcinogen" by the U.S. Environmental Protection Agency (USEPA) in 1992. This classification is reserved only for those compounds shown to cause cancer in humans, based on studies of human populations. The finding was confirmed in the Ninth Report on Carcinogens of the U.S. National Toxicology Program, which in 2000 added ETS to its official list of 41 known human carcinogens, which includes asbestos, coke oven emissions, radon, mustard gas, and eight other substances that are also components of tobacco smoke (U.S. Department of Health and Human Services, 2000). In addition, the International Agency for Research on Cancer has determined sufficient evidence of carcinogenicity in animals for 43 chemicals in tobacco smoke (Ontario Tobacco Research Unit, *op cit*.).

Major scientific and health agencies throughout the world, such as the World Health Organization, the American College of Occupational and Environmental Medicine, and the United Kingdom Scientific Committee on Tobacco and Health, have confirmed the causal link between ETS and lung cancer.[19] Indeed, up to one-quarter of lung cancer deaths in non-smokers are related to ETS (Heart and Stroke Foundation of Canada, 1994). A 1997 *British Medical Journal* review of "the accumulated evidence on lung cancer and environmental tobacco smoke" concluded that non-smokers living with a smoker have an excess lung cancer risk of 26% (Hackshaw *et al.* 1997). The 1998 report of the United Kingdom Scientific Committee on Tobacco and Health similarly concluded that ETS exposure is a cause of lung cancer, and that those with long-term exposure have an increased risk of 20-30% (Ontario Tobacco Research Unit, *op cit.*).

Second-hand smoke may cause more than three times as many deaths due to other cancers (e.g. nasal sinus cancer and cervical cancer) than due to lung cancer (Glantz *op cit.*; Glantz and Parmley, 1991). However, because other cancers have a far greater range of potential triggers, research to connect ETS with such cancers has lagged behind that for ETS and lung cancer, and the evidence is more recent. A study by the Canadian Cancer Registries Epidemiology Research Group (2000) found that both active *and* passive smoking about doubled the risk of breast cancer in pre-menopausal women. Among post-menopausal women, active smoking increased the risk of breast cancer by 50%, and exposure to second-hand smoke increased the risk by 20%. Dose-response relationships were observed for both active smoking and exposure to ETS. These results are confirmed by nine published studies that have controlled properly for ETS exposure. Taken together, the results also show almost a doubling of breast cancer risk with *both* long-term active smoking *and* regular ETS exposure (Ontario Tobacco Control Unit, *op cit.*).

[19] The conclusions of six of these major scientific reviews are summarized in Ontario Tobacco Research Unit (2001). *Protection from Second-Hand Smoke in Ontario: A review of evidence regarding best practices*. University of Toronto, Toronto.

4.2.3 ETS and Respiratory Illness

While the link between ETS and childhood respiratory ailments, including bronchitis, pneumonia and asthma has been established for some time, that connecting ETS and adult respiratory problems is less dated. Recent studies found that ETS elevates the risk of pneumococcal pneumonia, adult asthma, chronic bronchitis and emphysema, and increases the incidence of cough, phlegm, and days lost from work in workers exposed to ETS (Nuorti *et al.*, 2000; Sheffield *et al.*, 2000; Eisner *et al.*, 1998a; Tyler, 1998; Jindal *et al.*, 1994; Greer *et al.*, 1993; Shephard, 1992; White *et al.*, 1991). The California Environmental Protection Agency reports that sensory eye and nasal irritation can result from ETS-related noxious stimulation of upper respiratory tract and corneal mucous membranes. This agency has also found causal evidence between ETS exposure and both cystic fibrosis and decreased pulmonary function (California Environmental Protection Agency, 1997).

Similarly, the USEPA found that:

> *"Environmental tobacco smoke has subtle but significant effects on the respiratory health of non-smokers, including reduced lung function, increased coughing, phlegm production, and chest discomfort"* (Ontario Tobacco Research Unit, *op cit.*).

Self-reported obstructive lung disease *has* been associated with ETS exposure in several studies (Eisner *et al.*, 1998b). But because of the time span necessary to assess results, long-term clinical data establishing the decline over time in lung volume and lung function due to ETS exposure are not yet available.

Those most at risk of illness and death due to ETS exposure are:

- **Infants and children of smokers**: Young children are particularly susceptible to the effects of ETS, with increased risk of sudden infant death syndrome and developing asthma, respiratory illness, reduced lung development, middle ear infection, and a variety of other conditions, as well as increased risk of nicotine dependence and smoking in later life (Lister and Jorm, 1998; California Environmental Protection Agency, *op cit.*; Cohen-Klonoff *et al.*, 1995; Mitchell *et al*., 1993).

- **Spouses of smokers**: Breathing ETS increases the risk of death from heart disease by 20%-30% for non-smokers married to smokers (Nova Scotia Department of Health*, op cit.*). A review of 10 studies found that both male and female non-smokers exposed to ETS in the home have an overall 30% higher risk of death from heart disease than those married to non-smokers (Howard *et al.*, 1998; Wells, 1998; Nova Scotia Department of Health, *op cit.*; Kawachi *et al.*, 1997; Law *et al.*, 1997; Glantz {1995}, *op cit.;* Wells, 1994; Steenland, *op cit.*; Glantz {1991}, *op cit.*; Humble *et al.*, 1990). Moreover, statistically significant dose-response relationships have been found between increasing amounts of smoking by the

spouse and the risk of heart disease in the non-smoking spouse (Steenland, *op cit.*; Glantz and Parmley {1991}, *op cit.*; Hole *et al.*, 1989; Helsing *et al.*, 1988). Regarding lung cancer, the risk of contracting it increases for a non-smoker by 23% for every 10 cigarettes smoked per day by a spouse, and by 88% if the spouse smokes 30 a day. Lung cancer risk increases by an average of 11% for every 10 years of exposure to ETS in the home, and by 35% for 30 years exposure (Hackshaw, *op cit.*).

- **Persons exposed to ETS in the workplace**: Most studies of workplaces where no smoking bans are in effect show ETS exposure levels as similar to levels in the homes of smokers, with significantly higher levels of exposure in restaurants, and bars. Indeed, working in a smoke-filled environment has about the same long-term health effect as smoking 10 cigarettes a day (Nova Scotia Department of Health, *op cit.*).

  Levels of ETS in restaurants are about 1.6-2.0 times higher than in office workplaces that do not have total smoking bans, and 1.5 times higher than in residences with at least one smoker. Not surprisingly, food service workers have a 50% higher risk of lung cancer than the general population. Levels of ETS in bars are 3.9-6.1 times higher than in offices and 4.5 times higher than in residences with a smoker (Health Canada, no date{a}, *op cit.*; Eisner {1998b}, *op cit.*; Trout *et al.*, 1998; Siegel, 1993).

  Workers exposed to ETS experience excess heart disease, with a statistically significant linear trend with measures of increasing exposures (American College of Occupational and Environmental Medicine, 2000; Wells {1998}, *op cit.*; He *et al.*, 1994). A recent case-control study in German workplaces also found a statistically significant dose-related excess lung cancer risk among exposed workers (American College of Occupational and Environmental Medicine, *op cit*.; Kreuzer *et al.*, 2000).

4.3 Economic Costs of Smoking: Medical Care

Smoking exacts a heavy toll on health care budgets. The World Bank found that smoking-related health care in high-income countries accounts for between 6 and 15 percent of all annual health care costs (The World Bank, *op cit.*). Applied to NL's $1.45 billion Health & Community Services budget for 2001/2002, the World Bank estimate would have translated into $87-$218 million in health care costs.[20]

In the only study to have made explicit provincial estimates, the Canadian Centre on Substance Abuse (CCSA) estimated the cost of smoking for NL in 1992 at $53 million in direct medical care costs (Table 2) {Single, *op cit.*}. This is well below the lower end of the World Bank estimate, explained in part by the fact that the NL budget for the Health & Community Services

[20] Budget figure from http://www.gov.nf.ca/Budget2002/download/Estimates2002.pdf, accessed March 2003.

department includes expense items not wholly medical in nature but linked rather to a broader array of community services.

Table 2: Canadian Centre for Substance Abuse Estimate of Direct Medical Care Costs of Smoking in Canada and Newfoundland & Labrador (millions 2001$)

	Canada	Newfoundland & Labrador
Hospitals	$1,928.3	$37.8
Ambulance Services	62.9	0.6
Physician fees	373.6	4.6
Prescription Drugs	503.3	9.9
Other Health Care Costs	75.2	0.1
Total Direct Health Care Costs	**$2,943.3**	**$53.0**

Source: Single, *op cit.* All costs are adjusted from 1992 to 2001 dollars using the Canada and Newfoundland & Labrador Consumer Price Index for "health and personal care" costs.

In addition to direct medical care costs to NL, the CCSA estimated a further $1.4 million in other direct costs such as fire damage from smoking, smoking-related research, workplace tobacco cessation programs, and other preventive measures. However, the CCSA estimate omitted some health care categories, including long-term care costs for infants born with disabilities due to smoking, and treatment costs of infants and children affected by ETS, including asthma and other respiratory ailments. (Indeed, the only ETS cost included in the CCSA estimate is for lung cancer.) One U.S. study found that including the costs of passive smoking doubled the social costs imposed by smoking (Manning *et al*, 1989).

The CCSA study also excludes residential care. A 1991 Canadian study by Murray Kaiserman of Health Canada's Office of Tobacco Control found that smoking-attributable residential care added $1.8 *billion* to the bill. That study also found that smoking-attributable fires caused $94 million in damages compared to the $20.0 million estimated by CCSA and estimated total smoking attributable costs in Canada at $18.0 billion even after adjusting for $1.8 billion in "savings" to the health care system from the premature deaths of smokers (Kaiserman, 1997).[21]

The CCSA's *indirect* cost estimate also excluded some important categories, including on-the-job productivity losses and other workplace costs, which are considered in sub-section 4.4. However, those additional costs, if included, would have had a smaller impact on the total CCSA cost estimate, as productivity losses due to premature mortality (included in the CCSA estimate) are by far the largest constituent of indirect costs.

It is highly unlikely that NL would have smoking-attributable medical care costs at the lowest end of the World Bank assessment for high-income countries, as the CCSA estimate suggests. The CCSA estimate was based on a conservative approach to estimation, using low estimates

[21] Kaiserman notes that this study is the first in Canada to estimate the smoking-attributable cost of residential care.

whenever data were incomplete or when alternative sources yielded different figures (Single, *op cit.*). Coupled with the exclusions noted above, that justifies an upward adjustment to the CCSA estimate for medical care costs.

4.3.1 Other Medical Care Cost Estimates

A thorough review of the international literature on the economics of smoking by Phillips *et al*. (1993) led the authors to refine and recalculate many medical care costs more precisely. They estimated that excess medical care expenditure due to smoking amounted to about 7% of total state expenditure on health care in New Zealand. Applying the New Zealand estimate to NL's health care budget for 2001/2002 would yield a cost estimate of about $101.5 million for that fiscal year.

Table 3 summarizes medical care costs of smoking as calculated in various studies. The costs per smoker reflect health care costs in the given year of study. Phillips' review of the international literature attributes the wide discrepancy between the different estimates to:

- Inclusion of different cost items in the analyses (e.g. Kaiserman's inclusion of smoking-attributable residential care);
- Discrepancies in diseases considered smoking-related (e.g. Some studies consider only lung cancer, heart disease, and chronic obstructive pulmonary disease.);
- Use of different relative risk and smoking prevalence estimates in calculating the proportion of mortality and morbidity attributed to smoking;
- Different estimates for the cost of treating illness (e.g. higher health care costs in the U.S.A., and increasing health care costs over time); and
- Whether or not the "life cycle" approach was adopted in the calculation of costs (see below).

Table 3: Alternative Estimates of Medical Care Costs of Smoking (millions 2001$)

Reference	Country	Total Cost	Cost per smoker/year
Single, *op cit.* (Canada estimate)	Canada	$2,943	$545
Single, *op cit.* (1992) (NL estimate)	[NL]	53	469
Kaiserman, *op cit.* (incl. residential care)	Canada	4632	591
Stoddart *et al*. (1986), in Phillips *op cit.*	Canada	701	263
Collishaw and Myers (1984), in Phillips *op cit.*	Canada	3,366	337
Thompson and Forbes (1982), in Phillips *op cit.*	Canada	6,256	619
Dept. Health & Social Security (1972), in Phillips *op cit.*	U.K.	1,703	109
Kristein (1977), in Phillips *op cit.*	U.S.A.	25,140	1143
Luce & Schweitzer (1978), in Phillips *op cit.*	U.S.A.	36	613
US Office of Technology Assessment (1985) (mid-range estimate), in Phillips *op cit.*	U.S.A.	50,927	1020
Phillips *et al*. (1992), in Phillips *op cit.*	N.Z.	207	432
Phillips *et al*. (1993), in Phillips *op cit.* [22]	N.Z.	168	335

Based on the extensive review behind this report, GPI*Atlantic* estimates – conservatively – the direct medical care costs of smoking in NL to be $79 million annually. The estimate factors the costs excluded from the CCSA analysis (e.g. for residential care, long-term costs of infants born with disabilities due to smoking, treatment costs for second-hand smoke, etc.) as well as costs borne privately by smokers and others (e.g. for nicotine patches, private counselling etc.). Recent estimates from the Canadian Institute for Health Information are that private health expenditures account for 29% of total medical care spending in Canada (Canadian Institute for Health Information, 2000). Average spending of $100/year on smoking prevention and/or treatment costs, by each of NL's 113,080 smokers in 2001, would have cost $11.3 million alone that year on top of the CCSA total estimate of $53 million.

4.3.2 The Life-Cycle Approach to Estimating the Medical Care Costs of Smoking

An article published in 1997 in the *New England Journal of Medicine* reflected the life-cycle approach to argue that "smoking cessation would lead to increased health care costs" because the premature deaths of smokers save the health care system money in the long run (Barendregt *et al*, 1997). In other words, because old people use the health care system more, and because so many smokers die young, smokers are actually less expensive than non-smokers living to old age.

Kaiserman's 1991 Canadian study discounted a total smoking-attributable cost estimate of $18.9 billion by $1.7 billion to account for "savings" from smokers' premature deaths (Kaiserman, *op cit.*). Phillips (1993) reports an increasing trend in the literature to balance excess medical care

[22] Most of the estimates in the table are cited by Phillips from Markandaya A. and D. Pearce (1989). The Social Costs of Tobacco Smoking. *British Journal of Addiction,* 84: 1139-1150, 1989

costs incurred by smokers against future "savings" resulting from premature death. However, Mississippi's Attorney-General characterized as "ghoulish" the use of this argument by the tobacco industry to claim a credit against State lawsuits for recovery of medical care costs:

> *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'* (Moore, *op cit.*).

The controversy over this approach actually illustrates the limitations of cost-benefit analysis altogether, which can never be used as a substitute for establishing fundamental values, directions and goals. In other words, society must decide whether it values life itself and having its elderly citizens cared for in their old age. If the only goal is to save money, as industry use of the life-cycle analysis implies, that would suggest killing all old people before they become costly to the health care system. The argument that premature deaths are cost-effective should not apply only to smokers.

Life-cycle analysis *can* validly be used to calculate a smoker's total costs to the health care system over his or her life-time compared to the same costs accrued by the non-smoker over the same period of time. Indeed, life-cycle analysis is the only valid approach to calculate the economic benefits of cessation, which accrue gradually over time. However, a life-cycle approach cannot validly be used to *compare* total life-time costs of smokers with total life-time costs of non-smokers, because it makes no sense to compare the costs and benefits of dead people to those of live people. The comparison is only valid during each year of life and at each age.

In other words, it is valid to compare the economic costs of live smokers and live non-smokers at any given age. But, as the Mississippi Attorney-General points out, it is literally uncivilized for any society that values life at any age to compare the health care costs of dead smokers with those of live non-smokers, and to characterize the former as "savings" or "benefits" in a cost-benefit analysis. This point needs to be emphasized here both in light of the growing trend in academic analysis to discount smoking costs by premature death "savings," and particularly by tobacco industry misuse of life-cycle analysis to claim credits for health care savings in damage recovery lawsuits.

