THE COST OF SMOKING IN BRITISH COLUMBIA 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 British Columbia (BC) 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 British Columbians 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 generally decreasing. On the critical public health issue of smoking, BC leads the nation as it heads 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:

- British Columbians smoked nearly 4.3 billion cigarettes in 2002, approximately 7900 for each of the estimated 542,240 smokers.
- While British Columbia has a lower prevalence of smoking than the rest of Canada, overall consumption rates among smokers in BC are consistent with the national average. Among smokers between the ages of 15 and 19, daily cigarette consumption in BC is higher than the Canadian average.
- Most people who have ever smoked started 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 63,900 underage (0-18) smokers in BC.
- Approximately 14,000 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.
- Over one in five BC males and nearly one in five females reported exposure to second-hand smoke.
- An estimated 5,700 British Columbians lose their lives every year due to smoking.
- Smoking costs British Columbians an estimated $525 million (2002$) annually in medical care costs, an estimated $904 million (2002$) in productivity losses due to the premature deaths and excess disability of smokers, and millions more in costs borne directly by BC employers.

Ironically, standard economic growth statistics count cigarette sales and 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 cigarettes, 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 cigarette sales, illness treatment costs, and 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 and is being 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 BC 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 $152,000 (2002$) in avoided spending on cigarettes by retirement age. If people in British Columbia smoked at the same rate as the Utah population (12.9% of the population instead of 16% as at present), they would have nearly $290 million (2002$) extra in their pockets each year for more productive expenditures and investments.
- If just 10% of BC's smokers managed to quit, they would over their lifetimes save the provincial economy over $2.9 billion (2002$) in avoided medical care costs and productivity losses. If British Columbians smoked at the rate of those in Utah (the lowest rate in North America), approximately $240 million (2002$) 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 Canada, describes the savings that taxpayers, employers, individual smokers, and the economy as a whole may expect from a comprehensive tobacco control strategy.

ACKNOWLEDGEMENTS

This report is based on the template, methodologies, and data sources used in GPI Atlantic's earlier reports on the cost of tobacco and the economic impact of smoke-free workplaces in Nova Scotia, New Brunswick, and Newfoundland and Labrador, and is produced with express permission of GPI Atlantic. Needless to say, all errors and misinterpretations are the sole responsibility of the authors.

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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
SAM	Smoking-Attributable Mortality
SIDS	Sudden Infant Death Syndrome
WCB	Workers' Compensation Board of British Columbia
USEPA	United States Environmental Protection Agency

1. Introduction

Efforts to prevent and reduce the incidence of smoking in British Columbia (BC), and in Canada as a whole, are beginning to pay off. The numerous smoking prevention and cessation initiatives in the province include:

- *Kidzone* (televised anti-smoking programming aimed at youth through the Knowledge Network, with school kit, web site and activity book for children)
- *tobaccofacts* (web site and tobacco specific lesson plans and activities for grades K to 12 students)
- *Kick the Nic* (BC Ministry of Health Planning Teen Cessation Program delivered through schools/community groups)
- B.C. Doctors' Stop Smoking Program (helping health professionals deliver cessation interventions to their patients)
- B.C. Smokers' Helpline – operated through the Canadian Cancer Society, BC/Yukon Division, funded by the Ministry of Health Planning
- Tobacco Sales Enforcement, including the Tobacco Sales Act – prohibiting tobacco sales to minors
- Environmental Tobacco Smoke Regulations, through the WCB, protecting workers in the hospitality, correctional, and residential care facility industries
- Local municipal bylaws prohibiting smoking in public places
- Aboriginal Tobacco Strategy – community initiatives for First Nations in BC to help encourage tobacco reduction strategies
- Tobacco Enforcement Officers – trained personnel enforcing provincial and federal legislation
- Regional Tobacco Reduction Coordinators – ministry funding for local administration of community tobacco reduction programs (e.g.: the *Kick the Nic* program aimed at youth)
- Prevention Source BC – limited clearinghouse source for health professionals and educators
- Web-based education and prevention programs - BC Lung Association
- *Workers' Compensation Second-hand Smoke Regulation* – banning smoking in all workplaces, including bars, nightclubs, and restaurants (May 1, 2002)
- *Airspace Action on Smoking and Health* - Non-smokers Rights Association website– offers information on second hand smoke issues
- Numerous federal government programs are also active in the region, including the Health Canada Tobacco Control Programme, as well as initiatives specifically geared towards aboriginal communities such as the First Nations and Inuit Tobacco Control Strategy.

These awareness and education programs, coupled with legislation, municipal bylaws, rising tobacco taxes, and other interventions are helping British Columbians 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 overall incidence of teenage smoking is decreasing. On the critical public health issue of smoking, BC is leading the way for Canadians and the province's efforts in tobacco prevention have been recognized by the World Health Organization.[1]

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 BC. The report also estimates the full current cost of tobacco use in BC. That cost – which includes the unnecessary and premature loss of human life, the burden of illness both in human and 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 BC, 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, simply 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 and prosperity. 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 wellbeing. Nationally, 45.4 billion cigarettes were produced and over 41 billion were sold in 2002.[2] This included the nearly 4.265 billion cigarettes sold in BC for $1.493 billion, equivalent to more than 1% of BC's GDP of $128.151 billion in 2002.[3] Tobacco continues to contribute to the GDP in spending on nicotine replacement therapy and other quitting strategies, and then adds millions more to the BC 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.

[1] In 2000, the *Tobacco Free World Award* was presented to the province of British Columbia by the World Health Organization. BC Ministry of Health Planning, http://www.healthplanning.gov.bc.ca/prevent/, accessed November 10, 2003.
[2] Health Canada, Tobacco Control Programme, "Cigarette & Equivalent Production 1980-2002", May 2003; http://www.hc-sc.gc.ca/hecs-sesc/tobacco/pdf/Cigarette_&_Equivalent.PDF, accessed November 27, 2003; and Health Canada, Tobacco Control Programme, "Total Domestic & Imported Cigarette/Fine-Cut Sales 1980-2002", May 2003; http://www.hc-sc.gc.ca/hecs-sesc/tobacco/pdf/Domestic&FineCut.PDF, accessed November 27, 2003.
[3] For further discussion of the price of cigarettes in BC and cost calculations used in this report, please refer to section 4.2.

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, and improved population health registers as a sign of genuine progress in the GPI. 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 British Columbians, 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 BC (Section 2). Section 3 provides further information on the health-related costs of smoking, as well as detailed information on the economic costs of smoking. The benefits of smoking cessation are subsequently reviewed (Section 4), followed by an economic analysis of the principal means to prevent and reduce the incidence of smoking (Section 5). Conclusions from these analyses are contained in Section 6.

2. Smoking in Canada and British Columbia

2.1 Smoking Trends in Canada and British Columbia

In the 1970s and early 1980s, Canadians were the heaviest smokers on the planet, consuming an average of 3,910 cigarettes per capita per year in 1970-72 and 3,800 cigarettes per capita in 1980-82. Consumption rates like this have not been seen since in any country.[4]

By 1990-92, largely in step with 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) were followed by 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. After 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).[5]

Data from the Canadian Tobacco Use Monitoring Survey (CTUMS) indicate that, in 2002, the province of British Columbia continued to have the lowest smoking prevalence rate in the nation at 16%, which is significantly lower than the national average of 21%.[6] The highest rate of smoking prevalence was 26% in Quebec, followed closely by the Atlantic Provinces of Nova Scotia at 25% and Newfoundland at 24%. In terms of daily cigarette consumption, daily smokers in BC smoked at a rate (16.3 cigarettes/day) only marginally lower than the Canadian average of 16.4 cigarettes/day (**Figure 1**).[7] Interestingly, the 2001 and 2002 CTUMS statistics for BC indicate that while smoking prevalence decreased in the province from 16.7% to 16%[8], the average number of cigarettes smoked daily increased from 14.6 to 16.3 per daily smoker.

[4] 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.

[5] Canadian Cancer Society, 1999

[6] These prevalence figures represent "current smokers" who were defined by CTUMS in 2001 as "daily or occasional" smokers. However, figures on number of cigarettes smoked per day are for daily smokers only.

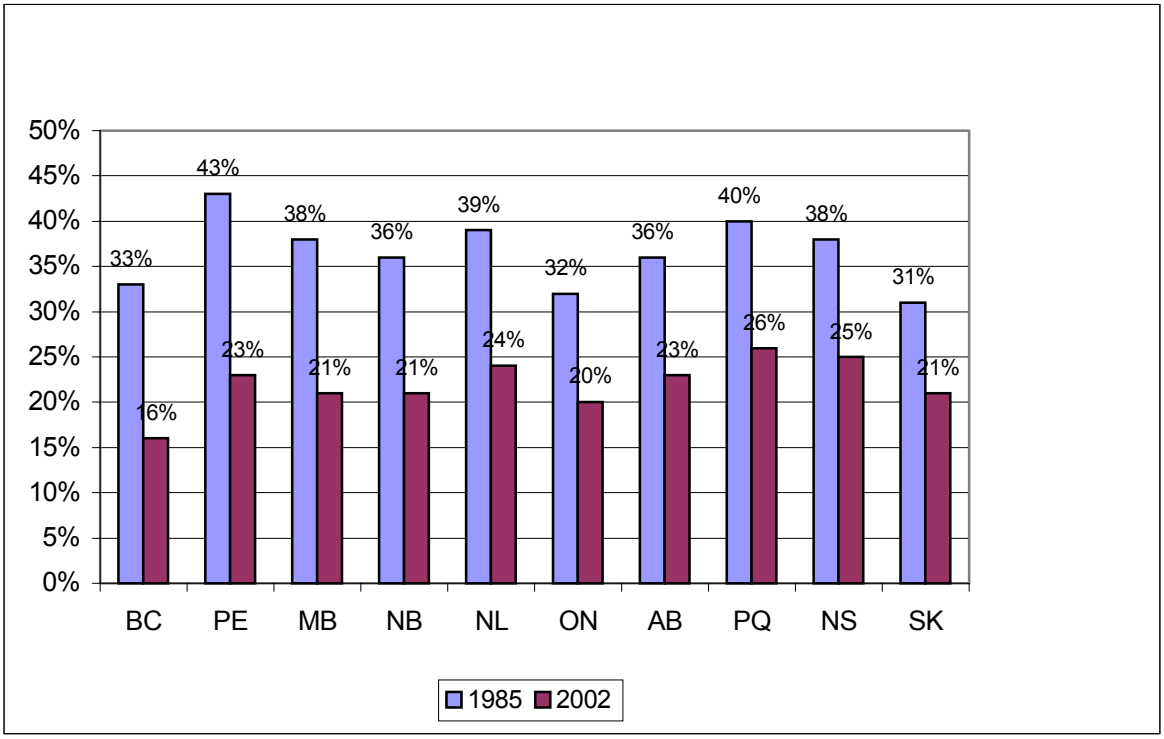
[7] Throughout this report, the full year 2002 numbers from the Canadian Tobacco Use Monitoring Survey are used, as they are the most recent full year results available at time of publication of this report.

[8] 2002 CTUMS percentages are published as whole numbers only, so the 16% figure given for 2002 could in fact be anywhere between 15.6% and 16.4%.

Figure 1 is a provincial comparison indicating the percentage of the population in each province that smoked in 1985 and 2002 (daily plus occasional, or non-daily, smokers). The graph is ordered from the province with the greatest rate of decline between 1985 and 2002 (British Columbia) to the province with the smallest rate of decline (Saskatchewan). British Columbia, with a smoking rate of 33% of the population over 15 years of age in 1985, dropped to a smoking rate of 16% in 2002.

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

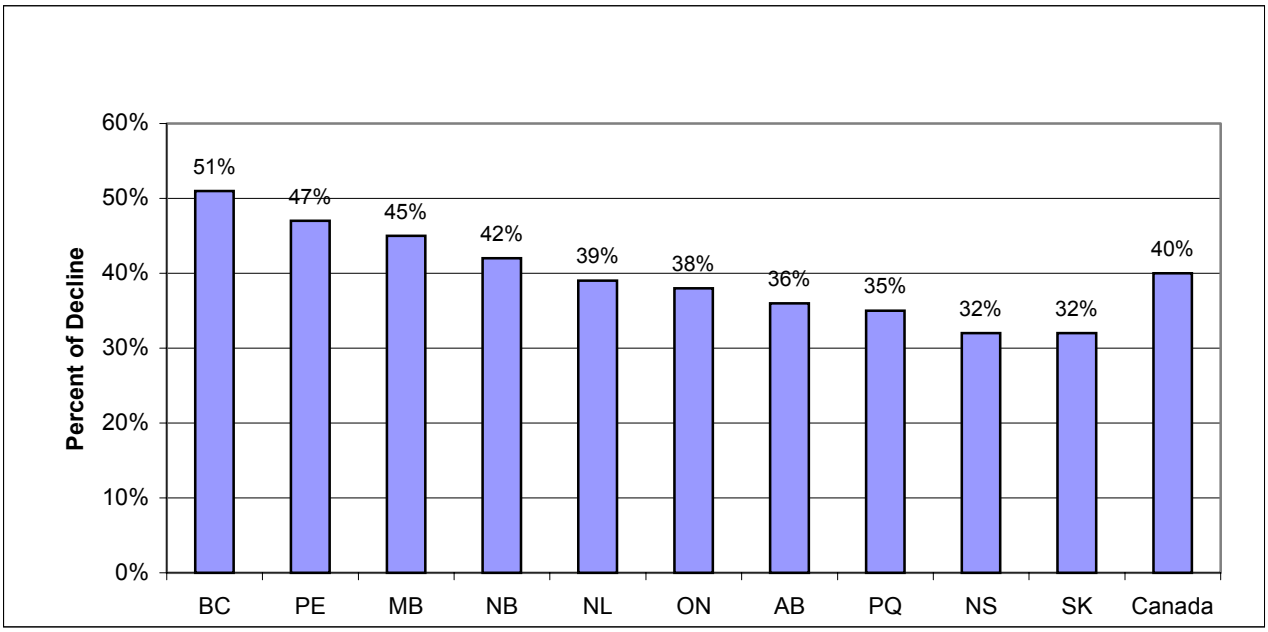
Figure 1: Percentage of Population Who Smoke, Age 15 and Over, (1985 and 2002) (%)



Sources: 1985 figures from CTUMS 2001, Smoking in Canada: An Overview, Figure 3 and 2002 figures from CTUMS 2002, Table 3

From 1985 to 2002, smoking prevalence in BC declined by 51%, which is the largest decline in the country and considerably higher than the national average decline of 40%**.** Figure 2 provides a provincial comparison of the rate of decline in cigarette smoking from 1985 to 2002, with the highest rate of decline on the left and the lowest rate on the right. Please note that all percentages in the chart have been rounded off to the nearest whole number.