4.4 Economic Costs of Smoking: Losses in Productivity

In addition to medical care costs, smoking exacts a heavy financial toll on employers and on overall economic productivity. Employers bear costs for (1) increased life insurance premiums; (2) maintenance for ventilation systems, additional cleaning etc.; (3) lost wages due to increased smoking-related absenteeism; and (4) lost wages due to unscheduled smoking breaks. Such lost wages translate into lost economic productivity to society as a whole, compounded by lost productivity due to premature deaths of smokers.

4.4.1 Increased Life Insurance Premiums

Of 209,060 NL employees (January 2002)[23], a 25.7% smoking rate (CTUMS 2001) yields about 53,728 smoking employees. The Conference Board of Canada (1997) estimated that each smoking employee costs an employer $84 per year in increased life insurance premiums. This amounts to $4.5 million to NL employers. Insurance companies give an average 35% discount to non-smokers to reflect their lower sickness and disability rates and their increased life expectancy relative to smokers. A firm with only non-smoking employees might negotiate a similar discount for group life insurance plans compared to those currently paid for by many employers.

4.4.2 Designated Smoking Areas

The provision of smoking rooms can actually *increase* employer costs. The same Conference Board of Canada study estimated the cost of providing and cleaning properly ventilated smoking areas at $94 per smoking employee per year, or $5.1 million to NL employers.

4.4.3 Absenteeism

Canadian and U.S. studies have estimated additional employer costs incurred due to excess absenteeism by smokers caused by smoking-related illnesses. Statistics Canada's 1994/95 General Social Survey found that smokers are absent 1.8 days per year more than non-smokers. Newfoundland & Labrador's average weekly wage in December 2001 was $613.77. Applying these figures and an absenteeism figure of 1.8 days/smoker, each smoker costs his/her employer an additional $221 a year in excess absenteeism for a total cost of $11.9 million to NL employers. In terms of total productive time lost, smokers' higher rates of absenteeism cost the NL economy nearly 96,710 person-days a year, or 426 person-years of work-time annually.

[23] Figure from labour force characteristics data on Statistics Canada's web site, http://www.statcan.ca, accessed February 2003.

4.4.4 Unscheduled Smoking Breaks

Studies in both Canada and the United States have estimated that smokers lose an additional half hour per day of productive work time compared to non-smokers, taking an average of three, ten-minute smoke breaks beyond normal, scheduled breaks. The U.S. study considered this a minimum estimate, and did not include time spent getting to and from smoking areas.[24]

If one-third (5.5) of a NL smoker's average of 16.7 cigarettes daily (CTUMS 2001) are consumed during work hours, and if three of those 5.5 work-time cigarettes are consumed during scheduled breaks, then 2.5 more, on average, are consumed during unscheduled breaks. Assuming a 227-day work year (allowing for weekends plus 3 weeks of vacation, 10 statutory holidays, and 9 sick days), the average NL smoker loses about 96 hours – about two and a half weeks – per year of work-time due to unscheduled smoke breaks.

Based on average weekly earnings in NL ($613.77 per week as of December 2001), and adding mandatory employer payroll tax and benefit costs of 15% (including Employment Insurance, Canada Pension Plan and Workers' Compensation Plan costs), the average smoking employee costs his employer approximately $1,765 extra per year in lost daily work-time. Adjusting for an 80%-20% full-time/part-time ratio, it is estimated that unscheduled smoking breaks cost NL employers $94.8 million a year in lost daily work time.

Workplace restrictions on smoking are almost always assessed in terms of protecting non-smoking employees from the negative health impacts of second-hand smoking. They can also save money. Evidence shows that smokers who work in smoke-free environments consume four fewer cigarettes per day during work hours than those who have no restrictions on smoking at work. For NL, such a decrease would translate into a decrease of lost wages from $94.8 million a year to approximately $31.2 million, and a decrease in foregone production from $199.4 million to $65.8 million.

Thus, the total annual cost to an employer from employing a smoker is an estimated $2,446. The total cost to employers in NL of employing smokers is an estimated $116.3 million (Table 4).

[24] Data in this section are based on two studies by The Conference Board of Canada, *Smoking and The Bottom Line:The Costs of Smoking in the Workplace,* Health Canada, Ottawa, 1997,and *Smoking Cessation Initiatives in the Workplace,* accessed from: http://www.hc-sc.gc.ca/hppb/tobaccoreduction/publications/workplace/bottom_line/report.htm, April 2002. Data is also drawn from Helyer, A. and W. Brehm (1998). The Economic Consequences of Tobacco Use for the Department of Defense, 1995. *Military Medicine,* Vol. 163, No. 4, April 1998, p. 217-221. A related study of Telecom Australia employees that estimated shorter smoke breaks but higher sick leave rates is: Hocking, B., H. Grain and I. Gordon (1994). Cost to Industry of Illnesses Related to Alcohol and Smoking: A Study of Telecom Australia Employees. *The Medical Journal of Australia,* Vol. 161, Oct. 3, 1994, p. 407-412.

Table 4: Annual Extra Cost of Employing Smokers in Newfoundland & Labrador (2001$)

Cost Factor	Cost Per Employee	Cost to NL employers
Increased life insurance premiums	$84	$4.5 million
Smoking area costs	$94	$5.1 million
Increased absenteeism	$214	$11.9 million
On-the-job productivity losses	$2,054	$94.8 million
Total	**$2,446**	**$116.3 million**

However, it should be noted that wages represent only a portion of the value of a worker's output or economic production. The GDP ($13.761 billion for NL in 2001), representing the gross value of production, can be divided by total employment and then by average hours/year/worker to yield the real hourly GDP per worker, factoring full-time/part-time employment ratios. Factoring in real hourly GDP per employee, the actual value of lost production per smoking employee is significantly higher, at $4,269 a year.

Therefore, the cost estimates for productivity losses associated with worker absenteeism and unscheduled smoking breaks can be adjusted upwards to $27.5 million in lost production value (for absenteeism) and to $229.4 million in lost production value (for unscheduled smoking breaks).

4.4.5 Lost Productivity Due to Premature Deaths of Smokers

In addition, significant economic productivity is lost from the premature deaths of employees who smoke and their consequent removal from the workforce. The Canadian Centre on Substance Abuse estimated that productivity losses to the Canadian economy from the premature deaths of smokers cost $7.8 billion in 1992. For NL, the CCSA estimated a loss of $137 million in 1992, and an additional $2.2 million for productivity losses due to morbidity (Single, *op cit.*).

5. The Benefits of Smoking Cessation

The cost of smoking in NL is illness, death, and hundreds of millions annually in medical expense and productivity losses. The benefits of preventing and curbing smoking are improved health, reduced medical expenses, and improved productivity.

5.1 Health Benefits

The medical benefits of smoking cessation are proven, clear and unambiguous. There is simply no better way to avert smoking-related illness or to reduce the economic costs of smoking than by quitting (or by never starting). In fact, for some leading causes of death, medical and economic analysis frequently goes a step further, and argues that of *all* possible interventions to reduce morbidity and mortality incidence from *any* cause, smoking cessation is among the most cost-effective.

Many medical benefits of smoking cessation are rapid and direct because the body begins cleansing itself of tobacco toxins immediately after a smoker quits. Just two hours after cessation, the concentration of nicotine in the bloodstream can drop by half. Many smoking effects are reversible within days or weeks, including non-chronic respiratory problems and symptoms associated with cardiovascular disease (Health Canada, no date[b], *op cit.*).

Recent evidence published in the *British Medical Journal* shows that smoking cessation, even late in life, eliminates most of the lung cancer risk and that the risk is decreased more than 90% for those who quit before they turn 35. A long-term study of national trends in smoking and smoking cessation in the United Kingdom, based on two large case-control studies in 1950 and 1990, found that widespread smoking cessation since 1950 had almost halved the number of lung cancers that would have been expected in 1990 if the former smokers had continued smoking. The study concluded:

> *Mortality in the near future and throughout the first half of the 21st century could be substantially reduced by current smokers giving up the habit* (Peto *et al*., 2000).

Health Canada puts it succinctly:

> *Recent studies show substantially reduced mortality rates for ex-smokers of all ages ... People with serious smoking-related illnesses survive longer and recover faster after quitting than those who continue to smoke ... Recent studies have demonstrated that, for ex-smokers, much of the damage done by smoking is reversed by the body's natural tendency toward health. The benefits of quitting apply to young smokers and old, to men and women, to those who are still healthy and those who already suffer from smoking-related illnesses* (Health Canada, no date[b], *op cit.*).

The benefits of smoking cessation accrue gradually, and can be measured by the difference in the relative risks of illness incurred by current and former smokers. That difference is assessed both according to the duration and the intensity of smoking habits. Thus, former heavy smokers incur higher relative risks of illness for a longer period than former light smokers. Conversely, because the relative risks of illness are significantly greater for heavy smokers, the greatest economic savings to the health care system accrue from early cessation by heavy smokers.

To assess these changing risks over time, along with the consequent economic benefits of quitting (see sub-section 5.2), this study uses the incidence-based model developed by Oster *et al.* (1984), which traces the gradually accruing benefits of quitting over a smoker's lifetime.[25] The authors describe the process in this way:

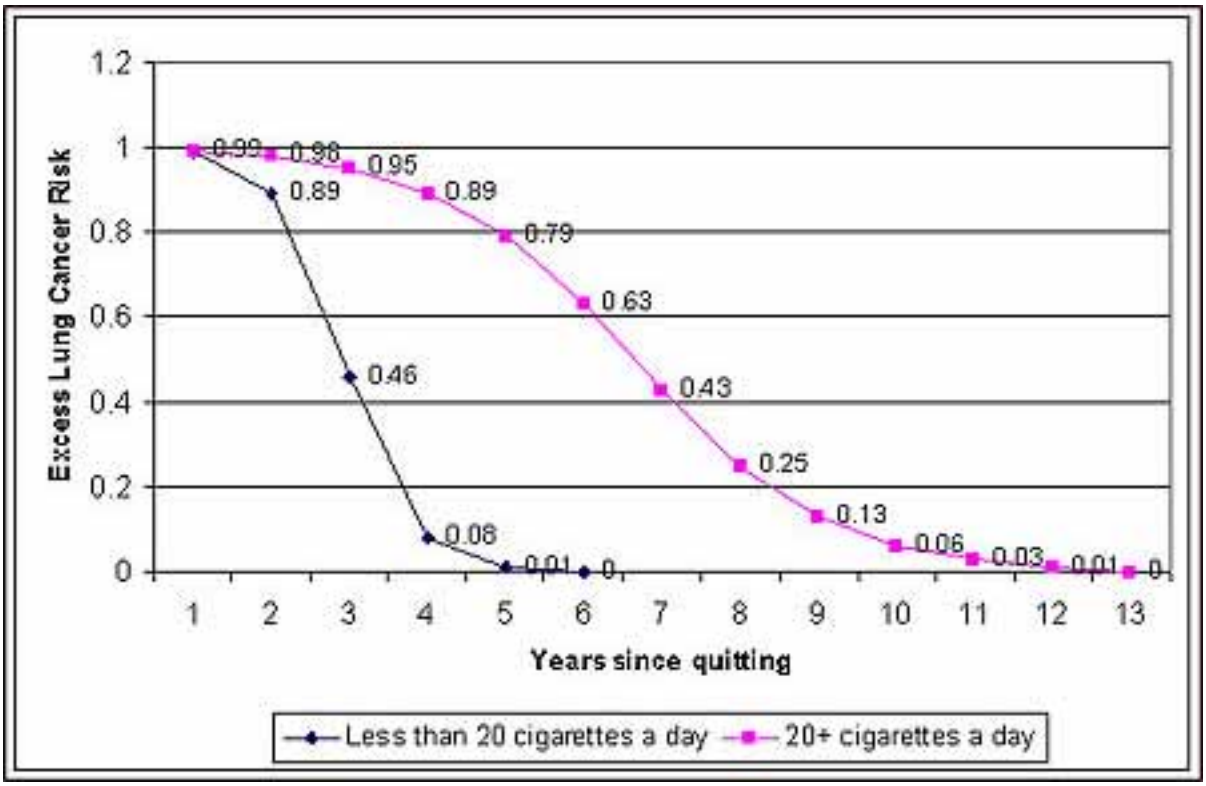
> *In each year following smoking cessation, then, the benefits of quitting will be equal to the difference between current smokers' and former smokers' marginal costs of illness in that year. In the initial period after a smoker quits, these benefits will be relatively low since quitters' risks of smoking-related diseases remain high relative to their peers who never smoked.*
>
> *Soon, though, these expected annual benefits begin to mount as quitters' marginal risks of health impairment continue to decline. As their risks of smoking-related diseases return to levels experienced by non-smokers, quitters' benefits in any year approach, in absolute terms, the expected value of costs that will be borne by smokers. Discounting and addition of these expected savings in costs of illness in each year after a smoker quits yield the total benefits of quitting* (Oster, *op cit*.).

The American Cancer Society's significant study of one million men and women found that within 2-4 years, light smokers (less than 20 cigarettes per day) had reduced their risk of lung cancer death by two-thirds, and heavy smokers (20+ cigarettes per day) by 13%. After five years, former light smokers had no greater risk than those who never smoked, while former heavy smokers had reduced their risk by half. After 10 years, former heavy smokers had reduced their risk of lung cancer death to only 1% the risk of current smokers. These findings are confirmed by the very large U.K. study described above (Oster *op cit.*; Peto, *op cit.*).

Relative lung cancer incidence rates are shown in Figure 26. After five years, former light smokers have returned to non-smoker risk levels, and after 13 years, former heavy smokers have returned to non-smoker risk levels. Though the American Cancer Society findings were for men age 50-69, Oster *et al.* felt confident that the ratios could be applied to other age groups and to women.

[25] See Appendix A for an overview of incidence-based and prevalence-based approaches to cost-benefit analysis.

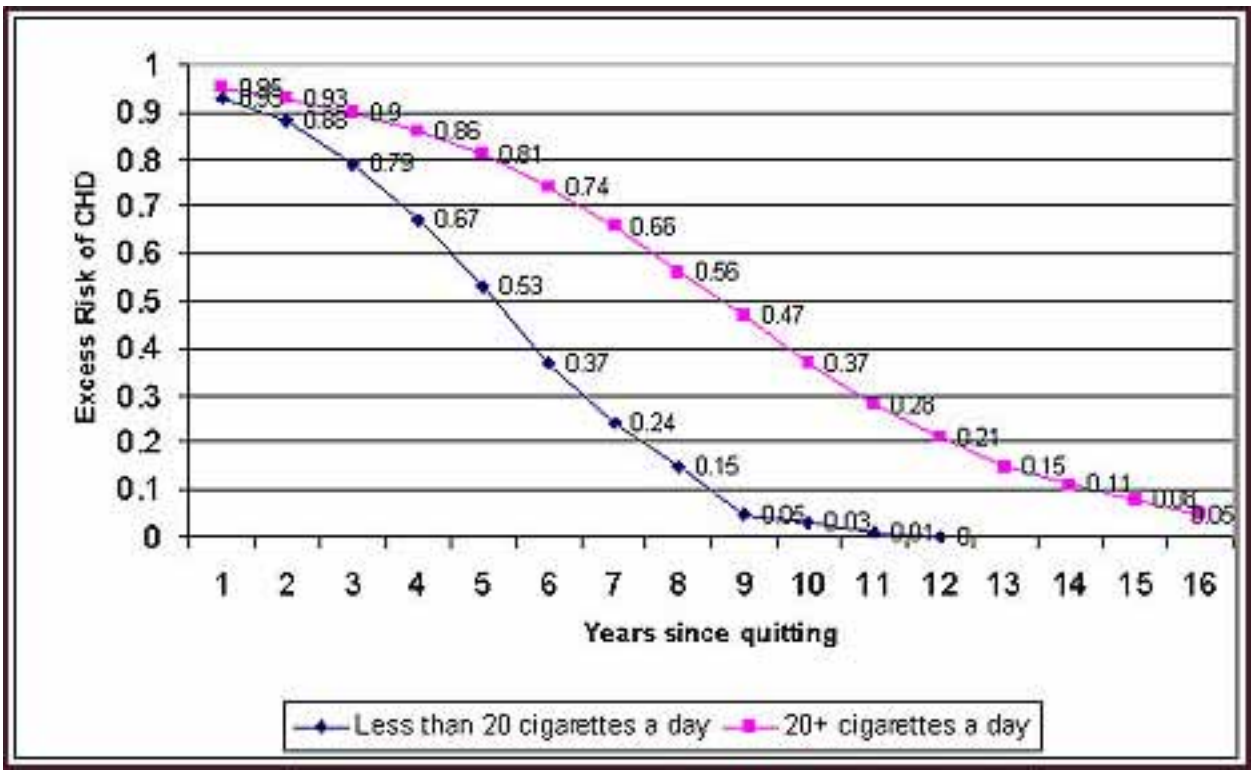
Figure 26: Effect of Smoking Cessation on Annual Excess Lung Cancer Risk, by level of former cigarette consumption and years since quitting (rate)



Source: Oster, *op cit.*

The American Cancer Society study also found that former light smokers reduced their risk of death from coronary heart disease by half within five years, with a complete return to non-smoker risk levels after the 10th year of cessation. By contrast, former heavy smokers took far longer to reduce their risk of death from heart disease: It took seven years to reduce the risk by one-third, and more than 10 years to reduce it by two-thirds (Figure 27) {Oster, *op cit.*}.