Figure 2: Percentage Decline in Smoking Rates, Age 15 and Over, 1985-2002 (%)



Sources: Statistics Canada, General Social Survey 1985; CTUMS 2002

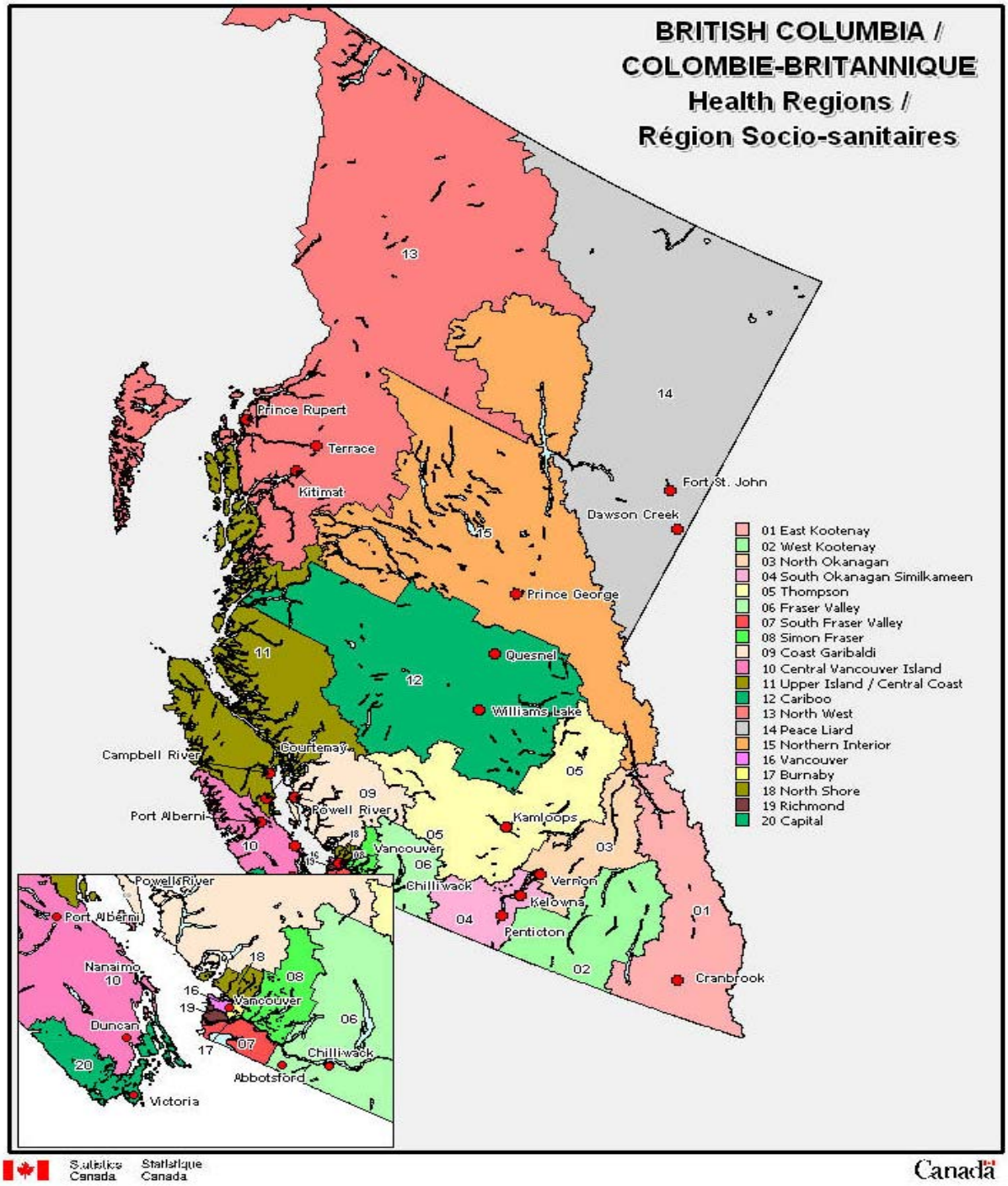
2.2 Smoking Trends in British Columbia's Health Districts

For the purposes of health care administration, the province of BC was organized into 20 health regions[9] (Figure 3) at the time of the 2000/01 Canadian Community Health Survey.[10]

[9] At the time the 2000/01 CCHS was conducted, the province of BC had created and defined 20 health regions "as the areas of responsibility for regional health boards (i.e. legislated) or as regions of interest to health care authorities." These health regions are numbered 5901 – 5920 in Statistics Canada's CCHS results. Statistics Canada added data to the CCHS for two amalgamated regions, namely 5921Vancouver/Richmond (corresponding to regions 5916 and 5919) and 5922 Burnaby/Simon Fraser (corresponding to regions 5917 and 5908), which better suited its method of "peer group" analysis. It is important to note, however, that data provided by Statistics Canada for regions 5921 and 5922 are duplicate information already contained in the data for BC Health Regions 5908, 5916, 5917, and 5919. Therefore the additional amalgamated data for regions 5921 and 5922 are not provided here. Shortly after the 2000/01 CCHS was completed, the province of BC announced a restructuring of its health regions, and in 2002 the province was reorganized into 16 health regions. Source: Brenda Wannell, Statistics Canada, Health Services, personal communication, November 12, 2003, and Statistics Canada, Canadian Community Health Survey 2000/01, map, "Smoking Status, by Health Region", http://www.statcan.ca/english/freepub/82-221-XIE/00502/pdf/2116m.pdf, accessed November 13, 2003. Since the publication of the 2000/01 Canadian Community Health Survey results, the province of BC has been further reorganized into 5 regional health authorities, the Northern Health Authority, Interior Health Authority, Vancouver Island Health Authority, Vancouver Coastal Health Authority, and the Fraser Health Authority, as well as the administrative authority for the province, the Provincial Health Services Authority. See: www.healthservices.gov.bc.ca/socsec/, accessed December 24, 2003.

[10] Canadian Community Health Survey, Health Regions, Map of BC; http://www.statcan.ca/english/concepts/health/maps/british_columbia.jpg, accessed November 12, 2003.

Figure 3: Health Regions of British Columbia



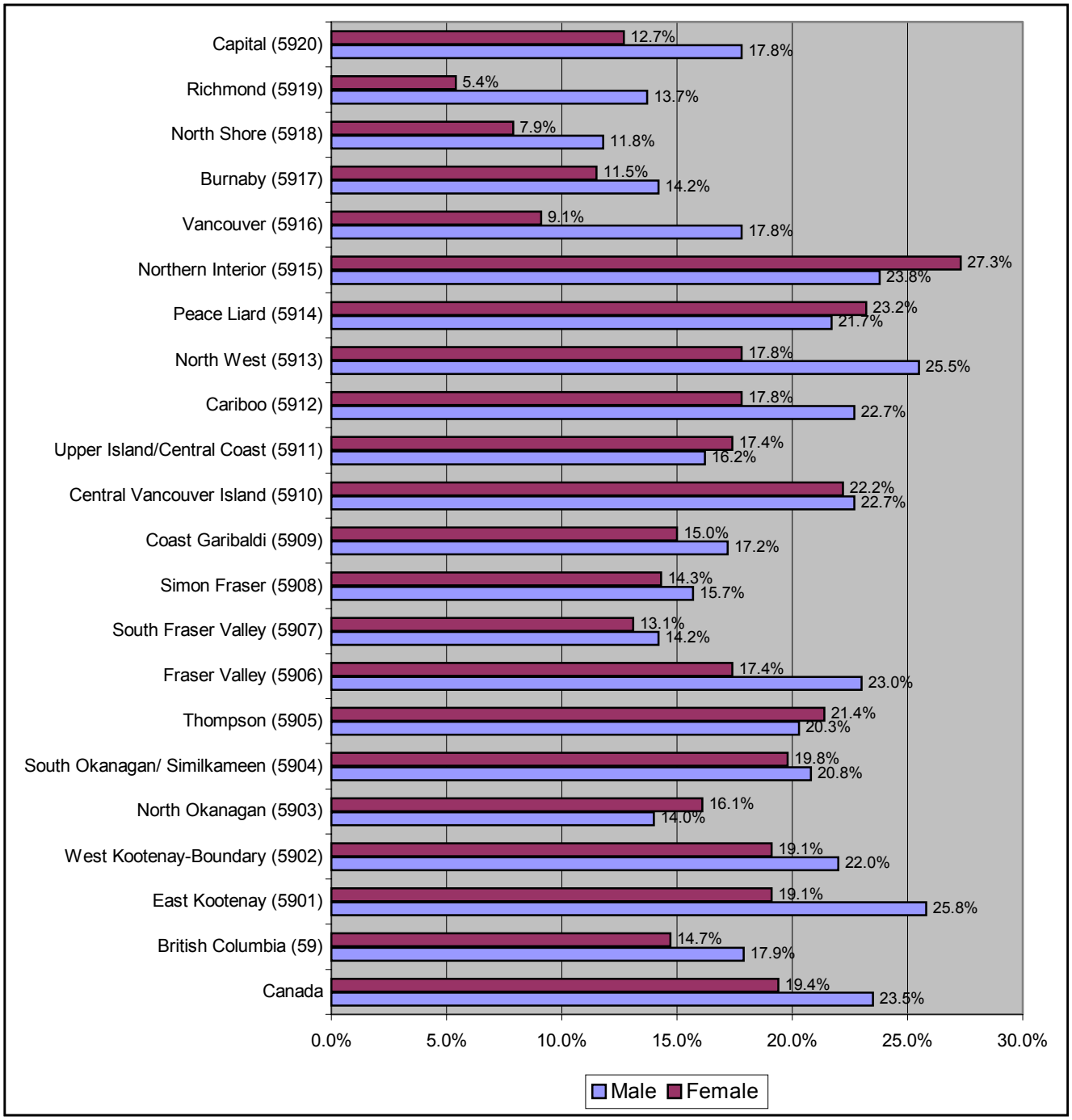
Source: Canadian Community Health Survey, BC Health Regions

Statistics Canada's 2000/01 Canadian Community Health Survey (CCHS) provides data for daily smokers for the 20 health regions within the province of British Columbia.[11] It should be noted that the CCHS data are for the population 12 and older, whereas the CTUMS data cited above are for the population 15 and older. The two data sets are therefore not comparable. Also, some health region data are subject to relatively high sampling variability due to small survey sample sizes, and should therefore be interpreted with caution.

According to the CCHS, 16.3% of British Columbians 12 and older are daily smokers, including 17.9% of males and 14.7% of females. This compares to the Canadian average of 21.5% (males – 23.5%, females – 19.4%). The highest smoking rates in British Columbia are in the Northern Interior (25.5%), East Kootenay (22.5%), Central Vancouver Island (22.4%), Peace Liard (22.4%), and Northwest BC (21.8%) – all registering daily smoking rates higher than the national average. The Northern Interior region has by far the highest rate of female smoking in the province (27.3%), and East Kootenay and Northwest BC have the highest rates of male smoking (25.8% and 25.5% respectively) (Figure 4). The lowest smoking rates in British Columbia – and also the lowest smoking rates among all 139 statistical health regions in the country – are in Richmond (9.5%) and the North Shore (9.8%). Other BC health regions with low smoking rates are: Burnaby (12.8%), Vancouver (13.4%), and the South Fraser Valley (13.6%).

[11] Source: Smoking Status, by Sex, Canada, Provinces, territories, health regions and peer groups, HTML version; http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/html/2116.htm; accessed November 12, 2003. Note: 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.

Figure 4: Percentage of the Population, Aged 12 and Over, who are Daily Smokers, Canada, and British Columbia Health Regions, 2000/01 (%)



Note: Data for males in Upper Island/Central Coast, and for females in Richmond and North Shore have a coefficient of variation (CV) from 16.6% to 33.3% and should be interpreted with caution.
Source: Statistics Canada, *Canadian Community Health Survey*, 2000/01

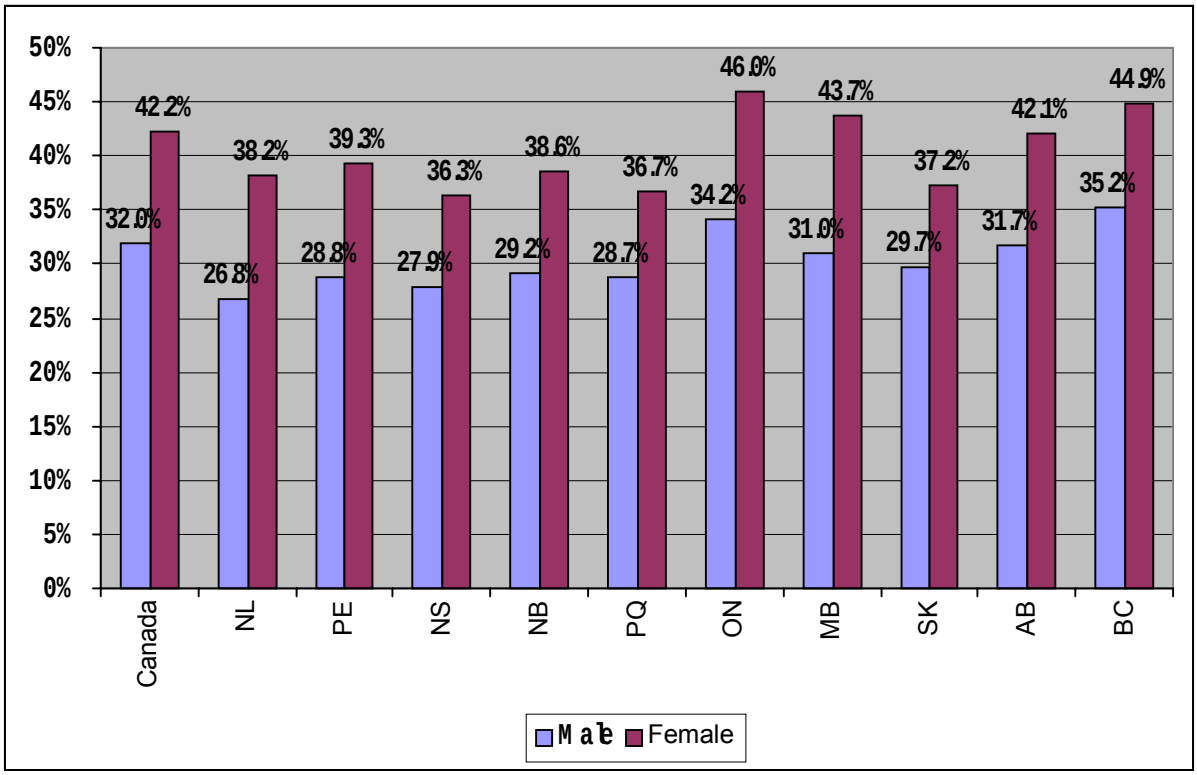
The CCHS also provides data on former smokers and on those who have never smoked. In light of its historically low smoking rates, it is to be expected that BC has a larger proportion of the population who have never smoked (40.1%) than the national average (37.2%), and second only to Ontario (40.2%). Further, because BC had the most dramatic decline in smoking rates in the country (Figure 1 and Figure 2), the BC rate for former smokers is also above the national average. Thirty-two percent of Canadian men and 42% of Canadian women have never smoked, compared to 35% of men and 45% of women in BC who have never smoked (Figure 5).

Among the BC health regions, the proportion of women who have never smoked is highest in the Lower Mainland area, in the regions of Richmond (63.2%), Vancouver (60.2%), and Burnaby (56.6%). Not surprisingly, the Lower Mainland also has the lowest proportions of women who are daily smokers.

In BC as a whole, 38.8% of those 12 and older are classified as former smokers compared to the national average of 36.7%. Most BC health regions also show that a greater proportion of the population has quit smoking than in Canada as a whole. The exception to this pattern is again in the Lower Mainland, particularly in the four regions where the proportions of people who have never smoked are the highest – Burnaby, Simon Fraser, Richmond, and Vancouver.[12] Thus the smaller proportion of quitters in the Lower Mainland is a function of more people never having started to smoke than of smaller quit rates among smokers.

[12] CCHS 2000/01, Smoking status, by sex, household population aged 12 and over, Canada, provinces, territories, health regions and peer groups; *CANSIM Database,* table number 01050027: http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/html/2116.htm , accessed November 12, 2003.

Figure 5: Percentage of the Population, Aged 12 and Over, Who Never Smoked, Canada and Provinces, 2000/01 (%)



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

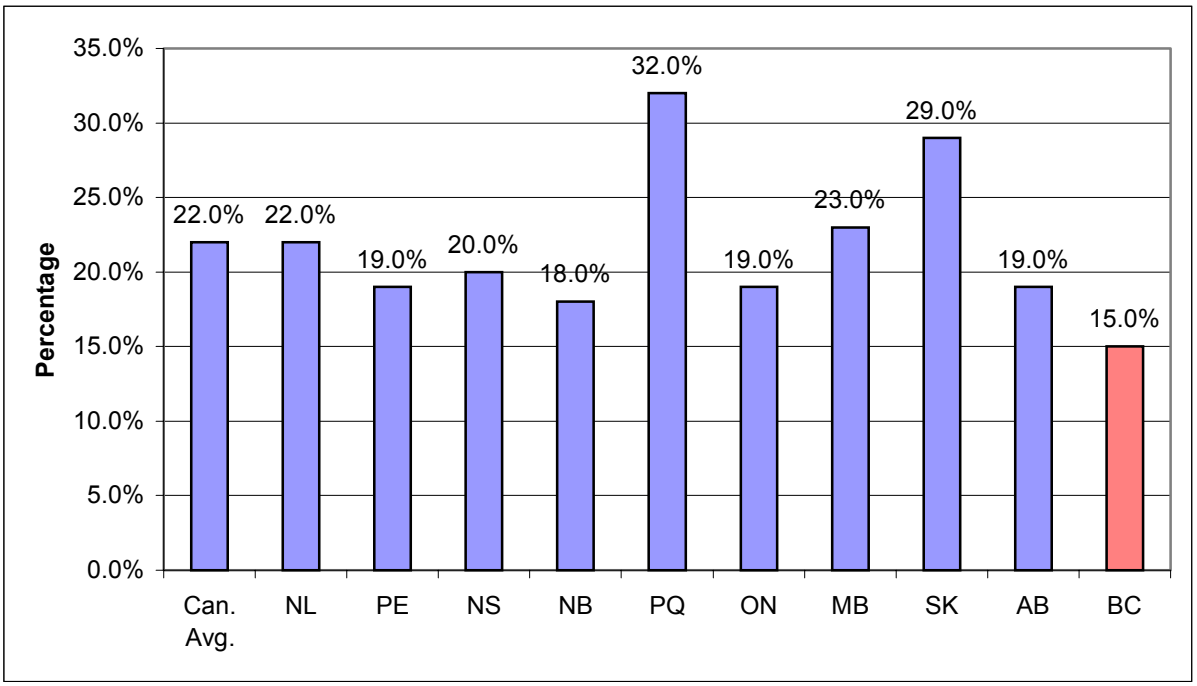
2.3 Teenage Smoking

The teenage years are when potential smokers are most vulnerable to smoking initiation. Almost all persons who have ever smoked had their first cigarette at some time in their teens, and at least half of all ever-smokers have tried smoking by the age of 15 (CTUMS Factsheet, 2000). The percentage of Canadian teens aged 15-19 who smoked reached a high of 49% in 1981, dropped by about half by 1989, and 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% of 15-19 aged teens reported as smokers in 2002 (CTUMS, 2002, 2001, 2000).

In the CTUMS 2002, 15% of BC's 15-19 year olds reported being current smokers, compared to the national average of 22%. This is the lowest rate of teen smoking in the country, followed by New Brunswick at 18% and Alberta, PEI, and Ontario, all at 19%. While BC continued to have the lowest prevalence of teen smokers, Quebec again had the highest rate, with 32% of teenagers smoking (Figure 6). Interestingly, however, those youth in BC who did smoke in 2002 reported

smoking more heavily than the national average. Among BC youth, daily smokers averaged 13.8 cigarettes,[13] compared to the national youth average of 12.9 (Figure 7).

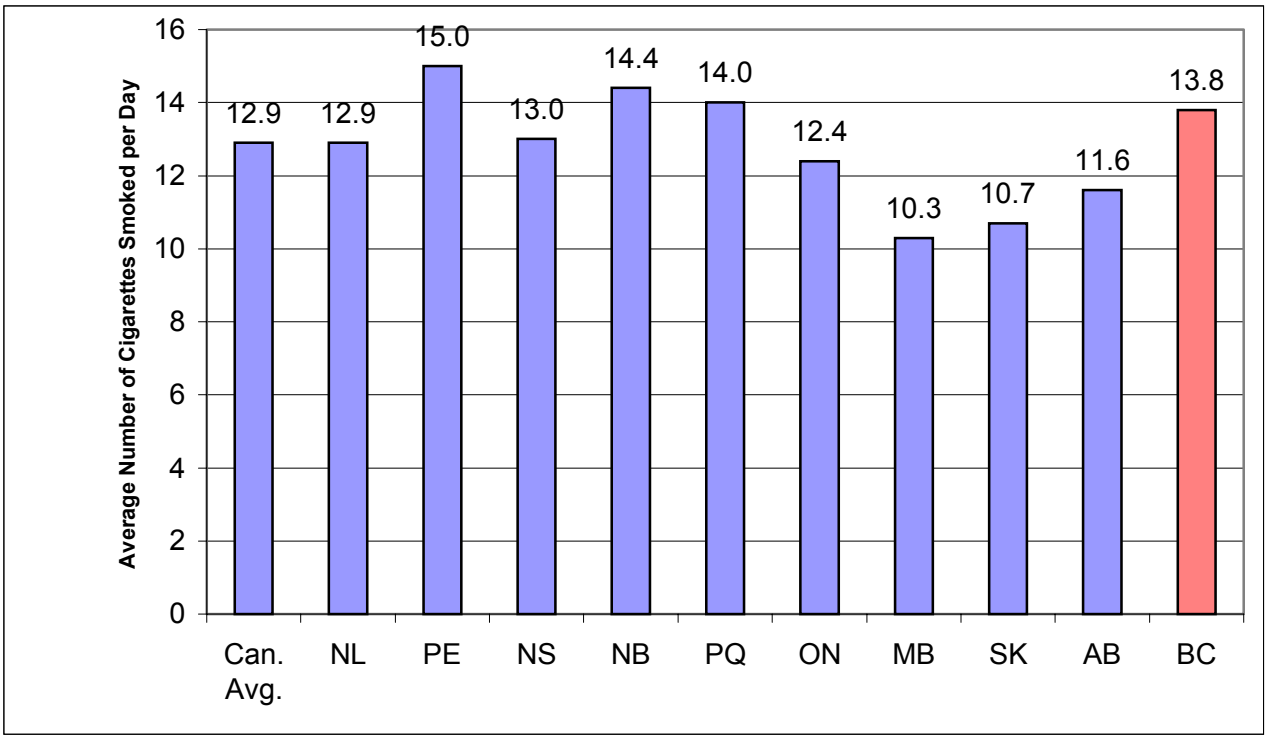
Figure 6: Percentage of Current Smokers, Aged 15-19, Canada, Provinces, 2002 (%)



Source: CTUMS 2002

[13] This represents an increase from the 2001 CTUMS statistic of 11.4 cigarettes smoked daily by teens in BC and is consistent with an overall increase in the province's 2002 CTUMS figures on daily cigarette consumption. This marks a departure from the previous trend of decreasing cigarette consumption and may point to the need for further research if the increase is shown not to be anomalous or a statistical artifact.

Figure 7: Average Number of Cigarettes Smoked per Day, Population Aged 15-19, Canada, Provinces, 2002



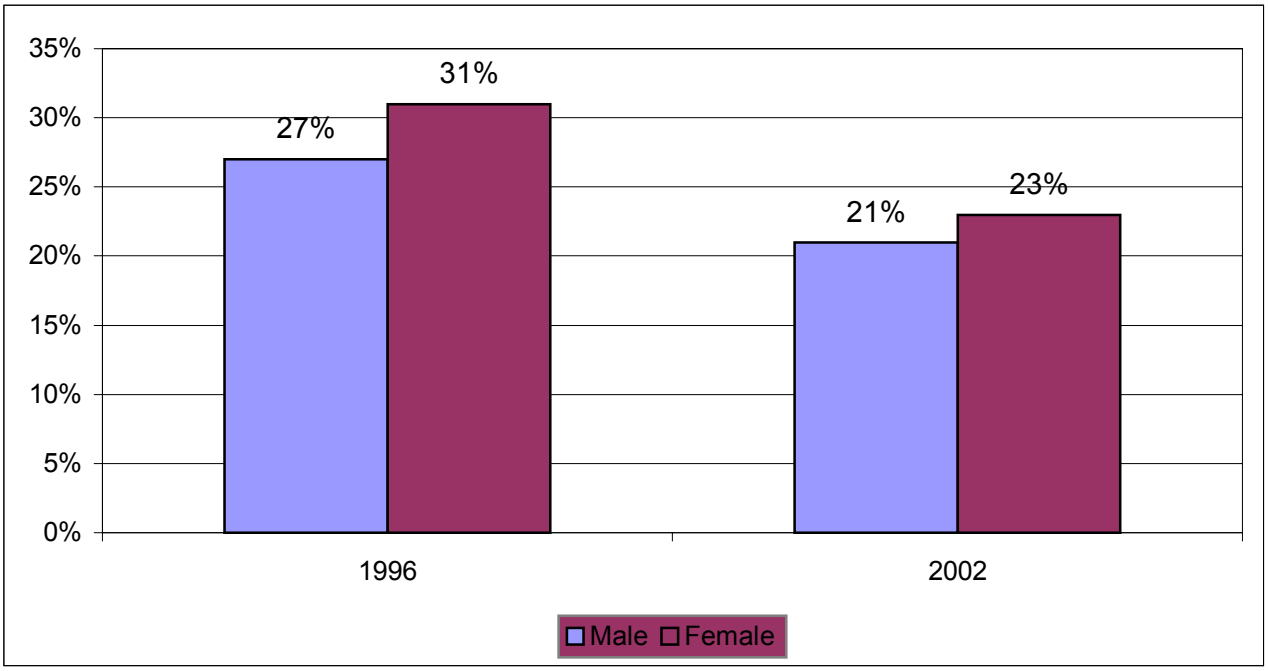
Source: CTUMS 2002, Table 2

The number of teen smokers aged 15-19 in Canada has declined since the mid-1990s, dropping from approximately 29% in 1996 to 22% in 2002.[14] Smoking prevalence among teenage boys aged 15-19 dropped from 27% to 21%, while the rate of smoking among girls in the same age group dropped from 31% to 23% (Figure 8). This higher rate of smoking among teenage girls is also true in British Columbia, where 16% of teenage girls aged 15-19 smoke compared to 13% of teenage boys. In fact, this is the only age group where more females than males smoke.[15]

[14] 1996 figures from National Population Health Survey Highlights, "Smoking Behaviour of Canadians", Cycle 2, 1996/97, see Figure 1.3-1, "Smoking Status of Youth by Sex, Age 15-19" (January 1999, No. 1), available at: http://www.hc-sc.gc.ca/pphb-dgspsp/ccdpc-cpcmc/cancer/publications/nphs-sboc/nphs11_e.html. Accessed January 24, 2004; and, see also CTUMS 2001, Smoking in Canada: An Overview, Figure 1, Trends in Smoking, Current smokers, by age, Canada, 1985-2001, available at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/ctums/2001/2001overview.html. Accessed January 24, 2004. 2002 figures from CTUMS 2002, Table 1, Smoking status and average number of cigarettes smoked per day, by age group and sex, age 15+ years, Canada, 2002, available at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/ctums/2002/annual_supplementary.html. Accessed January 24, 2004.

[15] CTUMS 2002, Table 3, Current smokers and average number of cigarettes smoked per day, by province, age group and sex, age 15+ years, Canada 2002, available at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/ctums/2002/annual_table03.html. Accessed December 30, 2003. The British Columbia

Figure 8: Smoking Rates by Gender, Age 15-19, Canada, 1996 and 2002 (%)



Source: National Population Health Survey Highlights, Figure 1.3-1 and CTUMS 2002, Table 1.

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.[16] 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). Further, 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). By 2002, CTUMS showed that the inverse relationship between education and smoking prevalence continues, with a marked differential in smoking rates between Canadians who did not complete high school, where 24 of 100 were current smokers, and those with university degrees, among whom only 13 of 100 were current smokers (CTUMS 2002).

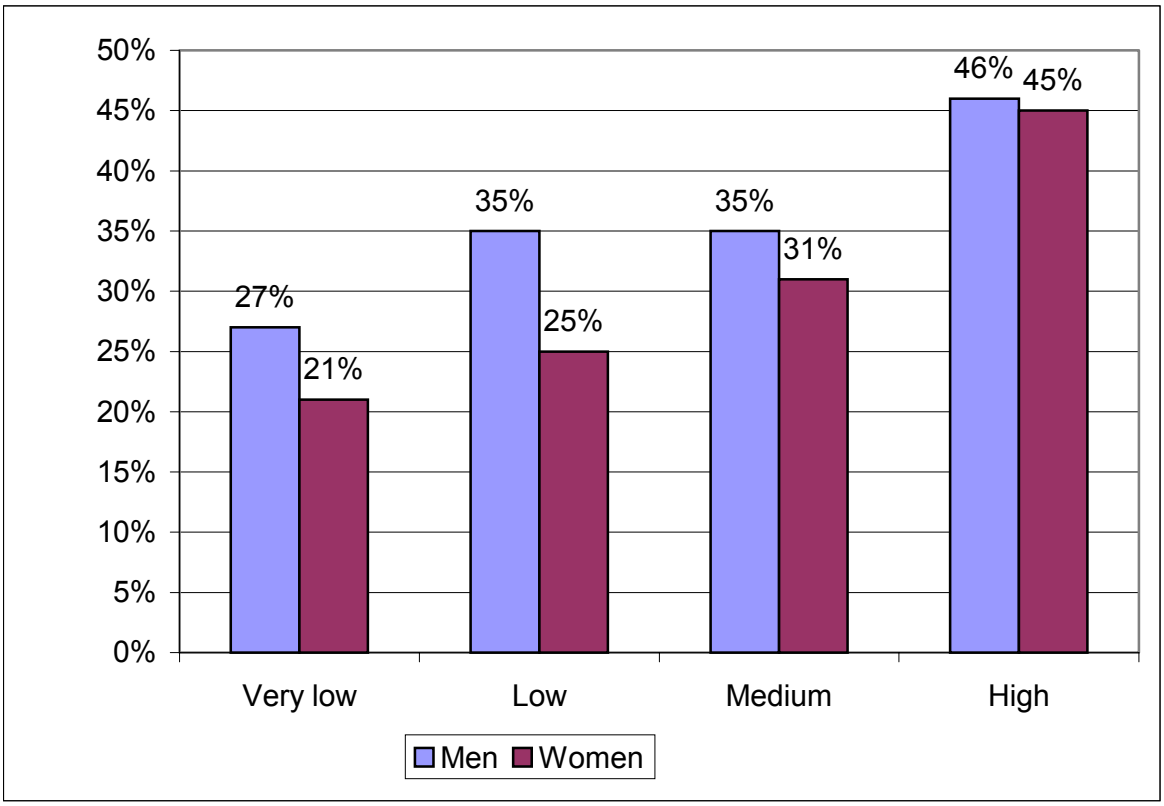
smoking rate for teenage boys aged 15-19 is subject to moderate sampling variability, and should therefore be interpreted with caution.

[16] 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 9) (Statistics Canada, National Population Health Survey 1994-95; Colman, 2000a).

Figure 9: Percentage of Canadian Population Age 18 and Over, Who Are Smokers, by Gender, Chronic Stress Levels, 1994-95 (%)



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 most recent Canadian Community Health Survey shows that while the correlation between high stress rates and prevalence of smoking holds true for much of Canada, this relationship is less evident in BC. For example, the province of Quebec shows the highest rates of both stress and smoking, with 30% of its people experiencing "quite a lot" of stress and 26% being current smokers and, conversely, 24% of BC's population experience high levels of stress but only 16% are current smokers. Similarly, within the health regions of BC, there does not appear to be a consistent correlation between high stress levels and smoking. This is illustrated in the North Shore region where 30.4% experience "quite a lot" of stress and yet only 9.8% of the region's population are current smokers.[17] The effect of stress on smoking rates in this region may be mitigated by its relatively high levels of income and education.