Figure 27: Effect of Smoking Cessation on Excess Coronary Heart Disease Risk, by level of former cigarette consumption and years since quitting (rate)



Source: Oster, *op cit.*

However, smoking causes a decline in lung function that is irreversible, so the decline in risk of death from chronic obstructive pulmonary disease (COPD) is not nearly as dramatic as with lung cancer and heart disease. Smokers can 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.

From the epidemiological evidence, Oster *et al.* estimated that light smokers who stopped would reduce their risk of COPD by about 50% compared to continuing light smokers; former moderate smokers by about 62% compared to continuing moderate smokers, and heavy smokers by about 70% compared to continuing heavy smokers (Oster, *op cit.*). Risk levels in this category, however, would never return to those of non-smokers.

5.2 Economic Benefits

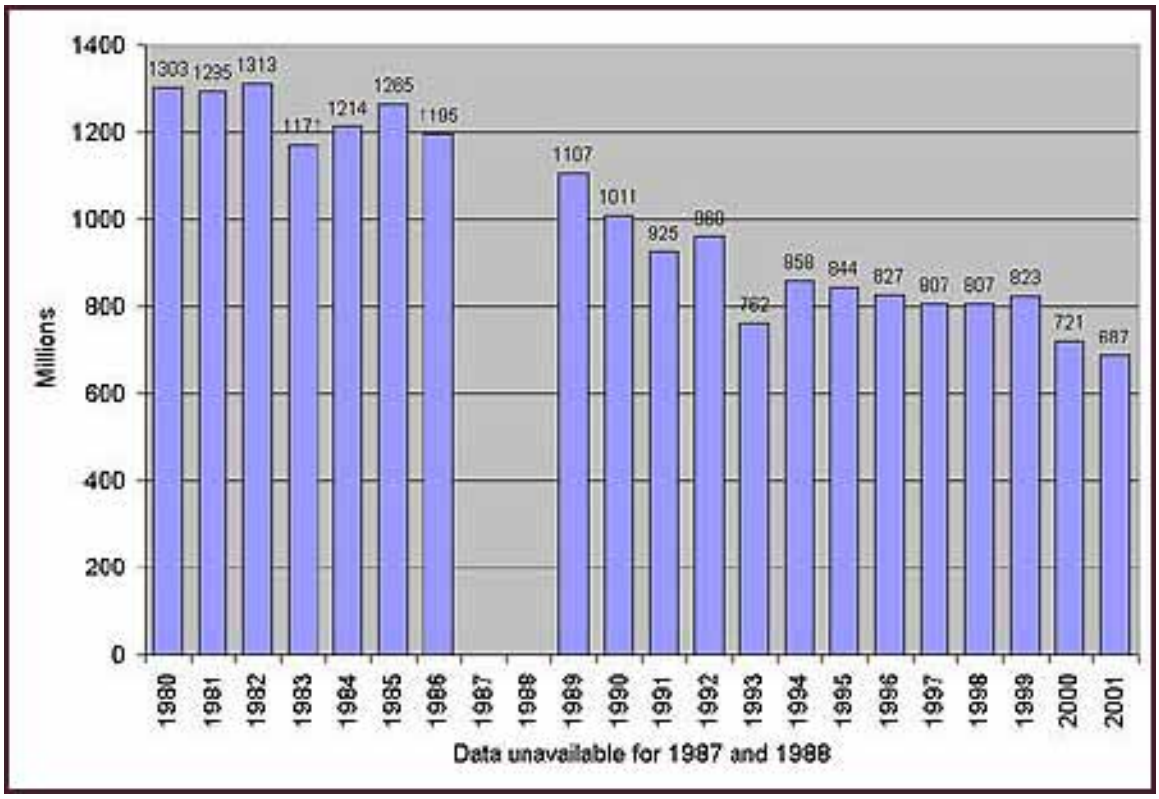
Quantifying, in economic terms, the benefits of smoking cessation can only be assessed over a smoker's lifetime, as cessation benefits increase gradually with each year's distance from smoking. Any economic analysis requires, first, a distinction between immediate and short-term gains on the one hand and long-term cost recovery on the other. And, analysis should be based on changing and declining "relative risk" ratios (separately developed for each illness in accordance with years of cessation) in each year after quitting.

Perhaps the most immediate economic benefit of cessation, and one rarely considered in cost-benefit analyses of smoking, is that the ex-smoker saves money. Indeed the savings can be huge. The Canadian average age for first smoking a whole cigarette is 13.1 years (CTUMS 2000). Although there is not a specific estimate for NL, the Nova Scotia Student Drug Use Survey 1998 estimate of average age for first smoking a whole cigarette is 12.7 years. Assuming the average Newfoundlander who smokes starts at age 13, and assuming an average one-pack-a-day habit to age 30 and 65, at about $8.00/pack, a smoker will spend about $50,000 on cigarettes by age 30 – almost enough for a modest starter home – and about $152,000 by retirement age. These figures are for cigarette purchases only, and do not include any associated medical costs of smoking-related illness and/or addiction treatment.

Newfoundlanders legally purchased the equivalent of 687 million cigarettes in 2001 (428 million in manufactured cigarettes and 259 million in equivalent cigarettes from fine-cut tobacco). While the number of manufactured cigarettes is only slightly higher than the low point of 414 million in 1998, it should be noted that equivalent cigarettes from fine-cut tobacco totalled 392 million in 1998 for total cigarette sales of 807 million in 1998 (Figure 28).[26]

[26] These figures do not include the number of cigarettes purchased illegally.

Figure 28: Cigarette Sales, Both Manufactured and Fine-Cut Tobacco Equivalents, 1980-2000



Source: Health Canada, Tobacco Control Programme, *Imported and Domestic Cigarette Sales, 1980-2001*

Low-income earners smoke more than high-income earners, with those in the lowest income bracket two and a half times more likely to smoke than those in the highest income bracket. Smoking cessation will therefore likely benefit lower income Newfoundlanders more, increase their disposable income, and create greater social equity.

Because almost all cigarettes are imported, this tobacco expenditure impacts the local economy by siphoning money from NL to central Canada. Money not spent on cigarettes but spent on other goods and services would generate additional employment and tax revenue for NL, as it is highly unlikely that the money saved would be spent entirely on imports. The shift in spending patterns would produce more spin-offs to the local economy and stem the current outflow to central Canada. As cigarette sales amount to about 1% of provincial GDP, local benefits would likely be substantial in any shift from tobacco to other products.

A University of Michigan study comparing the economic spin-offs from tobacco with those of other industries concluded that American states would be in better economic shape if people spent their money on consumer goods other than cigarettes (Moore, *op cit.*). This is confirmed by Canadian data. Because the cigarette manufacturing process is highly automated, the industry has seen declining employment since 1992, employing only 2,350 workers in 1997, even while profits have increased dramatically (Statistics Canada, 1999c).

In sum, smoking cessation will produce immediate economic benefits by increasing the disposable income of former smokers, decreasing the financial drain on lower income Newfoundlanders, and redirecting a portion of consumer spending from imports to locally produced goods.

There is a second immediate short-term benefit of smoking cessation. Unlike other longer-term health and life expectancy gains, smoking cessation among pregnant women will produce immediate short-term benefits from a lower proportion of low birth-weight babies and other birth complications. Due to the very high costs of neonatal intensive care, smoking cessation before the end of the first trimester will translate into significant health benefits and economic cost savings without delay (Lightwood *et al*., 1999).

For lung cancer, heart disease, and COPD, and using a 3% discount rate, Oster *et al.* (1984) calculated the economic benefits of quitting according to sex, age, and intensity of former smoking.[27] They estimated both the direct health care savings and the indirect productivity savings to the economy (assuming a 1% annual rate of growth in labour productivity.) For the purposes of this study, a profile has been developed of the average Canadian quitter, from data in the 1999 Canadian Tobacco Use Monitoring Survey, and from other Canadian data. Quitting rates within each age category were examined and multiplied by the number of smokers within each age group to ascertain that the mean age of quitting in Canada is about 44 years old. This means that roughly half of all Canadian quitters are 44 years and older and half are younger (CTUMS 1999b). To ascertain the average lifetime benefits of quitting among Newfoundlanders who stop smoking, Oster's estimates for the 40-44 year age group have been taken.

However, one core GPI principle has been applied to the use of Oster *et al.*'s estimates in this analysis. In the Oster study, the estimated costs of smoking and benefits of quitting are very much lower on a per capita basis for women than for men, largely because the *indirect* productivity losses and gains are a lot less. (Per capita health care costs do not differ much). The

[27] All cost-benefit estimates related to smoking are highly sensitive both to the methodology used to calculate savings, and to the choice of discount rate in assessing lifetime costs and savings. Simply put, the size of the discount rate reflects the value placed on the future in relation to the present. The lower the discount rate (the less the future is "discounted"), the more future years of life are valued, and the higher the estimate of potential savings from smoking cessation. A difference of a single percentage point in the discount rate can change cost-benefit outcomes by a third. The 3% discount rate used by Oster *et al.* (1984) is definitely at the lower end of the range of possible discount rates that can go as high as 8% or 10% (the rate recommended by Canada's Treasury Board.) Oster's results, therefore, yield much higher values than studies using higher discount rates.

productivity difference reflects women's much lower rate of labour force participation in 1980, as well as lower female wages, both of which are the basis for the productivity calculations.

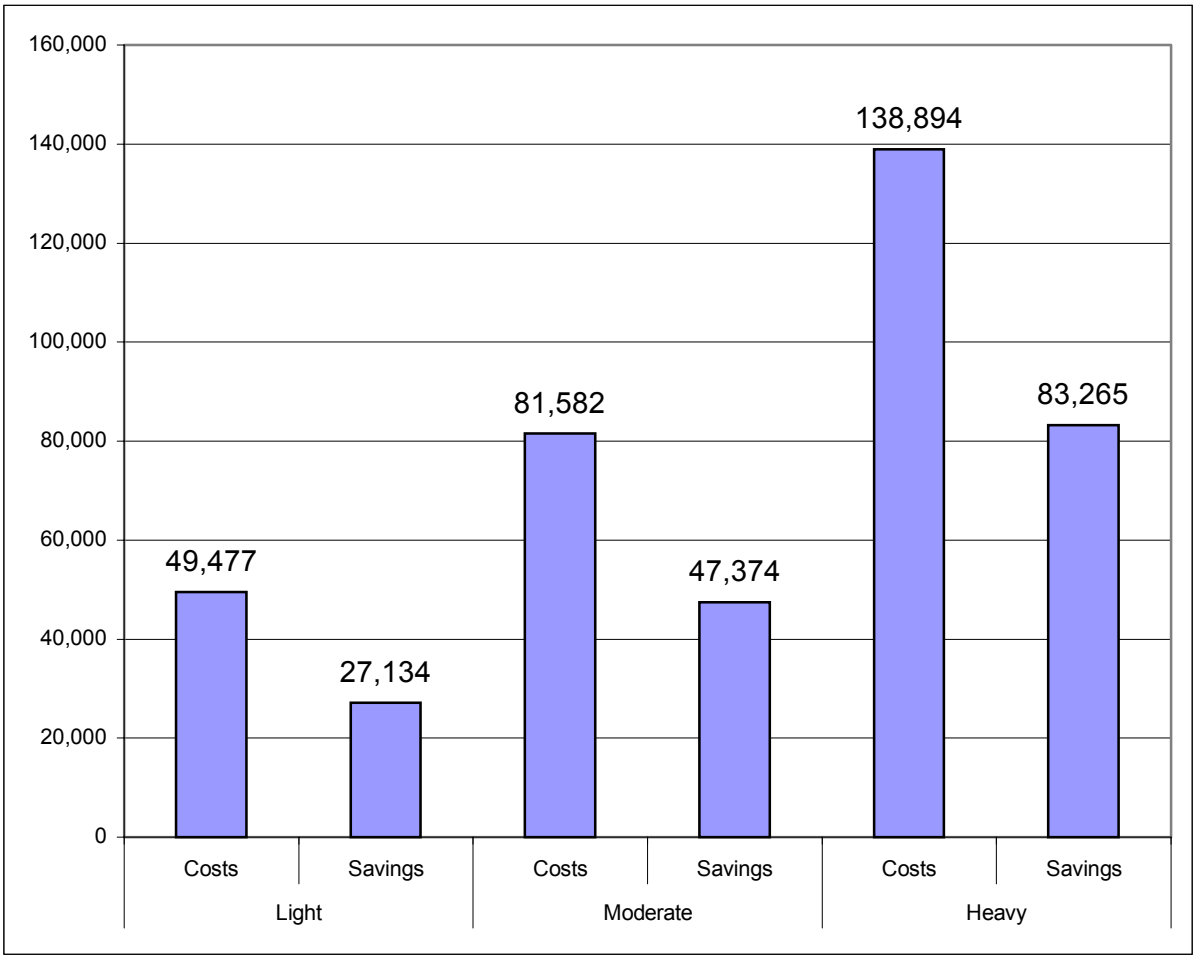
By contrast, GPI*Atlantic* explicitly values unpaid household work, two-thirds of which is still performed by women, and thus includes in the GPI both paid and unpaid work in any analysis of productivity value (Colman, 1998). Further, an earlier GPI*Atlantic* report on women's health in Atlantic Canada also points to the continuing gender wage gap that, according to Statistics Canada, remains largely "unexplained" (Colman, 2000c; Drolet, 1999). As equity is a core GPI principle, it is counter-intuitive to value women's work less than men's in an estimate of indirect costs of smoking and benefits of quitting. The value of women's life gained from smoking cessation is thus held here to be equal that of men, and Oster *et al.*'s estimates for male costs and benefits are held to be reflective of all Newfoundlanders.

Several other adjustments are necessary to Oster *et al*.'s figures, but the two most important of these roughly cancel each other out. First, Oster *et al.* examined the costs and cessation benefits of only three smoking-related illnesses. An examination of the morbidity and mortality ratios of *all* smoking related illnesses indicates that these three illnesses, while certainly the major killers of smokers, account for only about 75% of all smoking-related death and illness. Important disease categories not included in the Oster *et al.* analysis include stroke and other cancers besides lung cancer.

At the same time, comparative data from the Canadian Institute for Health Information clearly indicate that U.S. health care costs are considerably higher than comparable Canadian costs. In 1997, total per capita public and private expenditures on health care in the U.S. were almost double those in Canada (Canadian Institute for Health Information, *op cit.*) Though direct health care expenditures are only a portion of total costs considered by Oster *et al*., indirect costs and benefits should also be adjusted by the difference between the U.S. and NL average industrial wage.