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. (Shift work, in turn, is more common in blue-collar or sales and service occupations than in white-collar or clerical jobs.)[18] There is currently insufficient evidence to establish a causal relationship

[17] Statistics Canada, Community Health Survey 2000/01.
[18] Statistics Canada, *The Daily*, July 25, 2002, citing *Health reports*, Vol. 13, No. 4

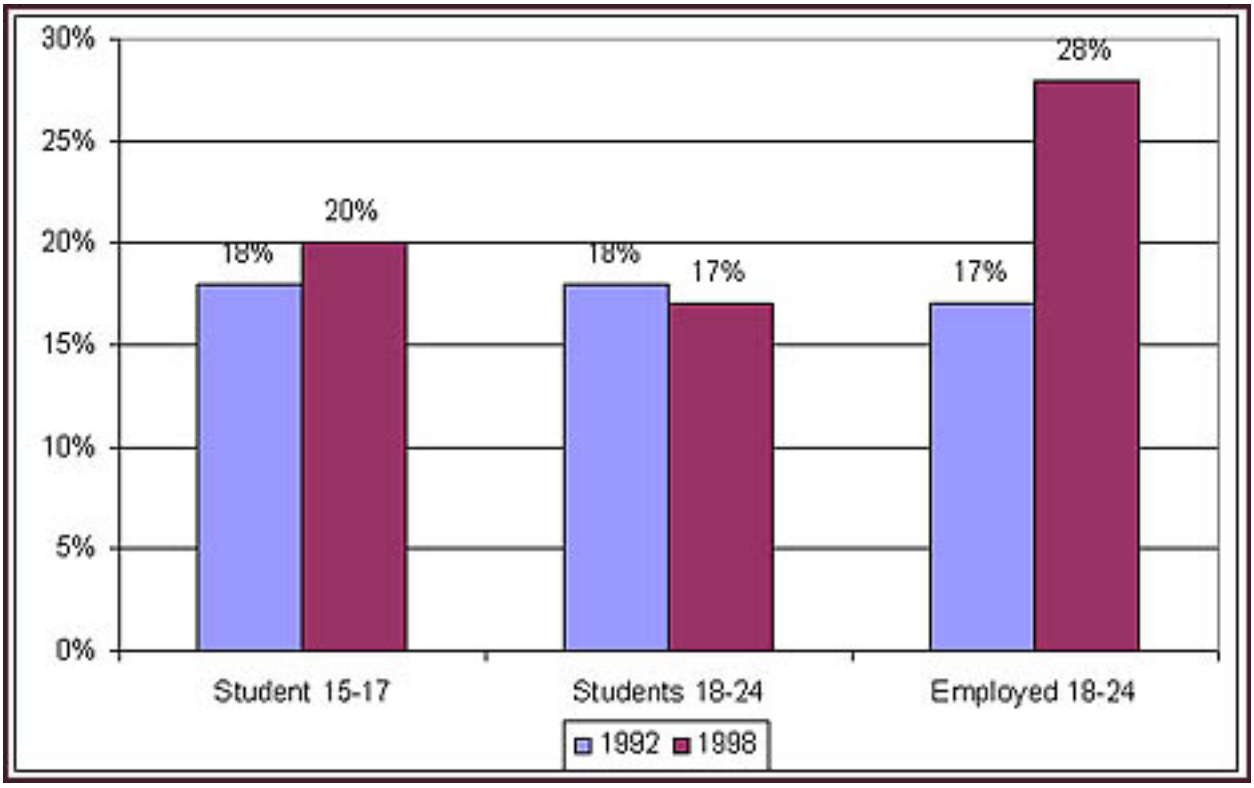
between work hours and smoking, but with employment patterns shifting in the last 20 years to higher rates of casual, on-call and temporary work, this correlation merits further study. Other indicators point to a clear relationship between smoking and job insecurity. Among all socio-demographic groups, 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 9 above), it is essential to give attention to the deeper societal patterns that may be responsible for smoking rates in BC. The concept of what is included in cessation promotion activities may need expansion, for example, to include stress management or self-esteem initiatives.[19]

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 10). 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]).

[19] 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 10: "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).[20]

[20] 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.[21] 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).

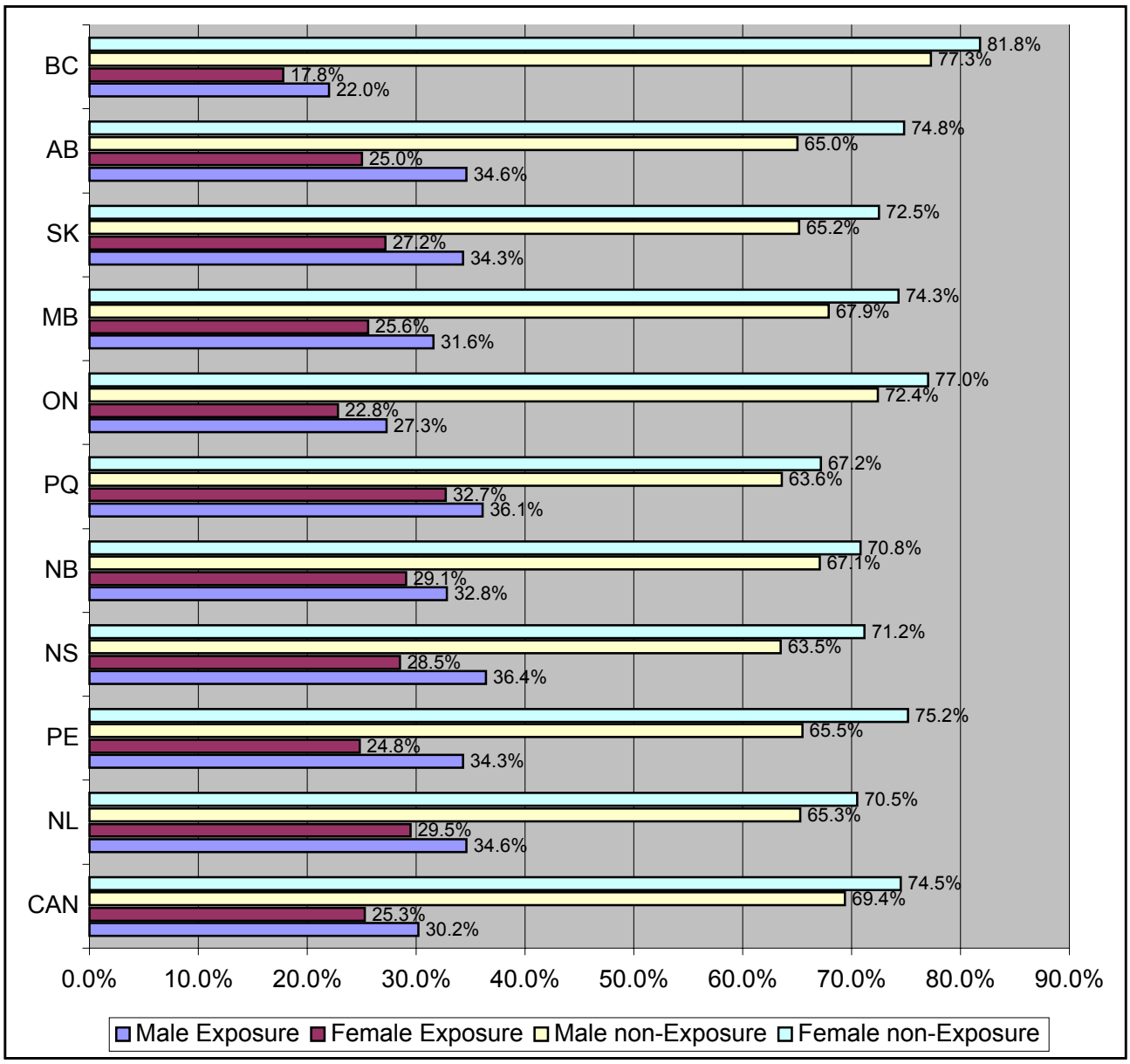
2.5 Exposure to Second-Hand Smoke in British Columbia

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 3.2, and accompanying report on *The Economic Impact of Smoke-Free Workplaces – An Assessment for British Columbia*).

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 British Columbia are considerably less likely to be exposed to second-hand smoke than most other Canadians. In 2000/01, 22% of males and 17.8% of females in BC reported being exposed to second-hand smoke on most days (Figure 11).

[21] See also "Nicotine Addiction Shows Up Early in Teen Smokers", Becky Hamm, Science Writer, Health Behaviour News Science, September 22, 2003; on website of the Centre for the Advancement of Health http://www.cfah.org/hbns/news/nicotine09-22-03.cfm, accessed November 11, 2003.

Figure 11: Percentage of the Population, Age 12 and Over, Reporting Exposure to Second-hand Smoke on Most Days in the Last Month, Canada and Provinces, 2000/01 (%)



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

Data from the 2000/01 Canadian Community Health Survey show that exposure to second-hand smoke continues to be a widespread problem for British Columbians, particularly for men who are exposed to ETS at a greater rate than are women in BC. The CCHS shows that the province's highest rate of exposure to ETS is in the Peace Liard region, with 35.3% of men and

28.9% of women (Figure 12). The CCHS results indicate that men invariably reported greater exposure than women across the three age groups studied (20-39, 40-59, 60+).[22]

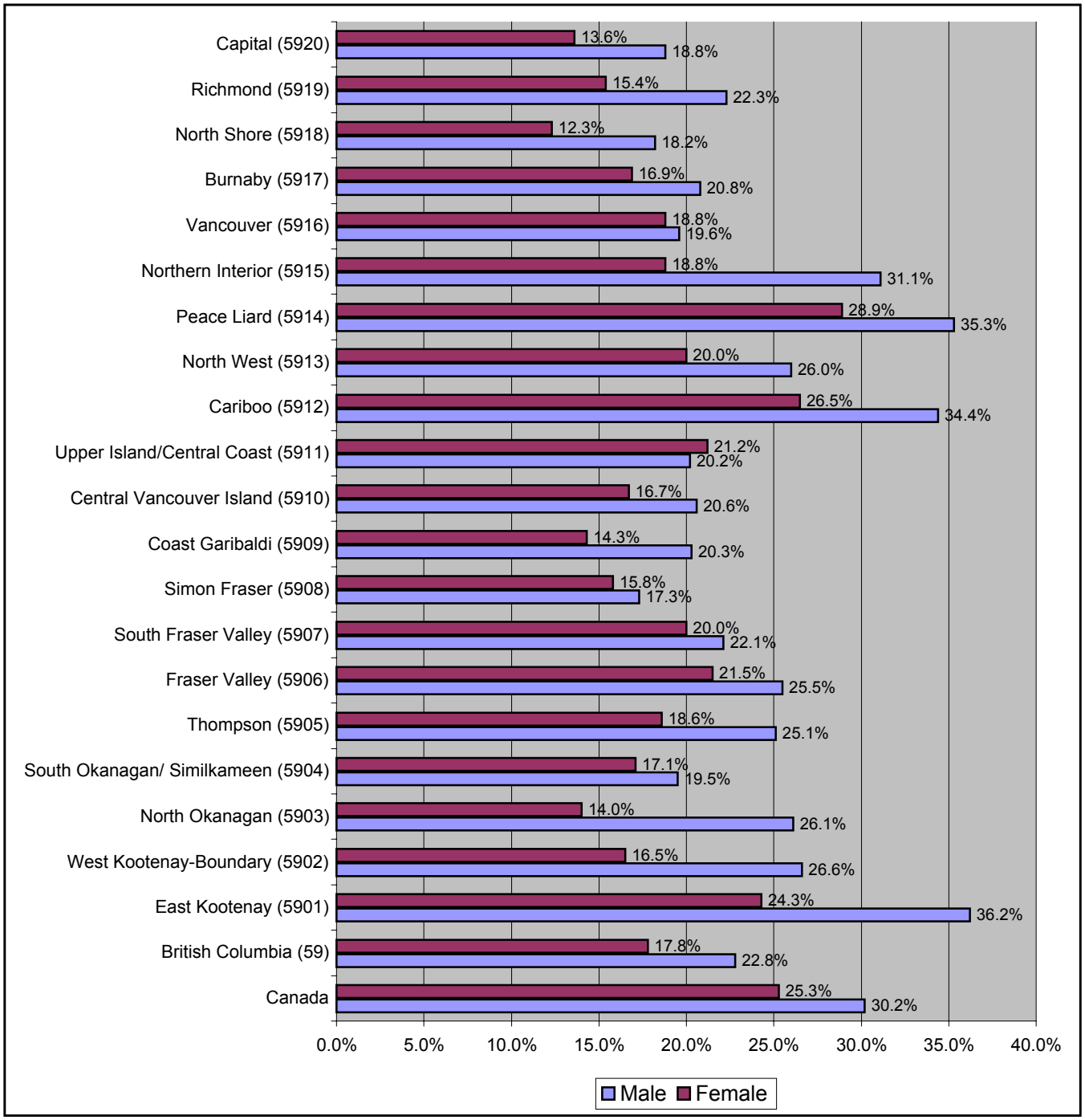
Comparing Figure 11 (prevalence of daily smokers over age 12 in BC health regions) and Figure 12 (exposure to second-hand smoke in BC health regions), it becomes clear that the rates of exposure to second-hand smoke tend to follow the prevalence rates of daily smokers. For instance, in the Lower Mainland regions of Simon Fraser, Coast Garibaldi, Vancouver, Burnaby, Richmond, North Shore and the Capital, the mean average rates for men and women in these regions for both daily smoking and exposure to second-hand smoke were below the provincial averages of 16.3% and 19.8% respectively.[23] Similarly, regions with above average rates of exposure to second-hand smoke also typically show higher than average proportions of daily smokers.[24] Regional exceptions to this trend towards correlation between prevalence of daily smokers and exposure to second-hand smoke are found in the North Okanagan and South Fraser Valley regions where the mean average rates of daily smoking are lower than the provincial average while mean exposure to second-hand smoke is higher than average. Conversely, in the South Okanagan/Similkameen and Central Vancouver regions, the mean average prevalence of daily smoking among men and women is above average at 20.3% and the mean exposure to second-hand smoke is below the average at 18.2%.

[22] Canadian Community Health Survey, Environmental Indicators, Exposure to Second-Hand Smoke, by age group and sex, Canada. *CANSIM table number 01050053;* *http://www.statcan.ca/english/freepub/82-221-XIE/01002/tables/html/2415.htm*, accessed November 12, 2003.

[23] Source for provincial average for smoking (16.3%) is CCHS, Health Behaviours, Smoking Status, http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/html/2116.htm; and the source for the provincial average of exposure to ETS is the CCHS, Environmental Factors, Exposure to Second-Hand Smoke, http://www.statcan.ca/english/freepub/82-221-XIE/01002/nonmed/environ1.htm, accessed November 12, 2003.

[24] These mean averages are calculated based on an assumption of equal numbers of men and women involved in the CCHS study.

Figure 12: Percentage of the Population, Age 12 and Over, Reporting Exposure to Second-hand Smoke on Most Days in the Last Month, Canada, British Columbia and BC Health Regions, 2000/01 (%)



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

3. The Cost of Smoking in British Columbia

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.

3.1 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 208,095 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.[25] Of these, 25,123 hospitalizations (728 per 100,000 people) and 376,545 hospital days (10,910 per 100,000 people) were estimated for BC.[26]

A study published in a 2000 volume of *Chronic Diseases in Canada* found that the principal causes of death for smokers in 1996 were cancer (all forms), cardiovascular diseases and respiratory diseases.[27] Figure 1 in Illing and Kaiserman's study shows that while cancers were the leading cause of death among male smokers, cardiovascular diseases were the primary cause of death for female smokers; however, for both men and women respiratory diseases were the

[25] The Costs of Substance Abuse in Canada: A Cost Estimation Study, Eric Single et al.; The Canadian Centre on Substance Abuse, 1996, p. 36.
[26] Ibid, Table 10.
[27] 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. 3, and Tables 2A and 2B; http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/archive/cd203b_e.html, accessed November 12, 2003.

third leading cause of death.[28] In terms of individual diseases, however, Illing and Kaiserman's study indicates that lung cancer was responsible for 31% of deaths among male smokers and 28% among female smokers.[29] 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).

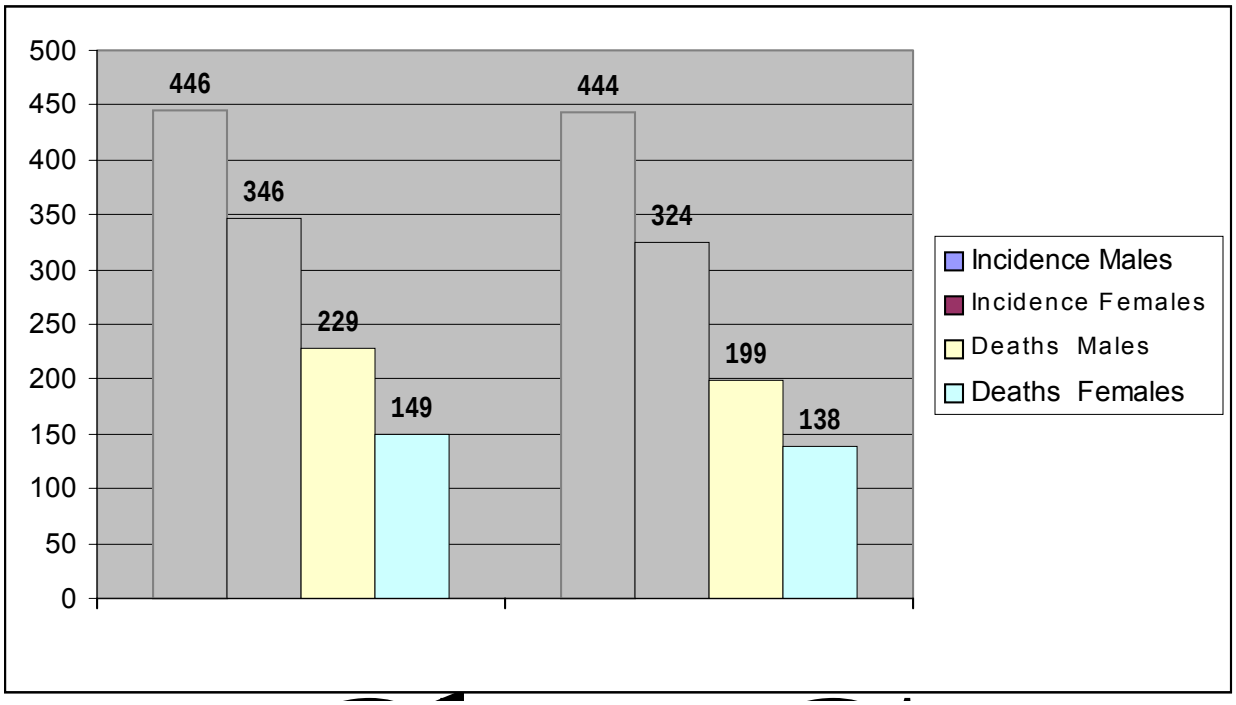
In 1999 British Columbia had an overall incidence rate of cancer that was only 3% lower than the national average; however, its cancer mortality rate was 11% below the Canadian average. Among men in BC, cancer incidence was only 0.5% lower than the national average, whereas male mortality rate due to cancer in 1999 was 13% lower in BC. For women, these rates were 6% and 7% less than the national average, respectively (Figure 13).[30]

[28] Makomaski Illing, E., and M. Kaiserman (1999). Mortality Attributable to Tobacco Use in Canada and its Regions, 1994 and 1996., *op cit*, Figure 1, p. 11. It is worth noting here that the percentage differences are very small, with 40.5% of deaths among male smokers attributable to cancer and 39.1% to cardiovascular diseases. Similarly, among female smokers, 36.7% of deaths were due to cancer and 38.4% were due to cardiovascular diseases. Interestingly, more female than male smokers died of respiratory diseases as these illnesses were responsible for 23.9% of deaths among female smokers and 19.4% among male smokers.

[29] Makomaski Illing, E., and M. Kaiserman (1999). Mortality Attributable to Tobacco Use in Canada and its Regions, 1994 and 1996, *op cit.,* p. 3.

[30] National Institute of Canada: Canadian Cancer Statistics 2003, Tables A4, p. 88 and A6, pg 90. Produced by the Canadian Cancer Society et al, 2003. http://www.ncic.cancer.ca/vgn/images/portal/cit_86751114/27/0/89485729cancerstatistics2003_en.pdf , accessed November 14, 2003. Note that the rates for cancer incidence and death are for 1999.

Figure 13: Cancer Incidence and Deaths, Age-standardized rate per 100,000 population (1999 rate)

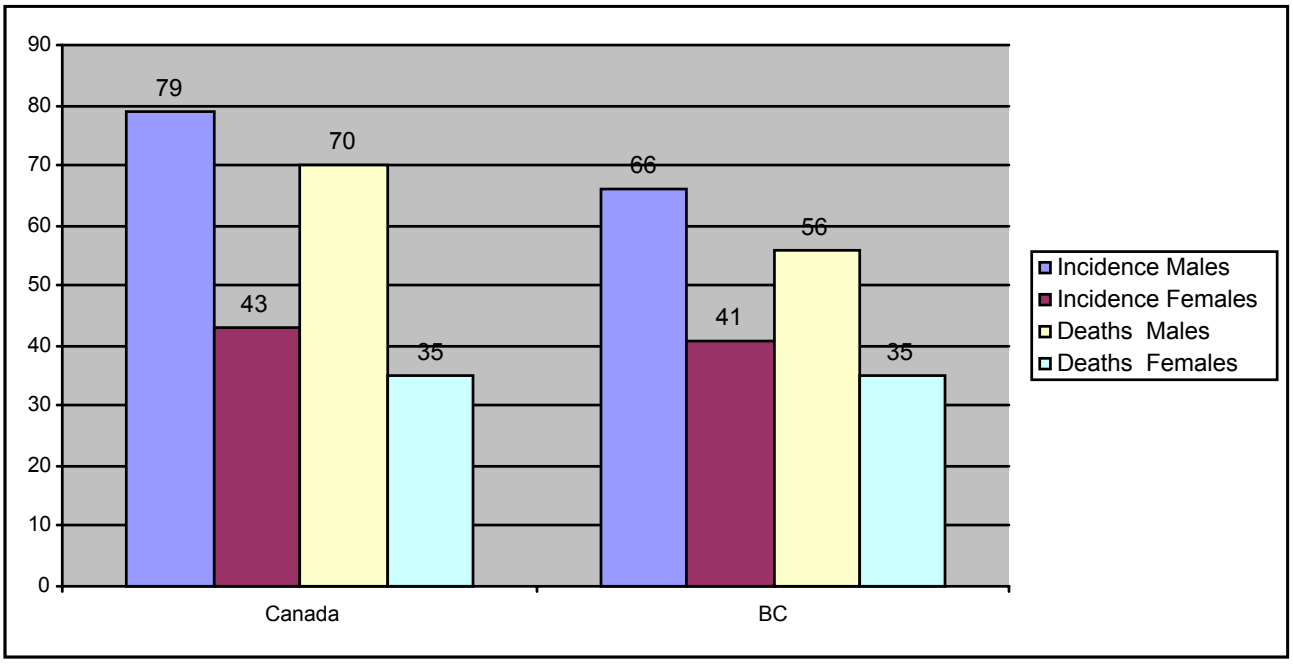


Source: National Cancer Institute of Canada: Canadian Cancer Statistics 2003

In 2003 lung cancer continues to be the leading cause of cancer deaths for male and female smokers in Canada.[31] Within the province of British Columbia in 1999, the overall incidence and mortality rates for lung cancer were below the national average by 12.3% and 13.3% respectively. It is interesting to note, however, that lung cancer incidence and mortality among women in BC is statistically much closer to the national average than for men. While BC men had an *incidence* rate 16.5% below the national rate, women's incidence rate was only 4.7% below the rate for all Canadian women. The mortality numbers for lung cancer in BC are more alarming in that while male mortality for lung cancer in BC is a full 20% below the nation's average, the mortality rate for women is the same (Figure 14).[32]

[31] National Institute of Canada: Canadian Cancer Statistics 2003, op cit., p. 17.
[32] National Institute of Canada: Canadian Cancer Statistics 2003, op cit., Tables A4 and A6.

Figure 14: Lung Cancer Incidence and Deaths, Age-standardized rate per 100,000 population, 1999 (rate)



Source: National Cancer Institute of Canada: Canadian Cancer Statistics 2003

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 and British Columbia. Currently, Health Canada reports that 21% of all deaths in Canada are attributable to smoking – 45,000 preventable deaths a year. The BC Vital Statistics Agency reports that 5,761 British Columbians died in 2002 due to smoking-attributable mortality (SAM).[33]

[33] Selected Vital Statistics and Health Status Indicators, Annual Report 2002; Table 42 – "Smoking-Attributable Mortality in BC 2002"; www.vx.gov.bc.ca/stats/annual/2002/tab42.html, accessed November 15, 2003.

Table 1: Estimates of Canadian and British Columbian Deaths Attributable to Smoking

Source	Focus Year	Deaths in Canada	Deaths in British Columbia
Health Canada (1991)[34]	1985	37,531	(n/a)
Health Canada (1991)[35]	1989	38,357	(n/a)
Health Canada (1992)[36]	1989	(n/a)	(n/a)
Health Canada (1996)[37]	1991	41,408	5,248
Health Canada (1999)[38]	1991	45,000	(n/a)
CCSA (1996)[39]	1992	33,498	4202
Health Canada (1999)[40]	1994	45,472	5,510
Health Canada (1999)[41]	1996	45,215	5,859
BC Vital Statistics (1998)	1998	(n/a)	5,656[42]
BC Vital Statistics (1999)	1999	(n/a)	5,762[43]
BC Vital Statistics (2000)	2000	(n/a)	5,514[44]
BC Vital Statistics (2001)	2001	(n/a)	5,670[45]
BC Vital Statistics (2002)	2002	(n/a)	5,761[46]

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

[34] Collishaw, N. and K. Leahy (1991). Mortality Attributable to Tobacco Use in Canada, 1989. *Chronic Diseases in Canada,* July-August, 1991, p. 46-49.
[35] *Ibid.*
[36] 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.
[37] Health Canada (1996). Deaths in Canada Due to Smoking. Accessed from http://www.hc-sc.gc.ca/english/media/releases/1996/deathe.htm, Accessed November 16, 2003.
[38] 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.
[39] Single, *op cit.,* Table 10.
[40] 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; http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/archive/cd203b_e.html, accessed November 12, 2003.
[41] Makomaski Illing, *op.cit.*.
[42] Selected Vital Statistics and Health Status Indicators, Annual Report 1998; Table 42 – "Smoking-Attributable Mortality in BC 1998"; www.vx.gov.bc.ca/stats/annual/1998/tab42.html, accessed November 15, 2003.
[43] Selected Vital Statistics and Health Status Indicators, Annual Report 1999; Table 42 – "Smoking-Attributable Mortality in BC 1999"; www.vx.gov.bc.ca/stats/annual/1999/tab42.html, accessed November 15, 2003.
[44] Selected Vital Statistics and Health Status Indicators, Annual Report 2000; Table 42 – "Smoking-Attributable Mortality in BC 2000"; www.vx.gov.bc.ca/stats/annual/2000/tab42.html, accessed November 15, 2003.
[45] Selected Vital Statistics and Health Status Indicators, Annual Report 2001; Table 42 – "Smoking-Attributable Mortality in BC 2001"; www.vx.gov.bc.ca/stats/annual/2001/tab42.html, accessed November 15, 2003.
[46] Selected Vital Statistics and Health Status Indicators, Annual Report 2002; Table 42 – "Smoking-Attributable Mortality in BC 2002"; www.vx.gov.bc.ca/stats/annual/2002/tab42.html, accessed November 15, 2003.

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 59,784 of these years being lost in BC (1723 years per 100,000 people).[47]

A study 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.[48] This study further estimates that a similar percentage of young smokers will "*die prematurely in old age due to their smoking."* According to the BC Ministry of Children and Family Development, there were over 1,023,000 British Columbians aged 0 to 19 years in 1998.[49] If 16% of them are or become regular smokers then, extrapolating from the estimates in the *BMJ* study, it can be expected that approximately 37,328 will be killed by their addiction in middle age, thereby losing about 22 years of non-smoker life expectancy. A further 37,328 will likely die prematurely in later life.

3.2 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.*).

[47] Single et al, op cit. Canadian PYLL, Table 2; British Columbia PYLL, Table 15.
[48] Johnathan Foulds and Christine Godrey, "Counting the Cost of Children's Smoking", *British Medical Journal*, vol. 311, October 28, 1995.
[49] 1998 BC population under age 19 is 1, 023, 258. Source: BC Ministry of Children and Family Development: http://www.mcf.gov.bc.ca/publications/measure_success/msappendix_a.htm, accessed November 26, 2003.

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.

3.2.1 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 one can have in reaching the conclusion that passive smoking causes heart disease"* (*Glantz and Parmley,* op cit.).

3.2.2 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.[50] 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,

[50] 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.

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.*).

3.2.3 ETS and Respiratory Illness

While the link between ETS and childhood respiratory ailments, including bronchitis, pneumonia and asthma has been established for some time, the connection between 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.*). Further, a 2001 paper by the Airspace Action on Smoking and Health group in BC about the effects of ETS in the workplace reported that ETS was the single greatest cause of workplace death.[51]

  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).

[51] "Deadly Fumes: British Columbia Workplace Death Toll attributable to Secondhand Smoke 1989 – 1998", Airspace Action on Smoking & Health, 2001, p. 10.

3.3 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 BC's projected expenditure of over $10.7 billion (2003$) on health care in 2003/04, the World Bank estimate would have translated into between $642 million and $1.6 billion in smoking-related health care costs.[52]

In the only study to have made explicit provincial estimates, the Canadian Centre on Substance Abuse (CCSA) estimated the direct medical care costs for smokers in BC at $333.3 million (Table 3).[53] This is well below the lower end of the World Bank estimate, explained in part by the fact that the BC budget for the Ministry of Health includes expense items not wholly medical in nature but linked rather to a broader array of community services.

Table 2: Estimate of Direct Medical Care Costs of Smoking in Canada and British Columbia (millions 2002$)

	Canada	British Columbia
Hospitals	$1,955.4	$199.6
Ambulance Services	63.8	8.3
Physician fees	378.8	50.7
Prescription Drugs	510.1	62.3
Other Health Care Costs	76.3	12.4
Total Direct Health Care Costs	**$2,984.4**	**$333.3**

Source: Single, *op cit,* Tables 4 and 12. All costs are adjusted from 1992 to 2002 dollars using the Canadian and British Columbian Consumer Price Indexes for "health and personal care" costs.

In addition to direct medical care costs to BC, the CCSA estimated a further $12.5 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).

[52] BC provincial budget figure from http://www.healthservices.gov.bc.ca/bchealthcare/, accessed November 16, 2003.
[53] Single, op cit., Table 12. This cost estimate has been adjusted from 1992$ to 2002$ using the BC CPI for "Health and Personal Care."

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 almost $1.8 *billion* to the bill (2002$). That study also found that smoking-attributable fires caused over $94 million in damages compared to the $20 million estimated by CCSA and estimated total smoking attributable costs in Canada at approximately $18 billion even after adjusting for $1.8 billion in "savings" to the health care system from the premature deaths of smokers (Kaiserman, 1997).[54]

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 3.4. 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 BC 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 whenever data were incomplete or when alternative sources yielded different figures. Coupled with the exclusions noted above, that justifies an upward adjustment to the CCSA estimate for medical care costs.

3.3.1 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 BC's health care budget for 2003/2004 would yield a cost estimate of about $749 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

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

- 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 (2002$)

Reference	Region	Total Cost (millions)	Cost per smoker/year
Single, *op cit.* (Canada estimate)	Canada	2,984.4	553
Single, *op cit.* (1992) (BC estimate)	BC	333.3	615
Kaiserman, *op cit.* (incl. residential care)	Canada	4703	600
Stoddart *et al*. (1986), in Phillips *op cit.*	Canada	712	266
Collishaw and Myers (1984), in Phillips *op cit.*	Canada	3,417	342
Thompson and Forbes (1982), in Phillips *op cit.*	Canada	6,351	629
Dept. Health & Social Security (1972), in Phillips *op cit.*	U.K.	1,729	111
Kristein (1977), in Phillips *op cit.*	U.S.A.	25,529	1162
Luce & Schweitzer (1978), in Phillips *op cit.*	U.S.A.	37,731	623
US Office of Technology Assessment (1985) (mid-range estimate), in Phillips *op cit.*	U.S.A.	51,706	1036
Phillips *et al*. (1992), in Phillips *op cit.*	N.Z.	210	439
Phillips *et al*. (1993), in Phillips *op cit.* [55]	N.Z.	171	340

Based on the extensive review behind this report, GPI*Atlantic* estimates – conservatively – the direct medical care costs of smoking in BC to $525 million annually. This 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.[56] Average spending of $100/year on smoking prevention and/or treatment costs, by each of BC's 542,240 smokers in 2002, would have cost over $54.2 million alone that year on top of the CCSA total estimate of $333.3 million.