It has been estimated that the upward adjustment for the illnesses not included by Oster *et al.*, and the downward adjustment to reflect NL's lower health costs and wages will roughly cancel each other out. Oster *et al*.'s lifetime cost and saving estimates for smoking and cessation for the 40-44 year age group have therefore been provisionally applied to NL to estimate the benefits of cessation for the average quitter (Figure 29). Greater precision and more direct measurements are clearly desirable in future updates of this report.

Figure 29: Total Lifetime Costs of Smoking and Benefits of Quitting, age 40-44 per Smoker and Ex-Smoker, ($)



Source: Oster, *op cit.*

It is seen from Figure 29 that a light smoker costs the NL economy $49,000 over his or her lifetime. Quitting saves approximately $27,000 of those costs. A moderate smoker incurs lifetime costs of nearly $82,000. If she or he quits, about $47,000 of those costs is avoided. A heavy smoker incurs costs of nearly $139,000, but saves about $83,000 of those costs by quitting. While the "cost recovery ratio" is highest for young smokers who save the most in avoided costs from quitting early, cost recovery ratios are still significant for older smokers.

In 2001, there were 113,080 smokers in NL consuming a total of 687 million cigarettes (CTUMS 2001).[28] Using Oster *et al.*'s estimate, if 10% of those smokers quit, they would save the NL economy over $594 million in costs over their lifetimes, both through reduced burden on the health care system, and through avoided productivity losses due to premature mortality and

[28] Cigarette sales data from Health Canada, Tobacco Control Programme

sickness. This rough estimate assumes that an equal number of light, moderate and heavy smokers quit, with quitters evenly spread across ages.

If current Newfoundlanders 15+ years in age smoked at the current Canadian rate (21.7% as opposed to NL's 25.7%), and assuming that among the 17,600 smokers who would quit would be an equal number of light, moderate and heavy smokers with an even spread of ages, approximately $925 million in avoided costs would be saved over their lifetimes. Assuming an average quitting age of 44, and an additional 30 years of life, that method would yield lifetime savings of nearly $624 million.[29]

The economic benefits of quitting are averaged here over *all* smokers. Clearly many will not die of lung cancer, heart disease and chronic obstructive pulmonary disease (COPD). Relative risk ratios recognize the increased *risk* of smoking-related illnesses for smokers, but do not imply that all smokers develop the illnesses. Therefore, the *actual* lifetime costs for smokers who do suffer from these illnesses due to smoking are very much higher.

Table 5 shows savings to Newfoundlanders if they smoked at British Columbia rates (the lowest in Canada), at Ontario rates (second lowest), and at average Canadian rates. Years of life saved are calculated at 28 minutes per pack (at a 5% discount rate), as assessed by studies on premature mortality due to smoking (Manning, *op cit.*).[30] Because former smokers have a higher risk of mortality and illness for several years after quitting, life, health care and economic savings will not accrue immediately but over the long term.

Regarding health care costs, even though the weight of evidence in sub-section 4.3 indicates that the CCSA estimate is conservative, that study nevertheless remains the only one with explicit estimates for NL. For this reason, the estimates of health care savings in Table 5 are based on the CCSA assessments and should therefore be considered minimum potential savings, with actual cost savings likely to be higher.

[29] The average 30-year life-span assumption is calculated as follows: Smokers lose an average of seven years of potential life. Applying the 60% cost recovery ratio for moderate smokers (based on $47,000 in avoided costs out of $82,000 in costs had smoking continued), it can be estimated that the average quitter gains back 4.2 years of life that would have been lost had he or she continued smoking.

[30] For each pack smoked, the smoker loses 28 discounted minutes of life expectancy at a 5% discount rate. Varying the discount rate will change the estimate substantially. For a full explanation of discounting, please see the GPI*Atlantic* greenhouse gas and water resource reports for Nova Scotia, available at www.gpiatlantic.org.

Table 5: Potential Savings to Newfoundlanders if They Smoked Less (millions 2001$)

Smoking Rate 2001		**Packs Smoked 2001** (millions)		**Money Spent 2001**	**Medical Care Costs 2001** (from CCSA)	**Productivity Losses 2001** (from CCSA)
NF rate (25.7%)		27.5		$140.5	$53.0	$139.2
If Newfoundlanders smoked at:	**% Less Per Year**	**Packs a year less smoked** (millions)	**Years of NL Life Saved** (per year)	**Money saved on cigarettes** (per year)	**Future Direct Health Care Costs Saved** (per year)	**Future Economic Savings** (per year)
BC rate (16.7%)	35%	9.6	511	$49.2	$18.6	$48.7
ON rate (19.7%)	23%	6.3	336	$32.3	$12.2	$32.0
CDN rate (21.7%)	15%	4.1	218	$21.1	$8.0	$20.9

Sources: CTUMS 2001; Manning, *op cit.*; Single, *op cit.*

* From premature deaths of smokers and morbidity related on-the-job productivity losses (see sub-section 4.4.5).

Table 5 reflects an annual assessment of the potential years of life saved. These savings are cumulative over time: Every year that Newfoundlanders maintain lower rates of smoking, potential years of life saved accumulate at approximately the rate given. Such savings objectives are not unreasonably ambitious. The U.S. Surgeon-General has outlined a plan to halve the U.S. smoking rate from 25% today to 12% in 2010; and to cut teenage smoking from 35% today to 16% in 10 years (Picard, 2000).

6. The Economics of Tobacco Control

As mortality and morbidity due to smoking is directly related to intensity and duration of cigarette consumption, many different combinations of actions can produce the cost savings outlined in Section 5. The intensity of consumption can be reduced (people can smoke less), smokers can quit, and teenagers can avoid tobacco use completely. Efforts to reduce smoking prevalence in NL must clearly involve *both* active cessation by current smokers *and* active discouragement of potential new smokers, with particular focus on youth who are most susceptible to "taking up the habit". A comprehensive approach should include strategies to change societal knowledge and attitude towards tobacco products and the tobacco industry in order to influence behaviour and action.

This section of the study assesses the potential cost-effectiveness of six smoking reduction interventions:

- Tobacco tax increases
- Youth-based smoking intervention
- Counselling for pregnant women
- Anti-tobacco advertising
- Physician advice and nicotine-replacement therapy
- Smoking bans in public places

Experience from many jurisdictions demonstrates that the combination of various interventions is far more effective than any single one alone. For example, a study on Canadian tobacco control published in the *American Journal of Public Health* found that, while higher cigarette prices and no-smoking by-laws are both effective in controlling smoking, either alone will have less impact than the two measures together (Stephens *et al*., 1997). Therefore, although the following sub-sections examine the cost-effectiveness of alternative interventions separately, this does not imply that discrete choices should be made simply according to higher cost-benefit ratios for certain strategies. Employing several strategies in tandem will enhance the overall cost-benefit ratio of *all* interventions. That cannot be demonstrated in the separate cost-benefit analyses that follow, and must therefore be stated explicitly in this preamble.

Also, as pointed out earlier, smoking rates, and therefore the economic costs of smoking, vary based on region. Therefore, anti-tobacco interventions targeted at regions with higher smoking rates and in particular regions with higher youth smoking rates may be particularly cost-effective.

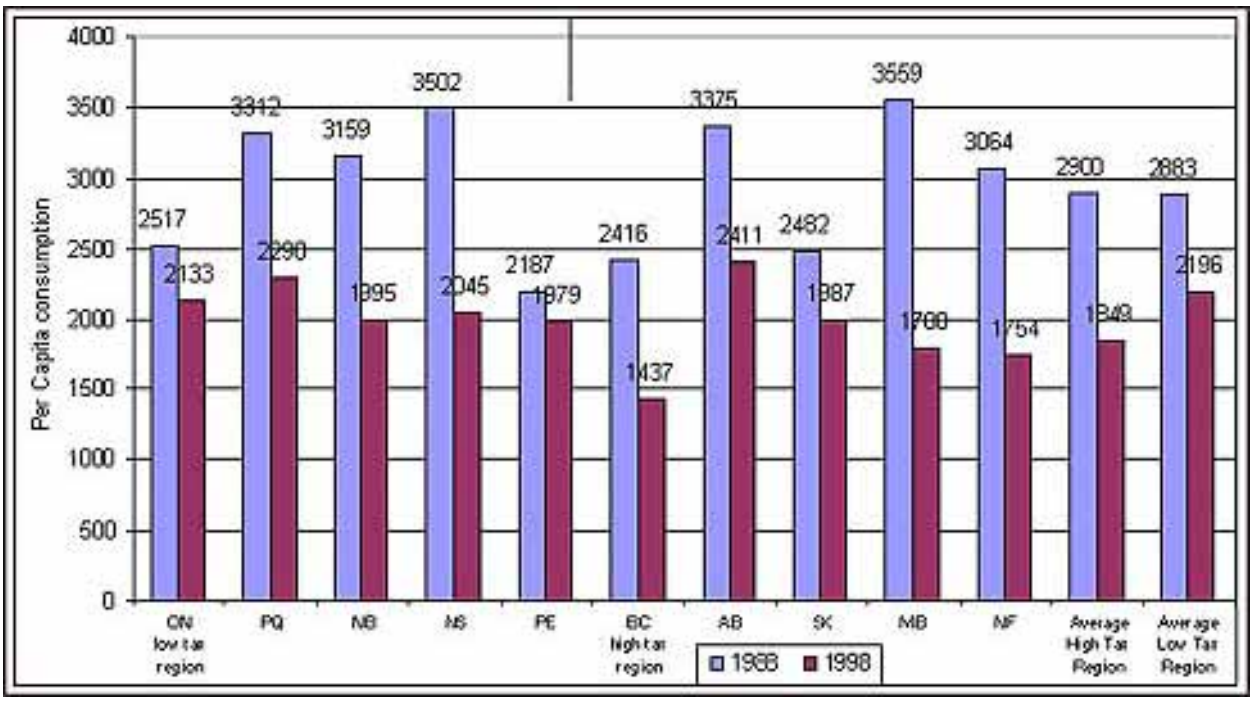
6.1 Tobacco Tax Increases

A detailed 1999 World Bank assessment of alternative tobacco control interventions throughout the world concluded "tax increases are by far the most cost-effective intervention, and one that compares favorably with many health interventions" (The World Bank, *op cit.*) Because it is literally a "stroke-of-the-pen" intervention, a tax increase incurs "zero or minimal costs" to implement, according to the World Bank. The assessment further found that, even accounting for the consequent drop in cigarette consumption, a modest 10% increase in cigarette excise taxes would increase tobacco tax revenues by about 7% (The World Bank, *op cit.*).

Examining the prevalence of smoking (smoking rates) in Canada and NL (Figure 1 and Figure 2) might suggest little correlation between the rate of decline in smoking and the 1994 tax cut that then separated the country into high tax (BC, AB, SK, MB, NF) and low tax (ON, QC, NB, NS, PE) regions. For example, of the five provinces that have seen the greatest decline in rates since 1985 (in order, BC, QC, PE, ON, NL), two of these (BC, NL) have been in the high tax bracket while the other three (QC, ON, PE) have been in the low tax bracket.

An examination of data on annual per capita consumption of cigarettes, however, reveals a different conclusion. In 1988, the average per capita cigarette consumption was slightly higher in the high tax region. Ten years later, the low tax region consumed an average of 19% more cigarettes per capita a year than the high tax region (Figure 30). Examining solely the percentage of current smokers, therefore, masks the dramatic decline of tobacco consumption that occurred in high tax regions compared to low tax regions. High cigarette taxes can reduce total tobacco consumption quite independently of changes in smoking prevalence.

Figure 30 Per-Capita Consumption (15+) of Cigarettes and Equivalents, 1988-1998



Source: Canadian Cancer Society, *op cit.*

Newfoundland & Labrador began taxing cigarettes in 1964, at just a quarter of a cent per cigarette. By 1972 the rate had quadrupled to 1¢/cigarette, and 20 years later had grown to 7.78¢. A substantial hike of 2.5¢/cigarette occurred in 1993 (to 10.28¢), followed by increases in 1997 and 2002 to the current level of $13.5¢/cigarette (though a reduced rate applies to Labrador City, Wabush, and coastal area of southern Labrador). In 1989 the NL government set the fine-cut rate at two-thirds the rate for cigarettes. That two-thirds rate has held steady ever since.[31] The latest provincial increase for cigarettes, in March 2002, followed a federal tax increase of $1.50 per carton in November 2001 (Finance Canada, 2001).

Given the evidence that higher tobacco taxes help reduce cigarette consumption, the recent substantial increases in tobacco taxes in NL should help achieve markedly reduced consumption in the province. Expected declines in consumption in response to price increases are determined by "price elasticity" ratios, expressed in terms of the anticipated decline in consumption that can be expected from a 1% increase in prices. Because nicotine is addictive, tobacco is relatively more "price inelastic" than some other consumer products.[32]

A study published in the *British Medical Journal* found the price elasticity of demand for cigarettes to be -0.5 for men and -0.6 for women. In other words, every 10% increase in

[31] Data furnished by H. Ryan, NL Statistics Agency, pers. comm., March 2003.
[32] For discussion of price elasticity in relation to tobacco, see Canadian Cancer Society, *op cit.*

cigarette prices would lead to a 5% decline in consumption among men and a 6% decline in consumption among women (Townsend *et al.*, 1994). That finding is very slightly higher than the U.S. Surgeon-General's estimate of -0.47 overall price elasticity for cigarettes, with similar results calculated for Western Europe and Canada (Canadian Cancer Society, *op cit.*). An assessment by the World Bank is somewhat more conservative, and estimates that a price rise of 10% on a pack of cigarettes would reduce demand by about 4% in high-income countries such as Canada (The World Bank, *op cit.*).

The most recent federal and NL tobacco tax increases[33] represent about a 10% price increase for a carton of cigarettes in NL between 2001 and March 2003. The average retail price in December 2002 in NL for a carton of cigarettes - $62.52 – was, after New York, the second highest of all eastern Canadian provinces (ON, QC, NB, NS, PE, NL) and neighbouring U.S. states bordering Canada.[34] Given the foregoing estimates, the 10% tax increase can be expected to reduce cigarette demand by 4-5% in the province, or by 27-34 million cigarettes annually from 2001 levels.

The effectiveness of price increases in controlling tobacco consumption is demonstrated by comparative analysis. For example, on January 1, 1993, Massachusetts imposed a 25-cent excise tax on cigarettes that raised prices by 15% per pack. Four months later, cigarette manufacturers responded by reducing prices, so that most smokers experienced an increase in the cost of smoking for less than 6 months. Nevertheless, consumption data show a 12.5% drop in cigarette sales in Massachusetts from 1992 to 1993, compared with a 3% drop nation-wide. A follow-up phone survey found that the price increase had helped persuade 3.5% of smokers to quit completely, and an additional 35% to consider quitting. Even more had cut back on consumption (Biener *et al*, 1998).

Similarly, a 25-cent tax per pack on cigarettes (on top of the existing 10-cent tax) in California in 1989, as part of the Proposition 99 anti-tobacco measures, is credited with doubling the rate of decline of cigarette purchases in the ensuing three years. From 1980 through 1988, per capita cigarette purchases had been declining at an average annual rate of 3.6%. Following the tax increase, purchases fell by an average of 7.2% per year from 1989 to 1991 (Breslow and Johnson, 1993). Twenty percent of the new tax revenues were specifically designated by the Proposition 99 initiative for anti-tobacco education in schools and communities, and funded a major anti-smoking advertising campaign. Therefore, only a portion of the dramatic decline in sales can be attributed directly to the price increase. Nevertheless, it is noteworthy that the tax itself made possible the other tobacco control activities, and so remains the primary agent in bringing about the decline in smoking. It is also noteworthy that the first year of the California price increase saw the sharpest decline in consumption (9.4% in a single year).

[33] $1.50 in federal tax in November 2001, and $4.50 in provincial tax in March 2002

[34] Source for average retail figure for carton price in NL and from across Canada and bordering states: Smoking and Health Action Foundation, Ottawa

> *Clearly, the California tobacco excise tax sharply accelerated the drop in both sales of cigarettes and in smoking. The data also suggest that the impact of the tax did not continue alone. The state's paid advertising campaign against tobacco use and its many other statewide, regional, and local tobacco control activities supported by revenues from that tax already seem to be contributing to curtailment of cigarette smoking among Californians* (Breslow and Johnson, 1993.).