3.3.2 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.

[55] 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

[56] Health Spending to Top $112 Billion in 2002, Canadian Institute for Health Information, p. 1, and Figure 5: Public and Private Shares of Total Health Expenditure, by Use of Funds, Current Dollars, Canada, 2000. http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=media_18dec2002_e; accessed November 20, 2003.

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 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.

3.4 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.

3.4.1 Increased Life Insurance Premiums

Of 1,990,300 BC employees (January 2003)[57], a 16% smoking rate (CTUMS 2002) yields about 318,448 smoking employees. The Conference Board of Canada (1997)[58] estimated that each smoking employee costs an employer $85.65 per year in increased life insurance premiums. This amounts to $27.28 million to BC 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.

3.4.2 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 $97 per smoking employee per year, or approximately $30.9 million to BC employers.

3.4.3 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. British Columbia's average weekly wage in December 2002 was $676.45.[59] Applying this weekly wage to an absenteeism figure of 1.8 days/smoker, and adding mandatory employer

[57] Figure from labour force characteristics data on Statistics Canada's web site, non-seasonally adjusted figures for BC population aged 15+ in January 2003, http://www.statcan.ca/Daily/English/030207/d030207a.htm, accessed November 16, 2003.
[58] Conference Board of Canada, "Smoking and the Bottom Line: The Costs of Smoking in the Workplace," 1997; http://www.hc-sc.gc.ca/hecs-sesc/tobacco/facts/bottomline/ch3_cost.html, accessed November 17, 2003. The study used 1995$ in its estimation of costs associated with smoking in workplace; here these costs have been updated to 2002$.
[59] Statistics Canada Labour Force Survey, Provincial Comparison – Average Weekly Wage Rate, Produced by BC Stats, www.bcstats.gov.bc.ca/DATA/LSS/empern/eet21.pdf, accessed November 16, 2003.

payroll tax and benefit costs of approximately 15% (for Employment Insurance, Canada Pension Plan and Workers' Compensation Plan costs), each smoker costs his/her employer an additional $280.00 a year in excess absenteeism for a total cost of over $89 million to BC employers.[60] In terms of total productive time lost, smokers' higher rates of absenteeism cost the BC economy approximately 573,206 work days a year, or 2487 work years annually.[61]

3.4.4 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.[62]

Extrapolating from this estimate, and allowing for BC's comparatively low rate of smoking prevalence, if one-third (5.4) of a BC smoker's average of 16.3 cigarettes daily (CTUMS 2002) are consumed during work hours, and if three of those 5.4 work-time cigarettes are consumed during scheduled breaks, then 2.4 more, on average, are consumed during unscheduled breaks. Assuming a 230.5-day work year, the average BC smoker loses about 92.2 hours – almost two and a half 40-hour work weeks – per year of work-time due to unscheduled smoke breaks.

Based on average weekly earnings in BC ($676.45 per week as of December 2002), and adding mandatory benefit and tax costs of 15%, the average full-time smoking employee costs his/her employer approximately $1,793 extra per year in wages paid for non-productive time.[63] Adjusting for an 80%-20% full-time/part-time ratio,[64] it is estimated that unscheduled smoking

[60] Please note that this calculation assumes that the employee gets paid sick days which, according to the BC labour standards, is up to the discretion of the employer. See BC Ministry of Skills Development and Labour; http://www.labour.gov.bc.ca/esb/facshts/hours_of_work_and_overtime.htm, accessed November 20, 2003.

[61] The 230.5-day work year is based on an allowance for 104 weekend days, plus an approximate average of 2.7 weeks vacation (13.5 work days), 9 statutory holidays, and 8 family/personal leave days. Please note that this estimate does not include sick or parental leave. Source: BC Ministry of Labour and Skills Development, http://www.labour.gov.bc.ca/esb/esaguide/ accessed November 22, 2003.

[62] 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.

[63] Adjusting to allow for a 37.5 hour work week, the cost of unscheduled smoking breaks increases to $1912.66 a year for each smoking employee. For the purposes of this report, the 40 hour work week has been used in all calculations, as per guidelines from the BC Ministry of Skills Development and Labour; http://www.labour.gov.bc.ca/esb/facshts/hours_of_work_and_overtime.htm, accessed November 20, 2003.

[64] According to Statistics Canada, in 2001 the ratio of full-time to part-time employees in BC was 79.5% to 20.5%. These numbers have been rounded to 80% and 20% for this calculation. Source: Statistics Canada, 2002, *Labour Force Historical Review, 2001*. Catalogue No. 71f0004xcb; Minister of Industry, Ottawa.

breaks taken by part-time and full-time workers cost BC employers nearly $514 million in wages paid for non-productive 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. In 2002 the British Medical Journal found that smoke-free workplaces not only encourage almost 4% of smoking employees to quit their habit but also effect an average reduced consumption of 3.1 fewer cigarettes per day among employees who continue to smoke.[65] Given BC's unique position as having the lowest smoking rate in Canada, if employees in a smoke-free work environment only smoked during their scheduled breaks, this would constitute a major savings to employers in the province who currently pay approximately $514 million in lost wages each year due to unscheduled smoking breaks. Even if the number of each employee's unscheduled smoking breaks were reduced to one from 2.4, employers would save over a week's worth of lost wages per smoking employee per year, resulting in a yearly savings of $276 million as the lost wages from unscheduled smoking breaks is reduced from $514 million to $238 million.

Thus, an employer's total annual cost of employing a smoker is an estimated $2,256 and the overall cost of employing workers in BC who smoke is an estimated $661 million per year (Table 4).

Table 4: Annual Extra Cost of Employing Smokers in British Columbia (2002$)

Cost Factor	Cost Per Employee ($)	Cost to BC employers ($ million)
Increased life insurance premiums	85.65	27.28
Smoking area costs	97.0	30.9
Increased absenteeism	280	89
On-the-job productivity losses	1793.0	514
Total	**2255.65**	**661.18**

Source: Adapted from The Conference Board of Trade, *Smoking and the Bottom Line*, 1997

However, it should be noted that wages represent only a portion of the value of a worker's output or economic production. The Real GDP at market prices, representing the gross value of production ($128.151 billion for BC in 2002[66]), can be divided by total employment and then by

[65] *The Effect of Clean Air Ordinances on Smoking Prevalence and Cessation*, August 6, 2002; Americans for Nonsmokers' Rights, citing C.M. Fichtenberg and S.A. Glantz, "Effect of smoke-free workplaces on smoking behaviour: Systematic Review", in *British Medical Journal* Vol. 325: pp. 188-191, July 27, 2002.
[66] StatCan, "Real gross domestic product, expenditure-based, provinces and territories, 1998-2002", http://www.statcan.ca/english/Pgdb/econ50.htm; accessed November 19, 2003. Since May 31 2001, Statistics Canada has adopted the use of the Fisher Index to calculate real GDP growth rates to better reflect change and inflation in the Canadian economy.

average hours/year/worker to yield the real hourly GDP per worker, factoring full-time/part-time employment ratios.

Therefore, factoring in the real hourly GDP per employee yields an actual value of lost production due to unscheduled smoking breaks which is significantly higher than lost wages alone, at $3577 a year per smoking employee, or $1.14 billion total. Similarly, the actual value of lost production as a result of smoking-related absenteeism is higher too, amounting to $558.72 for each smoking employee, and $178 million overall.

Using the real hourly GDP to account for lost production value, cost estimates for productivity losses can be adjusted upwards to $1.3 billion for smoking-related absenteeism and unscheduled smoking breaks – a significant increase from the conservative wages-based estimate of $514 million in costs for full-time and part-time worker's unscheduled breaks and $89 million in absenteeism. Further, by factoring in the real hourly GDP, the savings effected by a reduction to only one unscheduled smoking break among full-time employees increases from $238 million (using the average weekly wage) to $665 million (using the real hourly GDP).

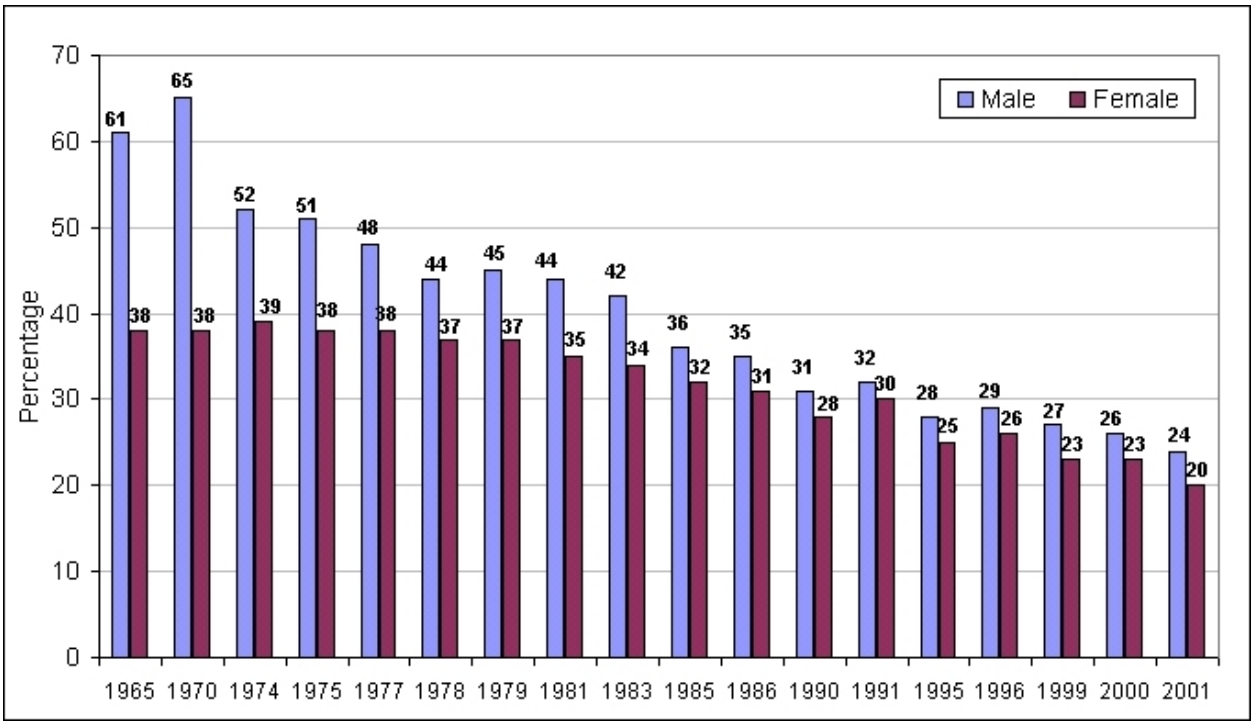
3.4.5 Lost Productivity Due to Premature Deaths of Smokers

In addition, significant economic productivity is lost from the premature deaths of employees who smoke and their consequent removal from the workforce. According to the Canadian Centre on Substance Abuse estimates, productivity losses to the Canadian economy from the premature deaths of smokers in 2002 would cost approximately $7.61 billion. For BC, the CCSA estimated a loss of $895.4 million in terms of premature mortality, and an additional $8.9 million for productivity losses due to morbidity caused by smoking.[67]

The CCSA data were for 1992 and are the latest available. Assuming a 25-year time lag between smoking and the onset of smoking-related diseases, 1992 costs would relate to smoking patterns in 1967, and 2002 costs would relate to patterns in 1977. Although Canadian smoking prevalence decreased during that period by approximately 13% (
Figure 15),[68] BC's population increased by more than 30% in the same period.[69] This means the number of smokers in BC likely grew in the intervening period. The above estimate, which was arrived at by adjusting the CCSA results for 2002 dollars can therefore be considered conservative.

[67] Single, Op cit., Table 12. Prices have been adjusted to 2002$. "The Costs of Substance Abuse" study is currently being updated by the CCSA and will be available as early as Fall 2004.
[68] Source: Health Canada, http://www.hc-sc.gc.ca/hecs sesc/tobacco/policy/prog02/indicators.html#prevalence, accessed Nov. 5, 2003
[69] BC Stats, BC Annual Population, 1931-2002 http://www.bcstats.gov.bc.ca/data/pop/pop/BCPop.htm, accessed Nov. 5, 2003

Figure 15: Proportion of the population, aged 15 and over, who are current smokers, Canada, 1965- 2001, (%)



Source: Health Canada, http://www.hc-sc.gc.ca/hecs sesc/tobacco/policy/prog02/indicators.html#prevalence

4. The Benefits of Smoking Cessation

The cost of smoking in BC 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.

4.1 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 4.2), 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.[70] The authors describe the process in this way:

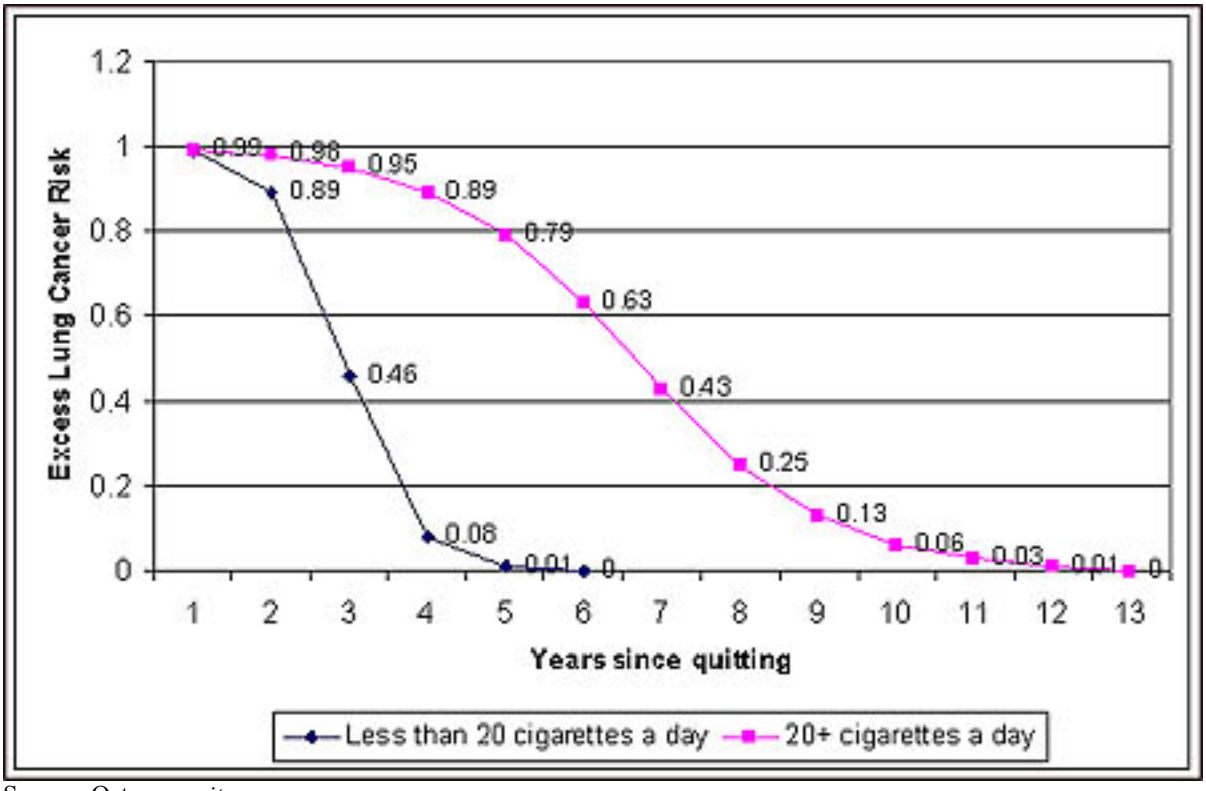
> *In each year following smoking cessation, then, the benefits of quitting will be equal to the difference between current smokers' and former smokers' marginal costs of illness in that year. In the initial period after a smoker quits, these benefits will be relatively low since quitters' risks of smoking-related 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 16. 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.