6.1.1 Effects of Price Increases by Income Level and Occupation

In addition to finding that tobacco price increases have a marginally greater impact on women than men, the aforementioned study published in the British Medical Journal also found differences in impacts according to income (Townsend, *op cit.*). (This helps explain the World Bank's assessment that a 10% increase would lead to an 8% decline in low-income countries but only a 4% decline in high-income countries {The World Bank, *op cit.*}.) Simply put, poorer people can less afford to smoke.) In that study, for the lowest income group (bottom one-fifth), the price elasticity was -1.0 for men, and -0.9 for women. That means that a 10% increase in price would lead to a 10% decline in consumption among the lowest income groups, which *also* have the highest rates of cigarette consumption (Townsend, *op cit.*).

For unskilled manual workers, the price elasticity of demand was -1.4, (compared to zero for professional men,) indicating that a 10% price increase would produce a 14% decline in consumption for those workers. The authors concluded "tax increases would have the greatest impact on men with the highest smoking rates and mortality," and could actually help reduce social inequities:

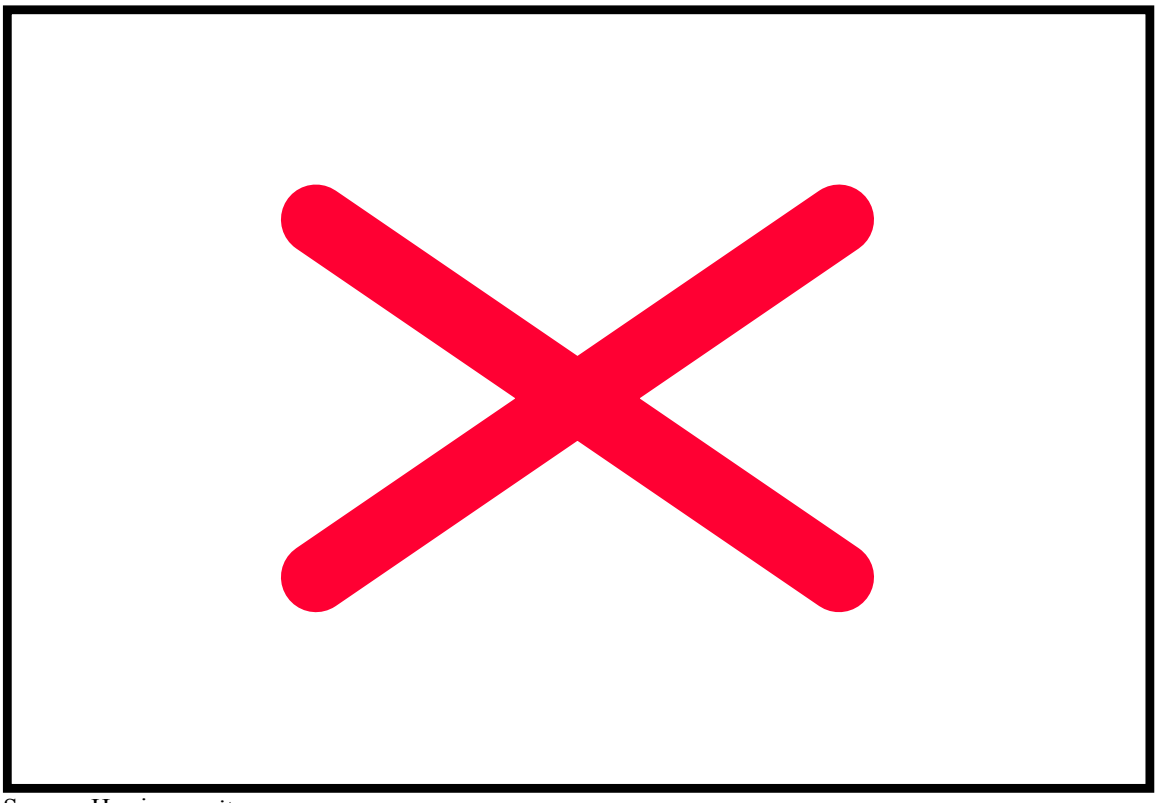
> *There is little doubt that price has a major effect on cigarette consumption and thus smoking related diseases, especially in low socioeconomic groups. To use this effective tool of preventive medicine therefore seems the right public policy.*
>
> *Our results suggest that the main effects of increasing the real price of cigarettes (for example by tax increases) would be to reduce the prevalence of smoking in men and women in lower socioeconomic groups (those with the highest levels of smoking and the greatest mortality from smoking related diseases....This suggests that real increases in the price of cigarettes will both reduce smoking and help to reduce the differences in the prevalence of smoking and smoking related diseases between socioeconomic groups* (Townsend, *op cit.*).

6.1.2 Effects of Price Increases on Youth Smoking

Numerous studies have found an equally strong relationship between price and youth smoking trends. In Canada, the prevalence of smoking among young people declined by 52% between 1980 and 1989, as the price of cigarettes doubled, a trend that was sharply reversed in the 1990s (Stephens, 1997, *op cit.*).

The most detailed study of the relationship between price and youth smoking was a U.S. analysis of 34,145 respondents aged 15-29 to the 1992-1993 Tobacco Use Supplements to the Current Population Survey (Harris and Chan, 1999). That study found that, within this age group, the price elasticity of current smoking varied inversely with age (Figure 31). Note that Figure 31 reflects the effect of price on smoking *prevalence* rather than on level of consumption as discussed above.

Figure 31: Price Elasticity of Current Smoking by Age, 15-29, U.S.A.



Source: Harris, *op cit.*

The authors found their results had important implications for public policy, as price seemed to have the greatest impact on discouraging young experimenting smokers who were not yet addicted. They determined that among 15-17 year olds, the price elasticity of smoking some days was six times greater than the price elasticity of smoking every day (-1.85 compared to -

0.3). In other words, a 10% price increase produced an 18% reduction in occasional smoking, but only a 3% reduction in daily smoking.

> *Public health policy needs to consider the impact of price increases on the number of experimenting smokers, and not just the number of young people who smoke every day. Our findings suggest that nicotine addiction is acquired and reinforced over an extended time period, starting in the teenage years and continuing at least through the mid-to-late 20s.*
>
> *In a young experimenter, whose 'stock of addictive capital' is relatively low, an increase in price can result in an abrupt, permanent shift to a new, non-smoking lifetime trajectory. As the smoker's addictive stock grows, however, an increase in price is more likely to cause only a marginal reduction in the number smoked. At the youngest ages, the impact of a change in price may also be amplified by bandwagon effects* (e.g. reduced peer pressure) {Harris and Chan, 1999.}.

These conclusions are confirmed in a report by the U.S. Surgeon-General on youth smoking, which also found that price is more likely to affect the decision to start smoking than to affect the behaviour of those who have already begun (U.S. Centers for Disease Control and Prevention, 1994). Several other U.S. studies confirm the conclusion that price elasticity varies inversely with age. A 1981 study found that a 10% increase in price would reduce youth smoking by 12%. Recent estimates are more conservative, but still find that a 10% increase in the price of cigarettes would reduce the number of teenagers who smoke by 7% and daily consumption of teenage smokers by 6%, well in excess of estimates for the general population (Grossman and Chaloupka, 1997). Finally, an assessment of a proposed Congressional 43-cent tax hike that would raise cigarette prices by 23% estimated that teenage smoking would fall by 16% and teenage cigarette consumption by 14% if the bill became law (Grossman and Chaloupka, 1997).

Given these estimates, the recent 10% price hike in NL should translate into about 616-1,056 fewer teenage smokers aged 15-19 (from a total of about 8,800 in 2001), while cigarette consumption by teens in this group would drop by about one cigarette per day per teen smoker. For comparison, factoring the Congressional assessment, a 23% hike could translate into about 1,400 fewer teen smokers aged 15-19, and a drop of about two cigarettes per day per teen smoker.

In particular, given the evidence examined above, there would be a large group of potential teenage smokers who would never use tobacco. Every day in NL about 12 teenagers try a cigarette for the first time and about half of them will become daily smokers. Like 90% of current smokers, they will be addicts by the time they turn 20.[35] Given the very high price elasticity for beginning experimental smokers noted above, a 10% price increase is likely to discourage 2-3 NL teenagers every day from starting to smoke.

[35] Based on estimates in U.S. Centers for Disease Control, *op cit.*

A 1997 study published in the Public Health Reports found that peer pressure has a "positive multiplying effect" on teenage smoking:

> *A rise in price curtails youth consumption directly and then again indirectly through its impact on peer consumption (if fewer teenagers are smoking, fewer other teenagers will want to emulate them) ... an excise tax hike is a very effective policy with regard to teenagers because they are so sensitive to price....a substantial tax hike would curb youth smoking; this strategy should move to the forefront of the antismoking campaign* (Grossman, *op cit.*).

These findings are critically important in assessing the long-term impacts of tobacco control policy measures, because 90% of smokers begin the habit as teenagers, and 82% of daily smokers began smoking before age 18 (U.S. Centers for Disease Control, *op cit.*).

Therefore, "cigarette control policies that discourage smoking by teenagers may be the most effective way of achieving long-run reductions in smoking in all segments of the population":

> *A tax hike would continue to discourage smoking for successive generations of young people and would gradually affect the smoking levels of older age groups as the smoking-discouraged cohorts move through the age spectrum. Over a period of several decades, aggregate smoking and its associated detrimental health effects would decline substantially* (Grossman, *op cit.*).

From an economic perspective, the evidence that tax hikes have a disproportionate impact on youth makes them a particularly cost-effective policy instrument. The estimates in sub-section 5.2 on the potential cost savings of smoking cessation are based on the existing profile of Canadian quitters (mean age: 44), but any measure that reduces smoking at younger ages will dramatically amplify these savings.

According to Oster *et al*.'s (1984) lifetime analysis of the benefits of quitting, lowering the mean age of quitting by 10 years can increase the total economic benefits of quitting by 62%.[36] Using another Oster estimate, GPI*Atlantic* has already calculated that if 10% of NL smokers quit, they would save the provincial economy over $594 million in costs over their lifetimes (see sub-section 5.2). On top of that, if the mean age of quitting were 10 years younger than at present, a 10% reduction in cigarette consumption would produce an additional $368 million in savings. Thus, the cost-effectiveness of tax hikes is greater for hikes that more effectively discourage youth smoking than adult smoking.

One other element of tax increases further amplifies their cost-effectiveness. Among the general population a 10% rise in prices will cause cigarette consumption to fall by about 4% (compared

[36] This calculation is based on moderate smokers aged 35-39 compared to moderate smokers aged 45-49.

to 7% among teenagers.) However, longer-term analyses have found that this decline has a multiplier effect over time. Thus, a 10% price rise will indeed reduce consumption by 4% after one year, but by as much as 8% after 20 years (Grossman, *op cit.*).

6.1.3 Closing a Tax Loophole

Throughout this report, "tobacco" and "cigarettes" have been used almost interchangeably. But at this point, a distinction is necessary. Raising tobacco taxes on cigarette prices will have only a limited effect on tobacco consumption if other tobacco products, such as "fine cut" or "roll your own" tobacco, are not taxed comparably. New "expanded" tobacco products reduce the amount of tobacco (to less than a gram) needed in a roll-your-own cigarette and thus provide more cigarettes per weight, while lowering the purchase cost of smoking. Taxes have not adjusted to this new reality.

Federal excise tax and duty on fine-cut tobacco is just $8.30 per 200 grams of fine-cut tobacco compared to $12.35 for 200 cigarettes (Finance Canada, *op cit.*). With the exception of British Columbia and Alberta, all provinces have far lower provincial taxes on 200 grams of fine-cut tobacco than they do on 200 cigarettes.[37]

These discrepancies help explain why NL, with some of the highest taxes on manufactured cigarettes in the country, still has a smoking rate 18% above the national average. The consumer cost for tobacco in NL in 2001 was 28 cents for a manufactured cigarette, but only 8 cents for a "roll-your-own" (Canadian Cancer Society, *op cit.*). Not surprisingly, fine-cut tobacco sales are about 45% of the total tobacco market in NL, more than double any other province. Newfoundland smokers are effectively evading the province's very high taxes on manufactured cigarettes by turning to roll-your-owns.

There is an important lesson here for NL if it the province continues to increase tobacco taxes. The Canadian Cancer Society recommends that the tax rate on the quantity of roll-your-own needed to make a cigarette (now considerably less than a gram) should equal the tax rate on one cigarette (Canadian Cancer Society, *op cit.*). To date, only British Columbia (with the lowest smoking rate in the country) and Alberta have done so, applying a uniform tax on 200 cigarettes, 200 tobacco sticks, and 200 grams of fine cut tobacco.

6.1.4 Government Revenues from Illegal Tobacco Sales to Minors

There are an estimated 8,750 underage smokers in NL (smokers under the age of 19). Assuming average cigarette consumption comparable to New Brunswick (nine cigarettes/day, per Canadian Cancer Society, *op cit.*) and that each underage smoker pays directly or indirectly for his/her cigarettes (indirectly through acquisition of cigarettes purchased by a legal-age smoker), NL

[37] Alberta, in a recent unprecedented provincial tax increase, introduced a uniform tax for fine-cut tobacco and manufactured cigarettes. Alberta Tax and Revenue Administration, March 2002.

children and underage teens will spend $9 million in 2003 on almost 29 million cigarettes. Based on these figures and current levels of federal and provincial tax, in 2003 the federal and provincial governments will collect $1.8 million and $3.9 million, respectively, from the illegal sale of cigarettes to minors in NL.

That no one should be able to profit from criminal activity or keep the proceeds of illegal activity is a fundamental principle of law. According to an analysis published in the *British Medical Journal*, if governments themselves followed this principle, they would "ringfence all of [their] income from tax on illegal sales of tobacco to children and dedicate that money to smoking prevention activities." A $5.7 million smoking prevention budget would go a long way to curbing smoking among teenagers in NL.

6.2 Youth-Based Smoking Intervention

As noted in sub-section 2.3, almost all persons who have ever smoked had their first cigarette sometime in their teens, and at least half of all ever-smokers have tried smoking by the age of 15 (CTUMS 2000). People who begin to smoke at an early age are more likely to develop severe levels of nicotine addiction than those who start at a later age. To rephrase from earlier in this report, researchers have found that 12 to 13-year-olds experimenting with smoking becoming addicted within days of their first cigarettes, including manifesting withdrawal symptoms, needing more nicotine, and losing control over number of cigarettes smoked (Halifax Daily News, *op cit.*). Dr. David Kessler, Commissioner of the U.S. Food and Drug Administration, has called teenage nicotine addiction "a paediatric disease" (World Health Organization, 1998).

For a host of reasons, children and youth are very vulnerable to taking up smoking, and smoking is the addicted behaviour they are most likely to establish. Indeed, tobacco is often the first drug used by young people who may also use alcohol, marijuana, and harder drugs. Coverage was given earlier in this report to the particular role stress plays in the lives of teens, and how it relates to the incidence of youth smoking. Other key socio-demographic, socio-economic, environmental risk, and behavioural risk factors include:

- Being from a family of lower socio-economic status;
- Living in a single-parent home;
- Lack of parental support and associated challenges adolescents face in growing up;
- Lower self-image and lower self-esteem than peers;
- Low levels of academic achievement and school involvement;
- Accessibility and availability of tobacco products;
- Perceptions by adolescents that tobacco use is normative;
- Peers' use and approval of tobacco use;
- Lack of skills required to resist influences to use tobacco;
- Experimentation with any tobacco product;

- Insufficient knowledge of the health consequences of smoking (U.S. Centers for Disease Control, 1994).