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

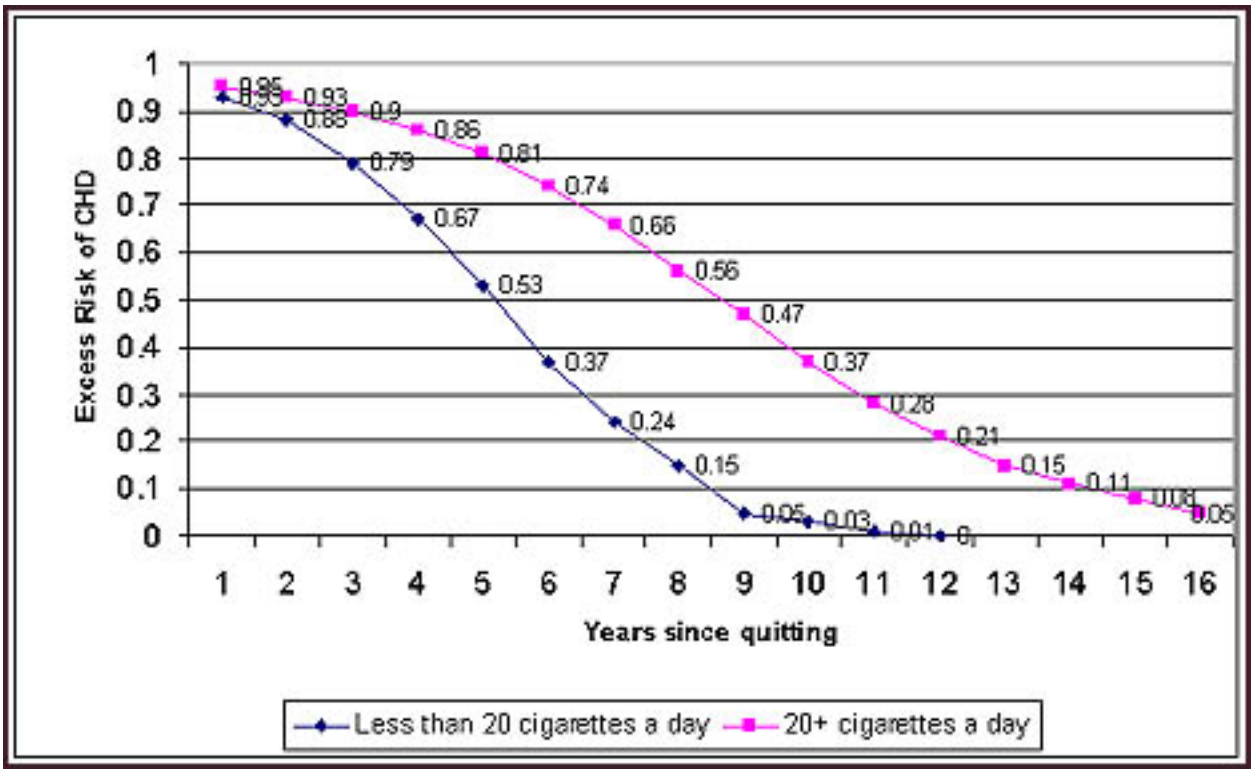
Figure 16: Effect of Smoking Cessation on Annual Excess Lung Cancer Risk, by level of former cigarette consumption and years since quitting (rate)



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 17) {Oster, *op cit*.}.

Figure 17: 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.

4.2 Economic Benefits

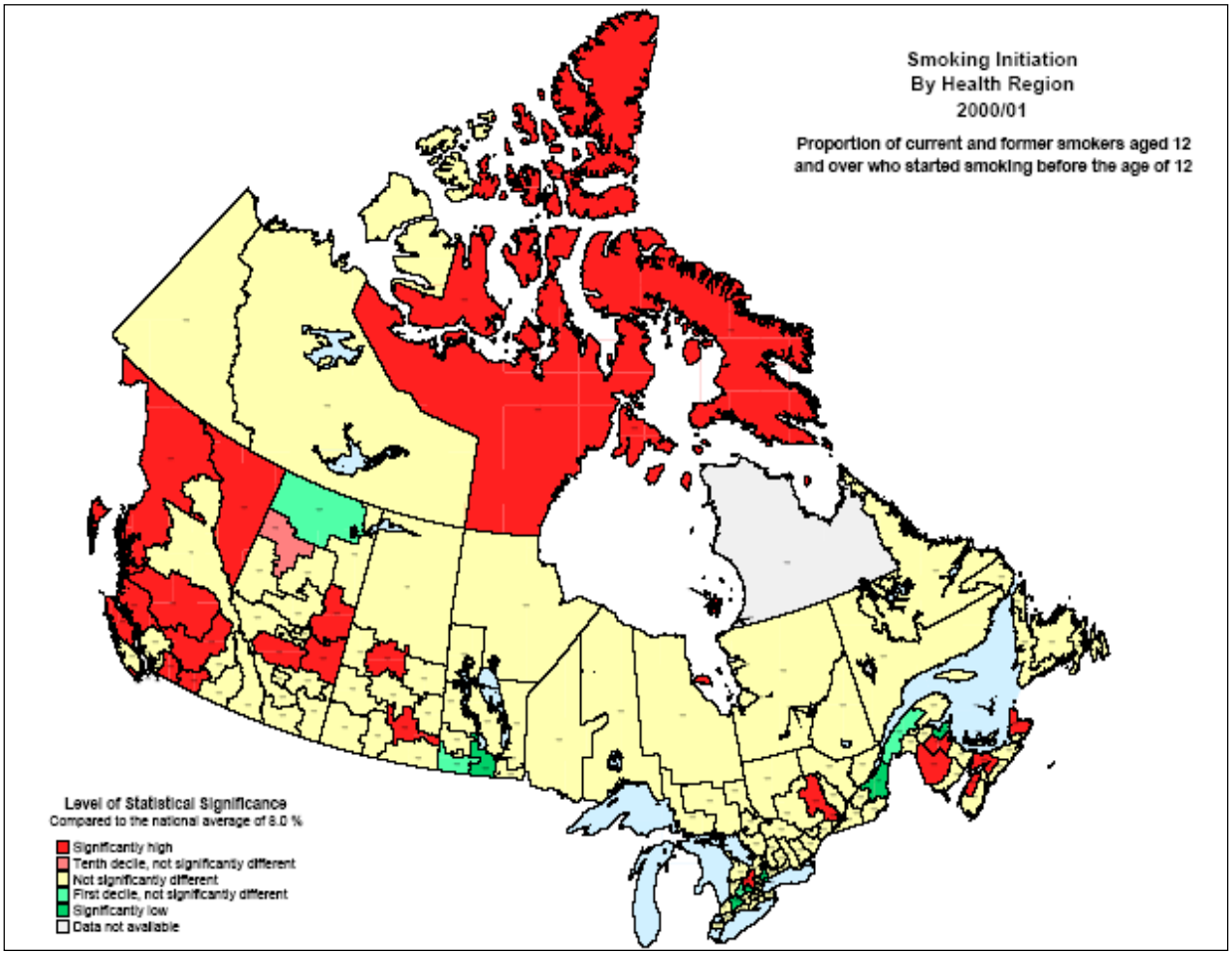
Quantifying, in economic terms, the benefits of smoking cessation can only be assessed over a smoker's lifetime, as cessation benefits increase gradually with each year's distance from smoking. Any economic analysis requires, first, a distinction between immediate and short-term gains on the one hand 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.[71] The Canadian Community Health Survey 2001/02 indicates that while 43% of smokers in BC took up the habit between the ages of 15-19, the CCHS map shows that a "statistically high" proportion of smokers in BC started before the age of 12 when compared to the other provinces (Figure 18).[72]

[71] The average age of smoking initiation for girls was 12.9 and for boys it was 13.3. CTUMS, Factsheet, 2000, Youth Smoking in Canada; http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/ctums/2000_youth/youth.html, accessed November 17, 2003.

[72] Canadian Community Health Survey 2001/02, Smoking: By sex, smokers and former smokers, Canada, provinces, territories, health regions and peer groups; http://www.statcan.ca/english/freepub/82-221-XIE/00502/tables/html/2126.htm, accessed November 17, 2003.

Figure 18: Map of Smoking Initiation in Canada, Proportion who Started Before Age 12



Source: Canadian Community Health Survey 2001/02

It should be stated here that an estimated price of $0.35 per cigarette is used in all the relevant cost calculations in this report. This amount was estimated based on a sample telephone survey, conducted by GPI*Atlantic* in November 2003, of approximately 20 retailers in different geographic regions of the province. According to this informal telephone survey, the price for a carton of 200 cigarettes averaged approximately $70, yielding $0.35 per cigarette; a pack of 20 cigarettes averaged just under $8, yielding an average of $0.40 per cigarette; and the price for a pouch of 40 grams of tobacco was approximately $12.65, yielding 40 one-gram cigarettes at $0.316 each.[73] Allowing for a roughly weighted ratio emphasizing the purchase of manufactured cigarettes as opposed to 'roll your own' tobacco, an overall average price of $0.35 per cigarette was then used in the calculations contained in this report. As of April, 2003, the Finance

[73] The prices include the 7% GST.

Department's estimated retail price for a carton of cigarettes in BC was $68.85. This price is approximately $1.15 lower than the per carton prices reported by retailers in BC in November 2003.[74]

Assuming then that the average British Columbian who smokes starts at age 13, and also 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 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, nor do they allow for inflation or compound interest of potential savings lost.

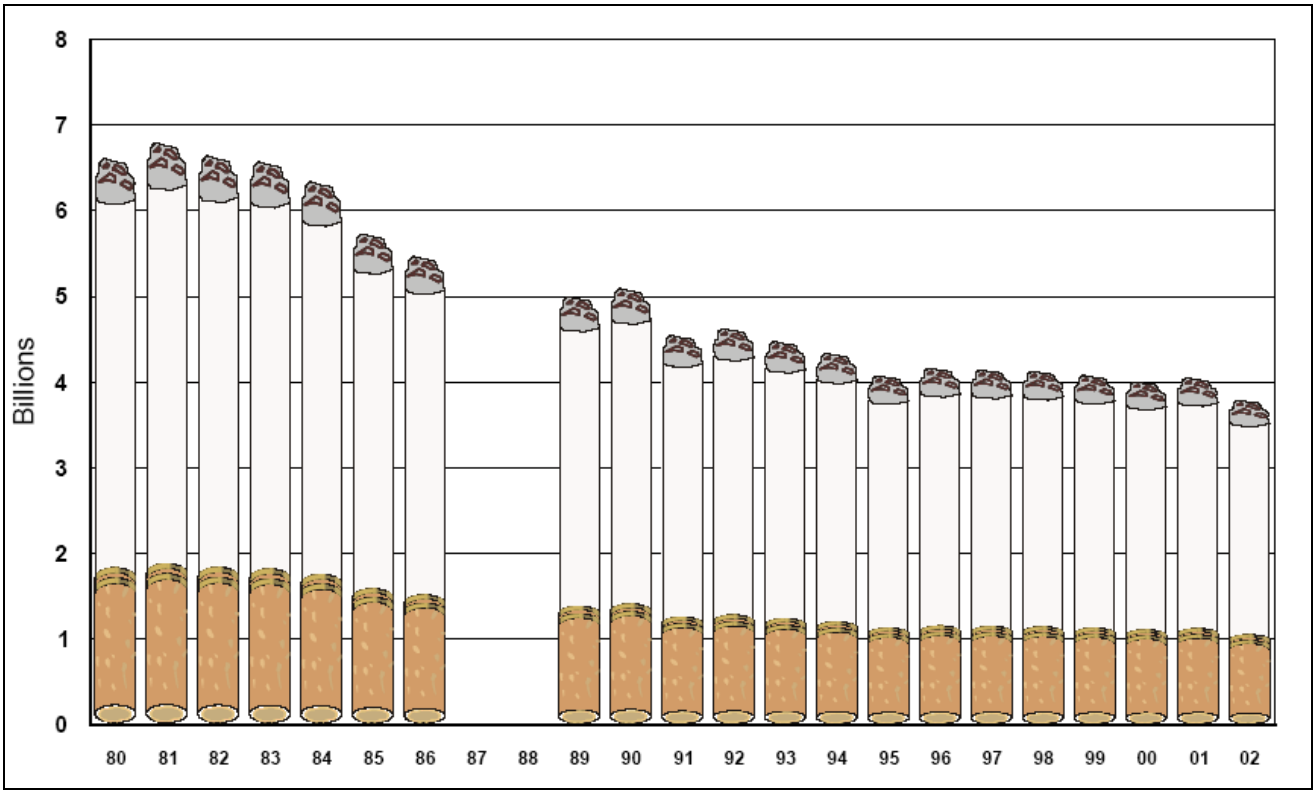
British Columbians legally purchased approximately 4.265 billion cigarettes in 2002 (3.795 billion manufactured cigarettes and 469.5 million in equivalent cigarettes from fine-cut tobacco).[75] While the number of manufactured cigarettes seemed to plateau during the late 1990s, sales dropped over a quarter of a million units between 2001 and 2002 (Figure 19).[76] During the same period, however, sales of fine-cut tobacco experienced their first increase in the last 10 years (Figure 20).

[74] Source for the April 2003 price of a carton of cigarettes ($68.85) is: "Estimated Detailed Retail Price for a Carton of 200 Cigarettes per province (in dollars), as of April, 2003", on the National Clearinghouse on Tobacco's website, under "Taxation": www.ncht.ca/NCTHweb.nsf, accessed November 23, 2003.

[75] Figures on cigarette sales vary significantly, depending on which categories of tobacco products are included in the estimates. Please note that these figures do not include an estimate of the number of cigarettes purchased illegally.

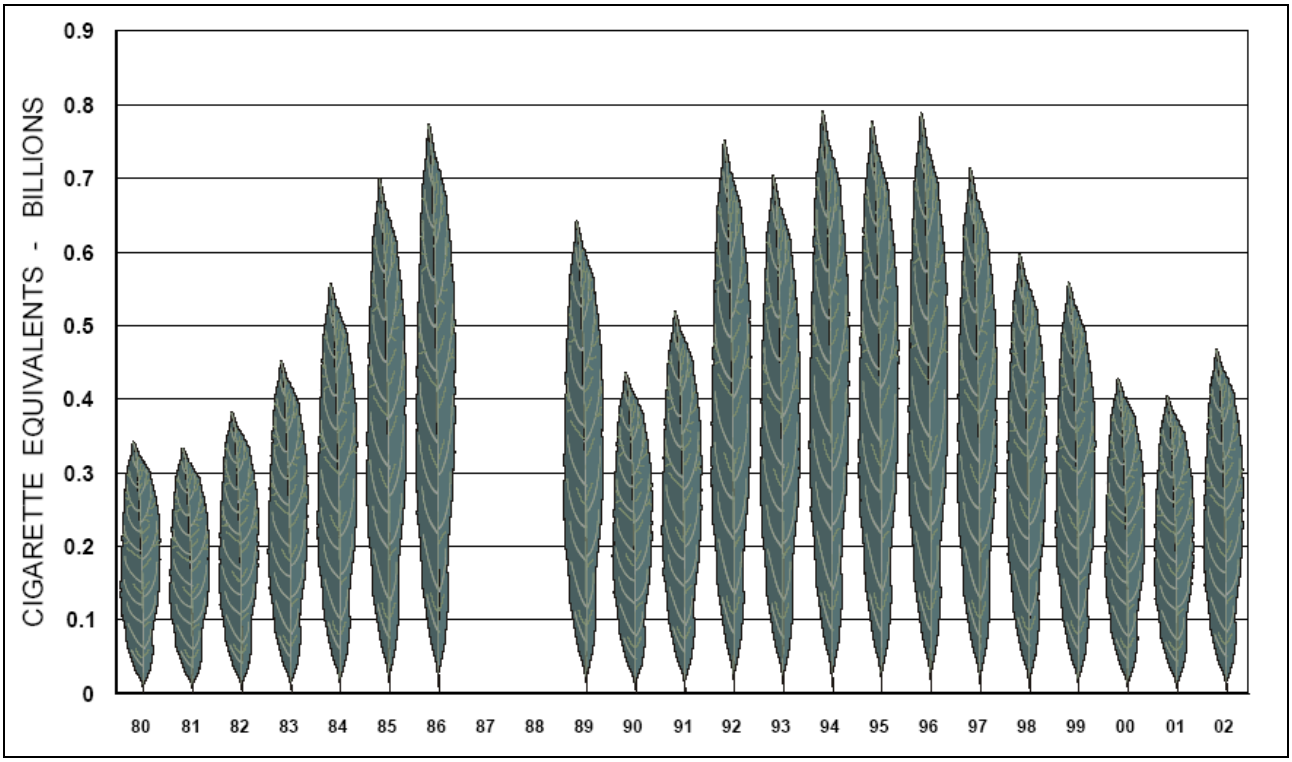
[76] Note that for Figures 18 and 19 provincial sales data are not available for the years 1987 and 1988. See: Health Canada, Tobacco Control Programme: www.hc-sc.gc.ca/hecs-sesc/tobacco/pdf/British_Columbia.pdf , accessed November 20, 2003.