Given (1) the extreme vulnerability of youth to starting smoking; (2) the consequent significant health problems among young people – cough and phlegm production, an increased number and severity of respiratory illnesses, decreased physical fitness, an unfavourable lipid profile, and potential retardation in the rate of lung growth and the level of maximum lung function; and (3) the significant economic benefits of reducing youth smoking rates, the importance of smoking intervention impacting on youth cannot be overstated. After the imposition of tobacco taxes, an action to be taken by the state, the next most logical interventions are those that can be done at home and at school.

6.2.1 Home-based Intervention

A cross-sectional study, published in the *British Medical Journal*, of the comparative effect of the impact of different types of smoking restrictions on more than 17,000 U.S. teenagers found that home smoking bans were the most effective of all place-based restrictions in preventing smoking uptake and reducing smoking prevalence. When compared with households that did not have smoking bans, the study also found that total home smoking bans had the strongest impact on preventing smoking among younger teenagers, but had a significantly deterrent effect at all ages. The study concluded:

> *Banning smoking in the home, even when parents smoke, gives an unequivocal message to teenagers about the unacceptability of smoking, as do restrictions on smoking in public places* (Wakefield *et al.*, 2000).

Across Canada, the National Population Health Survey found that about 22% of non-smoking teenagers aged 15-19 experience daily exposure to second hand smoke at home, a practice that not only endangers their health but makes it more likely that these teens will begin using tobacco (Health Canada, 1999a, *op cit.*).

6.2.2 School-based Intervention

School-based interventions, including prevention/cessation programs and smoking bans, appear to be most effective when delivered (a) by adhering to key principles for youth-targeted substance abuse programs; and (b) within a comprehensive school health model. A major review for Health Canada of best practices for preventing substance abuse in young people identified key principles that, if fully reflected in a program, increase the likelihood of program success. Grouped in four categories, the principles are:

1) *Build a Strong Framework*
    a. *Address protective factors, risk factors and resiliency: Focus on the factors that most directly promote resiliency or, conversely, contribute to substance use problems in the population of interest.*
    b. *Seek comprehensiveness: Tie activities to complementary efforts by others in the community for a holistic approach, and seek support through agency policy and municipal and other government regulation.*
    c. *Ensure sufficient program duration and intensity: Make certain there is sufficient contact time with participants; age appropriate coverage needs to occur through childhood and adolescence and needs to be intensified as the risk of participants increases.*

2) *Strive for Accountability*
    a. *Base program on accurate information: Base program aims on reliable and, ideally, local information on the nature and extent of youth substance use, problems associated with use and user characteristics.*
    b. *Set clear and realistic goals: Set goals, objectives and activities that address local circumstances, are linked logically and are measurable and time-limited.*
    c. *Monitor and evaluate the program: Evaluate the process and impact of efforts and ensure that costs are in line with program benefits.*
    d. *Address program sustainability from the beginning: From the outset, work toward long-term sustainability and integration of the program into the core activities of the relevant organization in the community.*

3) *Understand and Involve Young People*
    a. *Account for the implications of adolescent psychosocial development: See substance use issues within the context of the stages of adolescent development in order to respond most effectively.*
    b. *Recognize youth perceptions of substance use: In order to be credible with participants, programs need to take account of the way young people view the benefits and the risks associated with substance use.*
    c. *Involve youth in program design and implementation: Young people need to see themselves, and to be seen by others, as their own best resource for minimizing any harm associated with substance use.*

4) *Create an Effective Process*
    a. *Develop credible messages: Both the explicit and implied messages delivered in a program need to be viewed as realistic and credible by participants.*

b. *Combine knowledge and skill development: Skill development needs to be a central element in programs and it needs to be accompanied by accurate, objective information.*
c. *Use an interactive group process: Engage and involve participants in skill development activities and discussions.*
d. *Give attention to teacher or leader qualities and training: Select and train leaders or teachers who demonstrate competence, empathy and an ability to promote the involvement and interaction of young people* (Roberts *et al.*, 2001).

Such principles are behind the "comprehensive school health" movement in Canada, in which (as defined by the Canadian Association for School Health), the approach to school-based health promotion involves a broad spectrum of programs, activities and services, which take place in schools and their surrounding communities. A review in Ontario of 12 studies of the "effectiveness of the health promoting school approach" and 32 reviews of the "effectiveness of school health promotion" found that:

- *Health promotion interventions are most effective when they entail a multifaceted approach;*
- *Classroom education should be implemented in combination with changes to the school environment and/or family/community participation;*
- *When initiating the health promoting schools approach it is important to implement all components inherent to this approach* (City of Hamilton, 2001).

Indeed, the effectiveness of school-based smoking intervention programs appears to be enhanced and sustained by comprehensive school health education and by community wide programs that involve parents, mass media, community organizations, or other elements of adolescents' social environment. Programs that identify social influences to smoke and teach skills to resist those influences have demonstrated consistent and significant reductions in adolescent smoking prevalence. Lantz *et al.* (2000) conducted a comprehensive review of interventions and policies aimed at reducing youth smoking in the U.S. and concluded that prevention strategies are promising, especially if conducted in a coordinated way to take advantage of potential synergies across interventions. School-based smoking intervention that has been part of a larger community-wide initiative has been observed to have significant effects at reducing youth smoking at various time intervals following intervention (Perry *et al.*, 1992).

The adoption of a comprehensive school health approach to creating tobacco-free schools in NL would work to:

- Promote the health and wellness of students and staff;
- Prevent disease, disability and death caused by tobacco use;
- Assist students who are in need or at risk; andSupport those experiencing poor health caused by tobacco use.

Such an approach requires:

- Instruction about health and wellness, health risks and health problems associated with tobacco use, and providing students with opportunity to acquire knowledge, attitudes and skills to live a healthy life;
- An environment relating to physical, social, and emotional dimensions of school, community, and home that are healthy and safe and model the instruction being taught; and
- Services and support provided by the people around students, e.g. staff, peers, families, other professionals and community members to monitor the needs, identify resources and provide programs for students and staff.

Generally, schools with no-smoking policies have significantly lower rates of student smoking than schools lacking such policies (Wakefield, *op cit.*). As well, smoking bans work best within a more comprehensive approach to health promotion and illness prevention. Not surprisingly, bans also depend heavily on enforcement for success. Where bans are strongly enforced, an 11% reduction in uptake of smoking can be realized, but where poorly complied with, they are relatively ineffective (Wakefield, *op cit.*).

Given the price to be had from youth taking up smoking, almost any level of investment to prevent them from doing so and to help existing smokers quit would seem justifiable. It is worth restating here (from sub-section 4.1) that approximately 9,000 children and teenagers in NL who smoke today (including 1,980 in the 15-19 age bracket for whom data on the rate of smoking are available), or who will take up smoking, will die in middle age from it, while a similar number will die prematurely later in life.

The U.S. Surgeon-General has estimated that school-based anti-tobacco programs can prevent or postpone smoking in 20 to 40 per cent of adolescents (Picard, *op cit.*). A cost-benefit analysis by Health Canada of school-based smoking intervention programs in Canada concluded that a national smoking prevention program in Canadian schools that reached 1,167,000 pupils would cost $22.4 million annually, or $19.19 per student, based on a *minimum* program (Health Canada, 1997). The cost of such a program for NL's entire 2001 student population of 86,898[38] would be $1.67 million.

Stephens *et al.* (2000) determined that a minimum school-based program could result in an initial 6% reduction in teenage smoking among students exposed to the program, and a longer-term 4% reduction. They also estimated lifetime health care and productivity savings of $19,692 for every person who would have smoked but did not do so as a result of the program. Based on their analysis, a minimum program for NL could result in an initial reduction of at least 648-738

[38] Student enrollment numbers for 2001/2002, accessed from http://www.gov.nf.ca/edu/pub/stats02/enroll_3.pdf, March 2003.

youth smokers (6% of 10,800-12,300 smokers[39]) and a longer-term reduction of at least a further 432-492 smokers (4% of 10,800-12,300 smokers), for a net reduction of 1,080-1,230 smokers, or about 10% of the total youth smoking population. Lifetime health care and productivity savings would thus be at least $21.3-24.2 million, or about $13-14 in savings for every dollar invested in the program.

Stephens *et al.* (2000) also calculated costs of $135 per student over four years, ($59 greater than the minimum program) for a more "exemplary program" that exceeded the minimum requirements for effectiveness by 80%. Applied to NL's 86,898 students (2001) and costing $2.93 million a year, such a program could result in an initial reduction of 1,166-1,328 youth smokers and a longer-term reduction of a further 778-886 smokers, for a net reduction of 1,944-2,214 smokers, or about 18% of the total youth smoking population. Lifetime health care and productivity savings would thus be $38.3-43.6 million, or about $13-15 in savings for every dollar invested in the program.

To conclude, then, investing in either a minimum or more exemplary program would realize between $13 and $15 in savings for every dollar invested, and would help 10-18% of existing youth smokers or would-be smokers either stop smoking, reduce cigarette consumption, or avoid smoking altogether. Applying the 10-18% range against the 10,800-12,300 youths in NL who smoke, a minimum to premium program would help 1,080-2,214 of them quit or reduce their smoking. This potentially represents 6-12% of the 18,000 children and teenagers in NL who smoke today or who will take up smoking, and who will die by middle age or prematurely later as a result of this behaviour.

6.3 Smoking Cessation Programs for Pregnant Women

The high costs of smoking among pregnant women were briefly noted in sub-section 4.1. Beyond the costs to the life and health of the smoking mother, she is more likely to miscarry, give birth to a low birth-weight infant (<2,500 grams), and see her child die in the first year of life. Infants born to smoking mothers more often require extensive neonatal intensive care and suffer long-term impairments to physical and intellectual development, due to intrauterine growth retardation. Smoking is responsible for about 25% of low birth-weight cases, and infants born to smokers have a 20% greater risk of perinatal death (Lightwood, *op cit.*; Grossman, *op cit.*; Chang *et al.*, 1994; Marks *et al.*, 1990; Adams and Melvin, 1988).

Beyond the suffering caused by smoking during pregnancy, these conditions are also very expensive. One analysis found that the daily cost of hospital treatment for low birth-weight and neonatal intensive care was 80% higher than average hospital bed-day. Compared to other

[39] In 2001 there were 8,800 smokers in NL aged 15-19 (CTUMS 2001). Assuming another 2,000-3,500 smokers under the age of 15 and based on estimates from Health Canada (1997), the total number of youth smokers in NL in 2001 would have been in the 10,800-12,300 range.

diseases with a high smoking-attributable risk, the cost of low birth-weight hospital bed-days was 83% higher than for stroke, 70% higher than for chronic obstructive pulmonary disease, and 53% higher than for cancer (Phillips*, op cit.*).[40]

One U.S. study assessed and tallied the high costs of maternal conditions attributable to smoking during pregnancy, including pre-term premature rupture of the membrane and spontaneous abortion. Even without considering the effects of smoking on infant health care costs, the study found these conditions alone produced medical care costs of $230 million in the U.S (Adams, *op cit.*). Another U.S. study found that excess direct medical cost per live birth for each pregnant smoker was $795 for a total of $412 million (Lightwood, *op cit.*).

Even though smoking during pregnancy produces great risks for mother and child at high cost, it continues to occur at a high rate in NL. Of 5,747 live births in NL in 1996 (Health Canada, 1999a, *op cit.*), using comparative data from Nova Scotia, about 1,580 (27.5%) would have been delivered to mothers who smoked during pregnancy. Of those 5,747 births, there were 349 low birth-weight babies (<2,500 grams) born (Health Canada, 1999, *op cit.*), of whom about 60 were likely attributable to smoking during pregnancy.[41] The 1992 Canadian Centre on Substance Abuse study also attributed to smoking four deaths from sudden infant death syndrome, congenital abnormalities and perinatal conditions (Single*, op cit.*).

Like teenage smoking, this is clearly a specific target area for smoking cessation programs that can yield high benefit per dollar invested. In addition, as noted earlier, unlike other smoking-attributable illnesses, smoking cessation during pregnancy can yield gains that are immediate and short-term.

One overview of the literature on smoking cessation cost-effectiveness found that "approaches which targeted reduction or cessation in specific subgroups (e.g. targeting pregnant women who smoke, in order to reduce the frequency of stillbirth and low birth weight babies) showed larger gains than those which took a more general population approach" (Phillips, *op cit.*). This would imply that special attention to ensuring access to ongoing cessation support is necessary for women.

The empirical evidence confirms these findings. One U.S. study found that an annual drop of one percentage point in smoking prevalence among pregnant women would shift 1,300 low birth-weight babies to normal weight and save $35 million in direct medical costs ($26,923/baby {2001$}). In seven years it would prevent 57,200 low birth weight infants and save $867

[40] For one of the most precise calculations of medical care costs due to low birth-weight attributable to smoking, see Chang, *op cit.* The study found that low birth-weight costs due to smoking were up to 18% less than low birth-weight for all causes, because cases of intrauterine growth retardation (often due to smoking) are usually less severe than those due to pre-term delivery. Nevertheless, even with an 18% discount, low birth-weight due to smoking costs much more than most hospital conditions.

[41] About half of low birth weights are attributable to premature births; the rest are due to lack of nourishment, pregnancy-induced hypertension, of heavy smoking by the mother during pregnancy (Health Canada, 1999a, *op cit.*). The figure of 60 is an estimate based on this information.

million in direct medical costs. The study concluded that "smoking cessation before the end of the first trimester produces significant cost savings from the prevention of low birth weight" (Lightwood, *op cit*.)

Translated into NL numbers (without adjusting for differential health care costs or smoking prevalence), a one percentage point annual reduction in smoking among pregnant women in NL would reduce the estimated self-reported smoking rate from 27.5% today to about 20% after seven years. In those seven years, it would shift 112 low birth-weight babies to normal weight, and save the province $1.7 million in excess medical care costs.

Again, it must be remembered that low birth weight can lead to long-term impairments to physical and intellectual development. Though they count the high costs of neonatal intensive care, none of the cost studies have estimated the long-term social and economic costs of such disabilities, including impact on employment prospects and quality of life. For this reason, cost-benefit studies of smoking during pregnancy frequently acknowledge that their estimates are conservative and confined to direct medical costs at time of birth and in the neonatal stage.

Compared to the cost of caring for low birth-weight babies in a neonatal intensive care unit, smoking cessation support would save $3.37 for every $1 invested. When avoided long-term care costs for low birth-weight infants with disabilities are added in, the benefit-to-cost ratio of smoking cessation support doubles to 6.6:1, or $6.60 for every $1 invested. The U.S. study authors compared these cost savings from a modest smoking cessation program to other standard prenatal and perinatal prevention programs. Neonatal metabolic screening was found to have a cost-benefit ratio of about 5:1; maternal serum alpha-fetaprotein screening about 2:1; screening for Down's syndrome in women 40 and older about 2:1; and prenatal care 2.9:1.

In short, in terms of results achieved per dollar invested, a smoking cessation program for pregnant women was found to be highly cost-effective, and more than double the overall cost savings attributed to the rest of prenatal care. The researchers concluded with this forthright recommendation:

> *Based on this analysis and those documenting the health benefits and effectiveness of cessation programs, we conclude that physicians, third-party payers, managed-care organizations, and public health programs should offer this preventive service to all pregnant women who smoke....These findings argue for routinely including smoking cessation programs in prenatal care for smokers* (Marks, *op cit.*).

The significant benefits described by the U.S. researchers here do not include the savings in avoided health care costs, premature mortality and lost productivity due to smoking-related illnesses for the mother herself. With a quit ratio of 15%, 237 pregnant women in NL would cease smoking every year as the result of such a program. Due to their relative youth, their

cumulative lifetime cost savings, using Oster's incidence-based approach, would be very high – approximately $11.0 million for all 237 quitters.

If each of these 237 former smokers continues to abstain and lives for 55 years after pregnancy, to the average 81-year life expectancy for NL women (Health Canada, 1999a, *op cit.*), that lifetime saving amounts to about $815 a year in avoided medical costs and lost productivity for each quitter, or about $193,000 a year for all 237 quitters. When this saving is added to the infant savings, the cost-benefit ratio increases to almost 10:1 or $10 in savings for every $1 invested in the program.

6.4 Anti-Tobacco Advertising

Though interventions targeting teenagers and pregnant women will be highly cost-effective, as shown, the majority of smokers will remain unaware of prevention and cessation measures confined to schools and prenatal care. Fortunately, other effective strategies can reach the larger population.

Among those strategies is anti-tobacco advertising. Canada's recent federal initiatives that ban tobacco advertising, mandate graphic labels on cigarette packages, and require detailed industry information on products and practices are among the most progressive in the world. Canada is the first country in the world to have implemented such strong labelling and reporting measures, which came into effect January 2001.[42] This report examines what action NL could take to augment these federal initiatives.

An analysis of cigarette consumption in California between 1980 and 1992, using quarterly data and controlling for time, price, tax and other variables, found that a vigorous state-sponsored anti-tobacco media campaign starting in 1989 was highly effective in drastically reducing cigarette consumption. Of a 1.33 billion pack decline in cigarette sales between 1990 and 1992, a 232 million pack decline (17.4% of the total) was attributed to the media campaign (Hu *et al*. 1995). From 1989 through 1996, California per capita consumption of cigarettes fell 1.93 packs faster than the rest of the United States (Goldman and Glantz, 1998).

6.4.1 Cost Effectiveness of Media Advertising

California spent an average of 73 cents per capita per year on its anti-tobacco media program between 1989 and 1996, during which period per capita consumption of cigarettes fell 1.93 packs per year faster than the rest of the United States. Dividing the rate of that additional consumption decline by the average annual per capita media expenditure of 73 cents yields an

[42] Health Canada news releases on new tobacco control initiatives, January 19, January 20 and June 28, 2000, available at http://www.hc-sc.gc.ca/english/archives/releases/2000

estimate of a fall of 2.7 packs per capita per year for each per capita dollar spent on the media campaign (Goldman, *op cit*).

Assuming the NL advertising campaign yielded similar results for the same investment, then an investment of $389,674 per year for seven years would reduce cigarette consumption by an additional 1.4 million packs a year for seven years. Using this report's estimate of direct medical costs, that would produce annual savings of $11.4 million a year in avoided medical care costs and productivity losses due to premature deaths of smokers, or a savings of $29 for every dollar invested in the media campaign. In addition, at $8.00 per pack, NL smokers would save another $11.5 million a year in money they were not spending on cigarettes.

After seven years, the media campaign will have brought cigarette consumption down by more than 30%. Newfoundlanders will be living longer, getting sick less, and saving a lot of money. In total, in those seven years they will have saved $160.8 million for an investment of $2.7 million. Gradually, NL hospitals will become less burdened, and health care costs will be eased.

The reason the estimated annual decline here is somewhat smaller than the two year figures given in the section above is simply that the figures here are averaged over *seven* years rather than two, and include periods when tobacco advertising was reduced and consumption flat. Also, they measure only the portion of consumption reduction in California that was in excess of the overall U.S. rate of consumption decline, rather than attributing a portion of total decline to the media campaign as do the figures above. For these reasons, this estimate of a 2.7 pack decline for every dollar spent is a conservative and reasonable long-term estimate that factors out the normal background rate of consumption decline not attributable to media advertising.

6.4.2 Media Advertising Can Counter Industry Price Manipulation

California is not the only example of highly successful use of media advertising to reduce tobacco consumption. A Massachusetts referendum initiative, similar to California's Proposition 99, also resulted in a 25-cent tobacco tax increase in 1993, with funds specifically dedicated to anti-tobacco activities. In this case, however, the tobacco industry counter-attacked by reducing wholesale prices to the pre-tax level, thus effectively eliminating the price increase associated with the tax.

However, the increased government revenues funded a powerful anti-tobacco media campaign that began in October 1993, and Massachusetts cigarette consumption continued to decline at a rate of 1.28 packs per person per year faster than the national average between 1993 to 1996. This indicates that the media campaign was effective despite the nullification of the price increase (Goldman, *op cit.*).

The Massachusetts experience illustrates that a suite of tobacco reduction strategies working together is far more effective than any single measure alone. Indeed, the cost-effectiveness of each measure is multiplied by association with complementary measures.

Newfoundlanders, and Canadians in general, are today particularly susceptible to industry counter-measures on the price front as a result of the ill-advised tobacco tax decrease in February 1994 and the consequent jump in industry sales and profits. Even though tax increases are recognized by the World Bank and other authorities as the single most cost-effective tobacco control measure, the industry has enough play in manipulating market prices at this historical juncture to counter such tax increases by lowering prices, as occurred in Massachusetts.

Following the tobacco tax cut in 1994 and up to 1999, Imperial Tobacco raised its prices six times, and increased its pre-tax profit margin by 50% from 40 cents per pack to 60 cents per pack, producing record-breaking earnings and profit-making. Imperial Tobacco controls 68% of the Canadian cigarette market and thus effectively sets the prices for the industry as a whole, and the other companies follow its price lead (Canadian Cancer Society, *op cit*).[43]

In other words, with huge profit margins due to the 1994 tobacco tax cut, the Canadian tobacco industry now has even more leeway to counter tobacco price increases with price-cutting counter-measures than the U.S. tobacco industry had in reacting to the 1993 Massachusetts initiative.

Just three companies—Imperial (68%), Rothmans, Benson and Hedges (22%), and RJR-Macdonald (10%)—control 99% of the Canadian tobacco market, and can therefore act in concert to manipulate market prices. A coordinated government strategy to counter tobacco use is far more threatening to all three companies than competition among themselves.

However, the high likelihood of industry price manipulation in response to any tax hike need not deter governments from acting for two reasons. First, the change effectively involves a massive transfer of funds from the tobacco industry to the public purse, just as the tobacco tax cut produced a massive transfer of funds in the opposite direction. Secondly, as the Massachusetts experience demonstrates, the additional revenues can be effectively used to fund a wide range of other prevention and cessation measures.

Indeed, if even a modest portion of tobacco tax revenues is dedicated to *other* tobacco control activities, then the tobacco industry cannot win because the combined effect of a coordinated suite of measures will outweigh industry counter-measures. An analysis of the California and Massachusetts experiences revealed that:

> *Paid media is most effective when used as part of a multifaceted approach to reduce smoking, including community programs, higher taxes, and school-based programs. Because the various program elements are designed to work together,*

[43] Industry information and market share is available under "Canadian Tobacco Companies" and "Canadian Tobacco Industry" at the following web site: http://persweb.direct.ca/rjordan/Canadian_industry.htm

it is difficult to separate the effects of paid media from other contemporaneous tobacco control interventions (Canadian Cancer Society, *op cit.*).

6.4.3 What Type of Advertising Works Best?

In selecting the most appropriate form of anti-tobacco advertising, it is fortunate that NL does not have to re-invent the wheel. Detailed analyses and follow-up surveys of the California and Massachusetts advertising campaigns have revealed the particular forms of advertising that proved most effective in those states. Such ongoing marketing studies are essential to assess the cost-effectiveness of particular advertising strategies in reaching the public.

Focus group studies were conducted by the professional advertising agencies that contracted with California, Massachusetts and Michigan to run their anti-smoking advertising campaigns in order to assess their effectiveness. As well, the state health departments produced their own reports and studies on program effectiveness, and the U.S. Centers for Disease Control and Prevention have produced a *Media Campaign Resource Book* (U.S. Department of Health and Human Services, 1995).

The Institute for Health Policy Studies in the Department of Medicine at the University of California, San Francisco conducted a review of all these sources, including the reports of 186 focus groups (Goldman, *op cit.*). It found that the most effective advertisements were those that attacked the tobacco industry for deceitful and manipulative practices to hook new users, sell more cigarettes and make more money, as well as those portraying the dangerous effects of secondhand smoke on non-smokers. Youth, in particular, responded well to learning about industry's calculated attempts to manipulate them; second-hand smoke advertisements showed adult smokers how their habits endanger their own children.

Next most effective were advertisements portraying the addictive nature of nicotine. Particularly effective for youth was the message: "74% of all smokers aged 12 to 18 say they wish they could quit but can't because they are addicted to the nicotine." Among several other strategies reviewed, advertisements describing the long-term health effects of smoking were among the least effective, mostly because the health hazards are already well known, and because young people tend to "live in the present and to believe they are invulnerable" (Goldman, *op cit*.). In short, NL can target its advertising dollars *more* cost-effectively than pioneers like California and Massachusetts, by learning from their experience on how to determine what works best.

6.5 Physician Advice, Counselling, and Nicotine Replacement Therapy

Several studies have found that even brief advice to quit by a physician is very effective in motivating smokers to stop smoking. This is confirmed in the 1999 Canadian Tobacco Use Monitoring Survey, which reports "concern about future health" as by far the most important reason for quitting. Among quitters, 62% cited health concerns or health problems as their main

reason for quitting (CTUMS, 1999b; CTUMS, 1999c). Given that motivation, well-timed and skillful physician advice can be a powerful smoking cessation tool.

Health Canada reports:

> *The doctor's office is a site with great potential for effective intervention on tobacco use ... However, only half of current smokers report having ever been asked about their smoking status or advised to quit by their physician, and even fewer have received specific advice on how to quit. Still, smokers may see their physician with greater frequency than any other service provider* (Health Canada, no date{c}).

Although 77% of current smokers in Canada see a doctor at least once a year, only 41% of this group is advised to quit. This lost opportunity to save life and promote health may be a deeper reflection of a medical system focused on sickness treatment rather than disease prevention. A highly cost-effective tobacco cessation strategy may therefore be a reform of medical school education. In the short term, the medical profession can advise its own members that inquiry about smoking status and advice on cessation should be a routine part of every visit by a patient who smokes.

Smokers who get professional help to quit, through counselling, nicotine replacement therapy, or both, have higher long-term cessation rates than those who try to quit without such help. Nicotine replacement therapy (patches, gum or inhaler) helps the smoker deal with nicotine withdrawal symptoms, and can also be effective in reducing the amount of cigarettes consumed when smokers are unable or unwilling to stop quit abruptly.

Health Canada reports that clinical, intensive interventions – both group and individual – involving at least 4-7 counselling sessions over several weeks have remarkably high quit rates, often over 20%. These currently reach only about 5% of the Canadian population. Public health approaches can reach much larger population groups (up to 80%) but register lower quit rates (5%-15%) {Health Canada, no date[c], *op cit.*}.

A study at the Mayo Clinic Nicotine Dependence Center examined the cost effectiveness of its treatment program for nicotine dependence. In that program, an initial 60-minute consultation was followed by counselling to develop an individual nicotine dependence treatment plan that could include nicotine replacement therapy (patches or gum), group therapy, or an inpatient program. As well, a relapse prevention program included telephone calls and letters to patients. The study assessed cost-effectiveness in terms of net years of life gained per dollar invested. The program was given credit only for cessation rates beyond the normal expected cessation rates in the general population.

For all smokers in the United States who attempt to stop smoking, there is an average one-year cessation rate of 7.6%. The Mayo Clinic program produced a one-year cessation rate of 22.2%. At a net cost of $9,876 per net year of life gained (at a 5% discount rate) beyond what would be expected through normal population cessation rates, the researchers concluded:

> *From a cost-outcome perspective, the treatment of nicotine dependence is highly favorable when provided by non-physician health-care professionals in a medical setting* (Croghan *et al*, 1997).

The study further compared the cost-effectiveness of the program to a wide range of other medical interventions and found it highly cost-effective in terms of dollars invested per year of life gained. For example, it was four times as cost-effective as breast cancer screening, treatment of moderate hypertension, or estrogen replacement therapy, and 1.5 times as cost-effective as nicotine gum therapy combined with counselling. However, it was only one-third as cost-effective as brief advice by a physician, and only one-half as cost-effective as smoking cessation programs for pregnant women.

When privately purchased, nicotine patches and gum can cost up in the order of $140-$150 a month, enough to discourage some potential users among low-income groups who have high smoking rates. Quebec health insurance has just begun paying for nicotine therapy at a projected cost to the government of $5.1 million in the first year. Nevertheless, Quebec has decided that the investment is a bargain at 0.75% of the cost of health care treatments for smoking-related diseases (Daly, 2000).

The U.S. Surgeon-General has recommended changes in physician practices and insurance coverage to encourage state-of-the-art treatment of nicotine addiction, which could boost quitting rates ten times. He argued that spending US $6.3 billion would pay for smoking cessation programs for 75% of U.S. smokers, and result in 1.7 million smokers quitting, an investment he said would prove cost-effective (Picard, *op cit.*).

The main reason that nicotine replacement therapy in isolation ranks lower on some cost-benefit analyses than other tobacco control initiatives, is that studies have estimated that 15 patients have to use nicotine replacement therapy to produce one extra quitter (Bunney, 1999). This confirms again the importance of using a wide-range of coordinated tobacco control strategies to achieve the maximum benefit per dollar invested. Within the framework of other interventions, nicotine replacement therapy can be effective in easing smoking withdrawal symptoms and thus in promoting long-term cessation. But in isolation it is likely to have much more limited effectiveness.

Finally, studies of community incentive-based interventions, like "Quit and Win" contests where participants win a prize if they quit smoking have not so far been proven effective in the long term (Bains *et al*., 2000). An analysis of two such programs in Ontario found the program was successful for only 0.17% of the smoking population, with just one in every 588 smokers in the community actually quitting because of the contests. The authors concluded the rate of impact of such interventions to be low, and recommended that public health agencies recognize their "limited success in reaching and affecting certain sector of society." They noted that "such groups may be better served by other population-based approaches, such as price increases ... or promotion of more individualized support" (Bains *et al*., 2000), rather than by gimmicks that have a high profile in the short-term but little proven long-term effect. In other words, from the evidence, it seems wise for NL to stick with proven tobacco control strategies like tax increases, school-based programs, prenatal counselling, media advertising, and promotion of physician advice, professional counselling and nicotine replacement therapy.

6.6 Smoking Bans and Restrictions

Bans and restrictions on smoking in public places, especially schools, day care centres, health facilities and workplaces, are an essential component of any effective tobacco control strategy, and are effective to the extent they are enforced (as noted in sub-section 6.2 particular to schools and explained further below). In addition to protecting non-smokers, such restrictions have been demonstrated to reduce consumption among smokers. As noted in sub-section 4.4, daily smokers who work in smoke-free work places smoke four fewer cigarettes per day on average than those who have no such restrictions, for an average reduction of 22% in consumption.

6.6.1 By-laws Restricting Smoking in Public Places

A comparative study in Canada, factoring age, gender, education, and marital status, found that the likelihood of being a smoker is reduced where smoking by-laws are widespread. The study concluded that no-smoking by-laws are effective in controlling smoking, and are most effective where cigarette prices are also high (Stephens, 1997 *op cit.*).

A Health Canada study found that Atlantic Canadians are far less likely to be protected by by-laws restricting public smoking than other Canadians. The study found that 81% of the Ontario population is protected by such by-laws, compared to just 3% in Newfoundland, 13% in P.E.I., 27% in Nova Scotia, and 30% in New Brunswick – the lowest rates in the country (Health Canada, 1999, *op cit.*).

This is ironic, because the 1996-97 National Population Health Survey also found that Atlantic Canadians are the *most* strongly in favour of smoke-free environments among all the provinces, and are *more* aware than other Canadians about the damaging health effects of second-hand smoke (Ross and Perez, 1998). In other words, public support for smoke-free environments appears to be greater in the Atlantic provinces than in the rest of the country, and Atlantic Canadians seem to be far readier for more public smoking restrictions than governments appear ready to impose. In NL, 90% of adults support no smoking policies in public places, with support evenly distributed across the province (Newfoundland & Labrador Statistics Agency, *op cit.*).

Again, a major theme of this report – that the cost-effectiveness of different tobacco control initiatives is enhanced when several strategies are employed in a coordinated way – is demonstrated by the California experience. Passage of Proposition 99, which increased tobacco taxes and used the money for school and community tobacco education programs, *also* galvanized dozens of California cities into passing by-laws requiring restaurants, work-places and public buildings to be 100% smoke-free (without designated smoking areas) {Breslow, *op cit.*}. It is therefore highly likely that implementation of the other measures described in this report would also lead to a profusion of anti-smoking by-laws in NL towns and municipalities.

A word of caution about no-smoking by-laws is in order. Of Canadian municipalities that had passed such by-laws by 1995, Health Canada found that just 68% made an explicit provision for enforcement, and only 12% identified both the responsibility for enforcement and specified escalating fines for repeated offences. As well, only 29% required that visible signs be posted to inform the public of the existence of restrictions (Health Canada, 1999, *op cit.*; Health Canada, 1995). In other words, the existence of a by-law may not be enough. How it is written and enforced are equally important.

The U.S. Environmental Protection Agency has estimated that, in *addition* to long-term cost savings from health benefits, life-years gained, and productivity losses avoided, smoking restrictions in most public places would produce $4-$8 billion worth of direct savings every year in avoided housekeeping and maintenance expenses. Translated to NL numbers by population size, those immediate and short-term savings amount to $8.0-$16.1 million a year (U.S. Environmental Protection Agency, *op cit.*).

6.6.2 Workplace Smoking Bans

In addition to general smoking restriction by-laws, the three most important current targets for specific smoking bans are the workplace, home, and school. Home-based bans, noted in sub-section 6.2, clearly are not subject to external regulation but are dependent on education within the home environment. School-based bans, also covered in sub-section 6.2, are best utilized within a broader context of comprehensive, community-based health education, but at any rate require vigorous enforcement to be effective. The remainder of this part of the report discusses workplace smoking bans.

As described earlier, it has been estimated that up to 80% of the average non-smoker's exposure to second-smoke is in the workplace, with restaurant and bar employees at particular risk of smoking-related illnesses, including a 50% higher risk of lung cancer (Health Canada, no date[a], *op cit.*; Nova Scotia Department of Health, *op cit.*). Passive smoking over an eight-hour day has been estimated to equate to light active smoking, and there is evidence that second-hand smoke reduces the work efficiency of non-smoking employees (a cost not included in the estimated annual extra cost of employing smokers in NL, see **Table 4** {Price, 1989}).

The mechanisms by which work efficiency and health are affected have been studied. Non-smokers who inhale the toxic gases, particles and chemicals both from the lighted end of a cigarette and from the smoker's own exhalation, also have small amounts of nicotine and carbon monoxide pass into their own bloodstream. After half an hour, the blood pressure and heartbeat of these non-smokers has been found to rise measurably, indicating extra stress placed on the heart (Nova Scotia Department of Health, *op cit.*).

In addition, chronic exposure to cigarette smoke in the work environment has been found to reduce small airways function to the same extent as smoking one to 10 cigarettes a day. Not surprisingly, it has been reported that 25% of non-smokers in workplaces that have no restrictions on smoking express frustration and hostility towards both smokers and management (Price, *op cit.*).

That study, conducted by the Canadian Centre for Occupational Health and Safety, concluded that:

> *Smoking on the job increases absenteeism, property damage, and health and fire insurance costs. It can also lower the morale and productivity of some nonsmoking employees* (Price, *op cit*.).

6.6.3 Workplace Smoking Cessation Programs

Smoking bans in the workplace are best combined with smoking cessation programs for those employees who do smoke. An University of Michigan cost-benefit analysis of workplace smoking cessation found that "smoking cessation is a very sound economic investment for the firm, and is particularly profitable when long-term benefits are included, with an eventual cost-benefit ratio of 8.75" (Warner *et al.*, 1996).

In other words, every dollar invested by a firm in smoking cessation programs for its employees will yield nearly nine times that value in long-term benefits. The study found that, because of employee turnover, about half of these benefits will actually be realized by the wider community outside the firm, while the firm realizes the other half. However, for the firm itself, "gains from either reduced absenteeism or increased on-the-job productivity are sufficient by themselves to make the work-site program a profitable enterprise," and "a distinct economic winner"(Warner, *op cit.*).

On the 50-50 realization of benefits by the firm and the wider community, the University of Michigan study concludes:

> *Given the magnitude of the net benefits generated by the intervention, however, the firm can afford to 'give up' half of the benefits and still realize an enormous rate of return on its investment. The firm can justifiably claim that it is doing good for the community at the same time that it does well for itself* (Warner, *op cit.*).

Former smoking employees can approach the health profiles of those who have never smoked, with benefits accruing gradually at first and becoming more substantial over time. From that longer-term perspective, the study found that smoking cessation is a "cost-effective investment in employee health," and the "gold standard" of health care interventions (Warner, *op cit.*).

In terms of life-years saved per dollar invested, the study found, workplace smoking cessation programs were far more cost-effective than almost any other medical intervention:

> *In this context, this work-site intervention likely represents one of the very best investments the firm could make in its employees' health. There are relatively few live-saving interventions covered by the firm's medical insurance that compare favorably with the cost-effectiveness of this smoking-cessation program* (Warner, *op cit.*).

The Michigan study concludes with a statement that should apply to all the cost-benefit analyses in this report, and is therefore worth quoting in full:

> *We have never believed that a health-promotion program must yield a positive financial return to justify its existence. Firms interested in their employees' welfare should see an intervention such as the one studied here to be an extraordinary investment in their employees' health*.
>
> *This work-site intervention grants employees additional years of life at a cost well below that of nearly all of the medical interventions the firm covers through its conventional health insurance. We consider the fact that the program also generates a handsome economic return a very welcome bonus* (Warner, *op cit.*).

In light of the unequivocal findings of the University of Michigan study, the case for investing in smoking intervention in the workplace is compelling. The Michigan study estimates that 50% of workplace smoking cessation benefits spread to the wider community, suggesting that consideration be given to government incentives for any firm implementing an approved and effective workplace smoking cessation initiative, e.g., a 50% matching grant, etc. (Warner*, op cit.*).

6.6.4 Are Smoking Bans Bad for Business?

The tobacco industry and other opponents of legislation to ban smoking in public places, particularly restaurants and bars, argue that such restrictions will be bad for business. The available evidence does not support that argument. In a general way, some studies point out that anti-tobacco actions are "pro-business" because smoking "has a devastating effect on the business community and the economy ... by way of premature deaths, higher insurance premiums, increased absenteeism due to illness, and lost productivity" (Moore*, op cit.*). Evidence presented in this report on the costs of employing a smoker supports this conclusion.

More detailed empirical studies have specifically tracked the effect on sales of restaurants and bars where smoking bans are enforced, and concluded "smoke-free ordinances do not adversely affect either restaurant or bar sales" (Glantz and Smith, 1997; Glantz and Smith, 1994). Two comprehensive analyses in 1994 and 1997 matched restaurant and bar sales over time in cities with and without ordinances mandating smoke-free restaurants and/or bars. The studies included every single restaurant within town limits in 30 towns and cities in California and Colorado, and found:

> *Smoke-free ordinances generally had no statistically significant effect, either on the fraction of total retail sales that went to restaurants or on the ratio between sales in smoke-free cities and sales in comparison cities....There were no significant effects of the smoke-free ordinances on bar sales as a fraction of total retail sales, on the ratio between bar sales in cities with ordinances and sales in comparison cities, or on the fraction of all eating and drinking place revenues reported by establishments that sell all types of liquor* (Glantz 1997, *op cit.*).

That study concluded:

> *Legislators and government officials can enact health and safety regulations to protect patrons and employees in restaurants and bars from the toxins in secondhand tobacco smoke without fear of adverse economic consequences* (Glantz 1997, *op cit.*).

The phrasing of this recommendation is an important reminder that the major victims of second-hand smoke in bars and restaurants are the employees, who are 50% more likely to get lung cancer than workers in other industries (Siegel, *op cit.*).

6.7 Comparing Cost Effectiveness of Awareness/Education-based Intervention Options

The cost-benefit ratios of awareness/education-based tobacco control interventions described above cannot easily be compared. The most reasonable estimate might be to use the ratios reported by Phillips *et al*. (1993) that found a 2.22:1 cost benefit-ratio in prevalence-based approaches to cost-benefit analysis compared to a 7:1 cost-benefit ratio in incidence-based approaches.[44] In that case, a rough comparison of cost-benefit results would be:

- School-based prevention programs: 15:1 ($15 benefit for every $1 invested)[45]
- Brief advice by a physician 12:1 ($12 benefit for every $1 invested)
- Prenatal counselling: 10:1 ($10 benefit for every $1 invested)
- Media advertising campaign: 7:1 ($ 7 benefit for every $1 invested)
- Mayo Clinic program 4:1 ($ 4 benefit for every $1 invested)
- Nicotine gum and advice 3:1 ($ 3 benefit for every $1 invested)

This study does not give too much weight to such comparative analysis, principally because none of the interventions above (as well as tobacco tax increases and smoking bans) works alone. All interventions have different target audiences and can mutually reinforce the messages transmitted through each means. For example, a child who returns from a smoking prevention lesson in school may see an anti-tobacco advertisement on TV, or a pregnant mother receiving counselling on smoking cessation may receive a ‘lecture’ from her school-age child.

[44] See Appendix A for a discussion on prevalence-based versus incidence-based approaches.
[45] This ratio matches closely to the analysis in 6.2 regarding cost-benefit of a premium school-based program.

The cost-benefit analysis is also extremely sensitive to small changes in assumption. For example, the World Bank's global survey estimated that if nicotine replacement therapy (which can appear expensive in a traditional cost-benefit analysis, and yet be crucial to a quitter's ultimate success in stopping smoking) were publicly provided with 25% coverage, it would be highly cost-effective, second only to tax increases (The World Bank, *op cit.*).

7. Conclusion

Canada and NL have made encouraging progress in recent years to prevent and curb smoking. Given the toll of death and disease in the wake of smoking, such progress is imperative. It is also imperative economically: While the sale of cigarettes in NL in 2001 contributed $140.5 million to the provincial and national GDP (see Introduction), the smoking of those cigarettes resulted in $79 million in medical care costs, at least $139.2 million in economic productivity losses due to premature deaths of smokers and to sickness, and millions more in employer-related costs (see end of Section 4).

Advancing the imperative of a 'war on tobacco' requires an investment commensurate with that imperative. For a human population the size of NL's (533,800 in 2001), the U.S. Centers for Disease Control and Prevention recommended *minimum* funding of about $10 per capita per year (i.e. $5.3 million 2001$) to implement any kind of effective tobacco control policy.[46] Newfoundland & Labrador has no central tobacco control unit and no centralized mechanism for tracking investment in tobacco control and smoking prevention and cessation programs. It is therefore impossible to say whether current investment meets the minimum standard identified by the Center. Given that smoking rates in the province are declining slightly faster than in Nova Scotia and that Nova Scotia invested about $800,000 in tobacco control in 2000 (Colman, 2000a), the actual investment may be about one fifth to sixth the minimum required.

While providing a general survey of the potential cost-effectiveness of various tobacco control strategies, this study does not pretend to include all potential measures. For example, litigation against the tobacco industry to recover health care costs due to smoking has proved highly effective in the United States, and is a clear strategy to shift the costs of smoking from the public purse to the manufacturers of a product acknowledged to be lethal. It is hoped that this study will stimulate further analysis of other effective tobacco control strategies beyond those presented here.

A second important future direction for analysis is particularly relevant for policy makers. This study has examined the costs of smoking, the economic benefits of cessation, and the cost-effectiveness of various tobacco control strategies in isolation from other policy options. In a world of limited financial resources, and competing claims on the public purse, policy makers do not only have to be convinced of the cost-effectiveness of a particular policy option, but also of its cost-effectiveness in relation to other investment opportunities.

Compared to other policy priorities, the question then becomes: How much money should be spent to prevent 1,000 premature deaths due to tobacco-related disease each year in NL? How

[46] N.S. Department of Health, Tobacco Control Unit Briefing Notes, April, 2000, based on U.S. recommendations of November 19, 1998, and a 1.45 exchange rate.

much, for example, is spent to save or prolong a single life using high-technology intensive care treatment?

Each year there are approximately 50 road accident deaths in NL, compared to 1,000 deaths due to tobacco. Nearly 15,000 potential years of life are lost annually in NL due to premature mortality from smoking-related illnesses, which also cause more than 54,000 hospital bed-days a year in the province (see sub-section 3.1).[47]

Yet the percentage of the public purse allocated to illness and disease prevention pales against the average of $1 million per kilometre spent for each lane of new roadway designed to make roads safer and reduce the likelihood of road accidents. Road accident deaths represent 5% compared to total deaths due to tobacco in NL. It is worth considering what a small fraction of the amount invested in highway construction would yield in lives saved and in reducing the annual drain on the NL economy due to tobacco related illness, if that fraction were invested in comprehensive tobacco use reduction initiatives. Such comparative cost-benefit analyses can be useful in demonstrating the value of investments in preventive health care.

GPI*Atlantic* realizes that this is a provocative example.[48] But it is intended merely to point to the need for comparative studies of the cost-effectiveness of alternative policy options in terms of their potential to save lives, improve well-being, and save long-term costs due to illness and premature death. Such studies would provide a rational basis for decision-making and expenditures from the public purse.

[47] 15,000 figure extrapolated from Single, *op cit.* estimate of 9,650 (sub-section 4.1), which was based on 648 deaths annually, whereas the Province of NL estimates 1,000 deaths. Hospital bed-days/year figure from sub-section 4.1.

[48] The example is adapted from Colman, 2000b, *op cit*. Road accident deaths are from Statistics Canada, *Mortality: Summary List of Causes, 1997,* catalogue no. 84F0209, pages 2-3, and Statistics Canada, *Causes of Death,* catalogue no. 84F0208.

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APPENDIX A: PREVALENCE-BASED AND INCIDENCE-BASED APPROACHES TO COST-BENEFIT ANALYSIS

The vast majority of cost-benefit studies on smoking use a "prevalence-based" approach that is a snapshot of estimated smoking-attributable costs in a particular year, based on the current prevalence of smoking in a given population and the relative risk for morbidity and mortality attributable to smoking for different illnesses. However, that method clearly has significant limitations, as it cannot adequately account for the temporal relationship between smoking and disease onset. Though relative risk ratios do not change much over time, *current* sickness and death due to smoking is the product of *past* smoking prevalence and intensity, because of the delay between smoking and disease-onset. It is acknowledged that "incidence-based" approaches, which track changing relative risk ratios over the lifetime of the smoker, are far more accurate indicators for valuation purposes.

The main problem with the incidence-based approach is that it is far more complicated. Relative risk ratios over time are different for different diseases, and each one needs to be tracked separately over the smoker's lifetime to assess potential costs at different ages depending both on intensity and duration of consumption.

Because the intensity and duration of consumption in a mixed-aged population of smokers and former smokers varies widely, it is challenging to extrapolate from incidence-based approaches to overall population estimates at any given time. For example, the dramatic increase in youth smoking through much of the 1990s will show up as an illness and premature mortality trend many years in the future, while current sickness and death reflect an older profile of smokers in the past. Changing ratios among male and female smokers complicate the picture further.

Nevertheless, an incidence-based approach is really the *only* accurate way to assess the benefits of smoking cessation, since these benefits accrue gradually over time and never quite recover the full costs of smoking. Costs of smoking cannot simply be converted automatically into benefits of quitting, as if the two were equal. Instead the actual, *dynamic* process, which incidence-based approaches attempt to capture, is the gradual recovery of a substantial portion of those (avoided) costs over time.

The age of the quitter and the intensity and duration of consumption prior to cessation are key variables affecting calculations of the benefits of quitting smoking. These variables affect not only health care outcomes, but also productivity calculations of years of productive life saved.

In short, the incidence-based approach is the only methodology properly capable of estimating the economic benefits of quitting in relation to the costs of smoking. But it is challenging to apply, and it can yield results quite different from the "snapshot" prevalence-based approach.

Phillips *et al.* (1993) found that cost-benefit ratios of smoking cessation varied from 2.22:1 for a prevalence-based approach to 7:1 for an incidence-based approach. Because the benefits of quitting can only be assessed by separating out smokers from non-smokers, Oster's incidence-based approach has been used in this study. Hopefully this short methodological discussion will assist other researchers in conducting sensitivity analyses of the results given in this report, so that they can be tested against alternative discount rates and methodologies, and adjusted correspondingly if necessary.