Figure 19: Imported and Domestic Cigarette Sales in British Columbia, 1980-2002



Source: Health Canada, Tobacco Control Programme, Domestic and Fine-Cut Sales Charts, BC – 1980-2002

Figure 20: Imported and Domestic Fine-Cut Tobacco Sales in British Columbia, 1980-2002



Source: Health Canada, Tobacco Control Programme, Domestic and Fine-Cut Sales Charts, BC – 1980-2002

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.[77] Smoking cessation will therefore likely benefit lower income British Columbians more, increase their disposable income, and create greater social equity.

Because almost all cigarettes are imported from central Canada, this tobacco expenditure impacts the local economy by siphoning money away from BC. Money not spent on cigarettes but spent on other goods and services would generate additional employment and tax revenue for BC, 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 over 1% of provincial GDP, local benefits would likely be substantial in any shift from tobacco to other products.[78]

[77] The Population at Risk, Heart Disease and Stroke in BC 1998, Chapter 3: *Population at Risk: Cigarette Smoking Among BC Residents by Income Adequacy, BC, 1997*; http://www.heart-health.org/resources/hsf1998/chapter3/smoking3.html#smo3; accessed November 20, 2003.

[78] This estimate is calculated by taking the approximate total money spent on cigarettes in BC in 2002 (using sales figures of both manufactured cigarettes and fine-cut tobacco and calculating the price at $0.35 per cigarette) and dividing it by the Real GDP at market prices.

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 British Columbians, 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.[79] 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 British Columbians 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*

[79] 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 losses and gains are a lot less. (Per capita health care costs do not differ much). The 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.

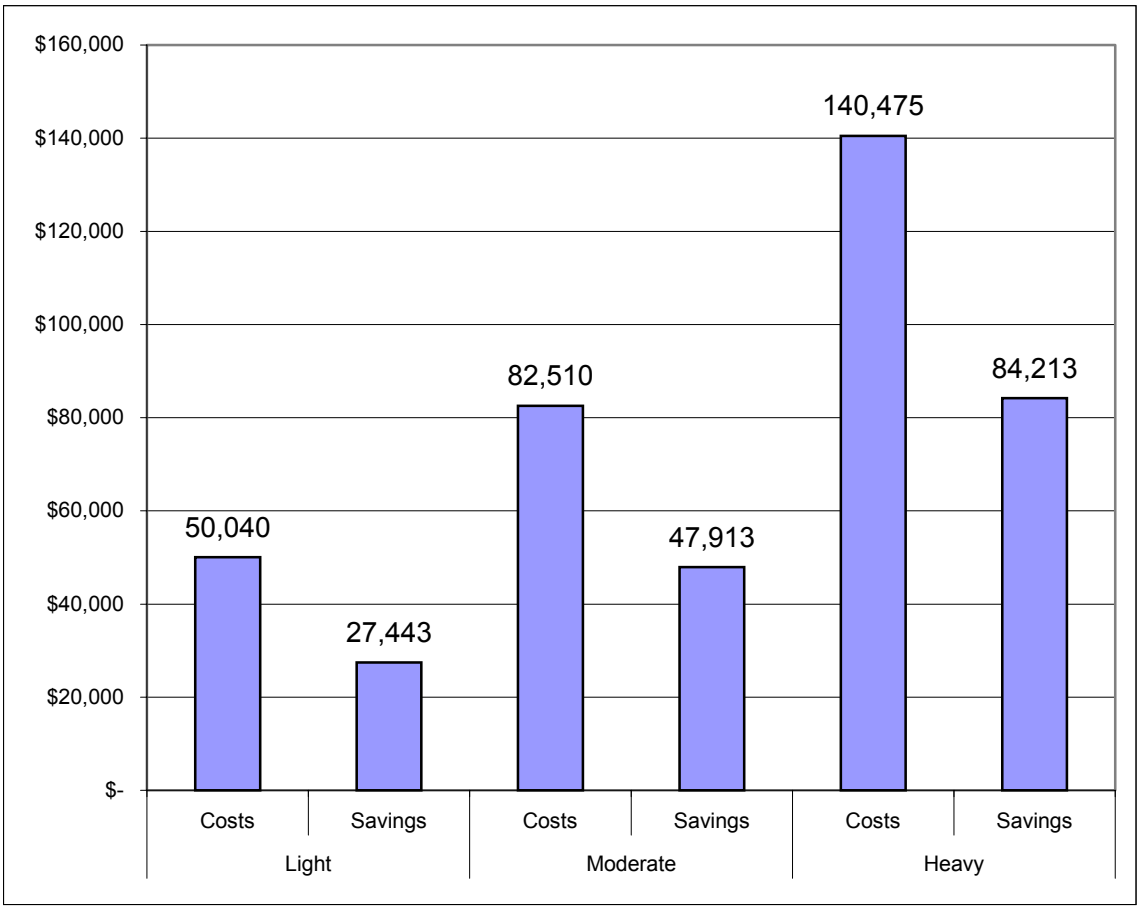
By contrast, GPI*Atlantic* explicitly values unpaid household work, two-thirds of which is still performed by women, and thus includes in the GPI both paid and unpaid work in any analysis of productivity value (Colman, 1998). Further, an earlier GPI*Atlantic* report on women's health in Atlantic Canada 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 British Columbians.

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 BC 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 BC'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 BC to estimate the benefits of cessation for the average quitter (Figure 21). Greater precision and more direct measurements are clearly desirable in future updates of this report.

Figure 21: Total Lifetime Costs of Smoking and Benefits of Quitting, age 40-44 per Smoker and Ex-Smoker, (2002$)



Source: Oster, *op cit.* Prices adjusted to CDN 2002$ using the Canadian Consumer Price Index listing for "Health and Personal Care".

It is seen from Figure 21 that a light smoker costs the BC economy $50,040 over his or her lifetime. Quitting saves approximately $27,443 of those costs. A moderate smoker incurs lifetime costs of over $82,000. If she or he quits, almost $48,000 of those costs is avoided. A heavy smoker incurs costs of over $140,000, but saves about $84,000 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 2002, there were 542,240 smokers in BC consuming a total of 4.265 billion cigarettes.[80] Using Oster *et al.*'s incidence-based estimate, if 10% of those smokers quit, they would save the

[80] Source for number of smokers aged 15 and over in BC is CTUMS 2002. Cigarette sales data from Health Canada, Tobacco Control Programme, Domestic and Fine-Cut Sales Charts, British Columbia – 1980-2002. This number yields an average of 21.54 cigs per person per day = higher than the CTUMS 2002 rate of 16.3 cigs/person/day.

BC economy approximately $2.9 billion in costs over their lifetimes, both through reduced burden on the health care system, and through avoided productivity losses due to premature mortality and sickness. This rough estimate assumes that an equal number of light, moderate and heavy smokers quit, with quitters evenly spread across ages.

If current British Columbians aged 15 and older smoked at the 2002 rate in the state of Utah, (12.9%[81] as opposed to BC's rate of 16%), then 105,059 smokers would have to quit (19% of BC's current number of smokers). Assuming that among these quitters were an equal number of light, moderate and heavy smokers with an even spread of ages, using Oster's incidence-based approach it can be estimated that approximately $5.6 billion in avoided costs would be saved over their lifetimes.

Table 5 below shows savings to British Columbians if they smoked at the Utah rate of 12.9%.[82] This Table used a completely different methodology (annual prevalence-based rather than lifetime incidence-based) to estimate that if British Columbians smoked at Utah rates they would save $175.4 million per year. Assuming an average quitting age of 44, and an additional 30 years of life, that method would yield lifetime savings of nearly $5.3 billion, somewhat lower than the incidence-based estimate, but close enough to indicate that both estimates are not unreasonable.

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 $48,000 in avoided costs out of nearly $83,000 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. 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.*).[83] 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.

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

[81] The American Centre for Disease Control: *Tobacco Information and Prevention Source (TIPS)*, reports that Utah had a smoking rate of 12.9% of its population in 2002; http://www.cdc.gov/tobacco/statehi/html_2002/utah.htm; accessed November 21, 2003.

[82] American Centre for Disease Control, op. cit., reports that 40.7 packs were sold per capita in 2000. The Utah Census 2000 indicates a population of 2,233,169 in 2000 (source: www.governor,.utah.gov/dea/Census2000Data/TopTen.pdf; accessed November 22, 2003. An average of 40.7 packs per capita yields approximately 90,889,978 packs sold in 2000. Taking 12.9% of the Utah population, it can be estimated that the 288,079 smokers in that state each consumed an average of 315.5 packs in 2000, roughly 17 cigarettes per day.

[83] 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.

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.

Regarding health care costs, even though the weight of evidence in sub-section 3.3 of this report indicates that the CCSA estimate is conservative, that study nevertheless remains the only one with explicit estimates for BC. 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.

Table 5: Potential Yearly Savings to British Columbians if They Smoked Less (millions)

Smoking Rate 2001		**Packs Smoked 2002**		**Money Spent 2002**	**Medical Care Costs 2002** (from CCSA)	**Productivity Losses 2002** (from CCSA)
BC rate (16%)		213.3		$1500	$333.3	$904.3*
If British Columbians smoked at:	**% Less**	**Fewer Packs Smoked per year**	**Years of Life Saved**	**Money saved on cigarettes**	**Future Direct Health Care Costs Saved**	**Future Economic Savings**
Utah rate (12.9%)	19.4%	41.4	2203	$290.6	$64.7 million	$175.4

Sources: CTUMS 2002; Manning, *op cit.*; Single, *op cit.;* American Center for Disease Control
* From premature deaths of smokers and morbidity related on-the-job productivity losses (see sub-section 3.4.5).

Table 5 reflects an annual assessment of the potential years of life saved. These savings are cumulative over time: Every year that British Columbians 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).

5. 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 4. 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 BC 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.

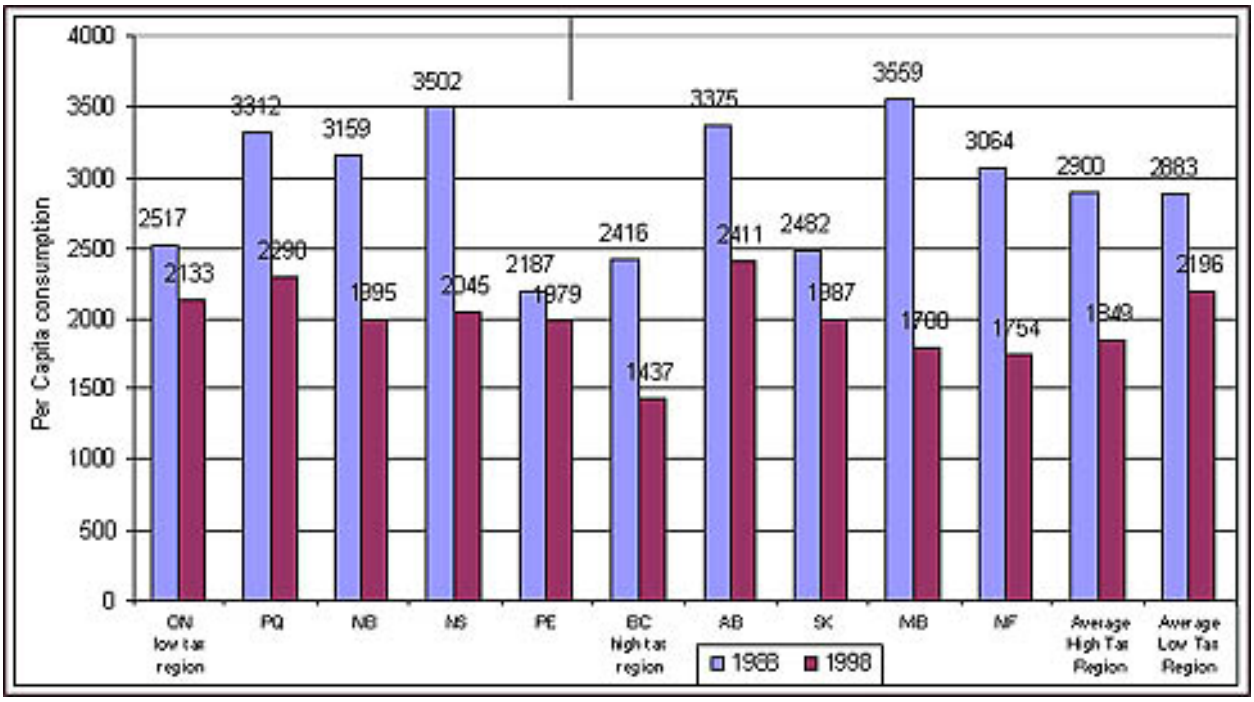
5.1 Tobacco Tax Increases

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.*).

In order to reduce cigarette smuggling and illegal purchases, the federal government introduced a tax decrease in 1994. Some provinces followed suit with additional tax cuts at the provincial level; however, BC was among those that did not. Examining the prevalence of smoking (smoking rates) in Canada (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 smoking 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 22). 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.

Figure 22: Per-Capita Consumption (15+) of Cigarettes and Equivalents, 1988-1998



Source: Canadian Cancer Society, *op cit.*

In the five years following the 1994 tax cut, federal taxes on cigarettes have become uniform across the country while at the same time several provinces and territories have continued to raise taxes. Following the 2002 provincial tax increase in BC of $8 per carton, and an additional increase of $0.01 per cigarette or $2 per carton in 2003, BC is now ranked as one of the highest cigarette tax regions in the country. It is in the North West Territories, however, where the highest provincial or territorial tax rate exists at $42 per carton, followed by BC, Alberta and Saskatchewan where cigarette taxes are at $32 per carton.[84]

Given the evidence that higher tobacco taxes appear to help reduce cigarette consumption, the recent substantial increases in tobacco taxes in BC 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.[85]

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 cigarette prices would lead to a 5% decline in consumption among men and a 6% decline in

[84] Canadian Tobacco Control Community, *The National Strategy: Moving Forward, The 2003 Progress Report on Tobacco Control*, pp. 9-11.
[85] For discussion of price elasticity in relation to tobacco, see Canadian Cancer Society, *op cit.*

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 average retail price for a carton of cigarettes in BC has risen from $49.59 in October 2001 to $68.85 as of April 30, 2003.[86] This dramatic price hike constitutes a 39% price increase and is a result of a series of rapid and dramatic tax increases. Federal taxes increased by $1.50 in November 2001 and again in June 2002 by $3.50, while provincial taxes jumped by $8 per carton in March 2002 and increased another $2 early in 2003.

Using the somewhat conservative estimates from the World Bank's study which found that a 10% price increase reduces cigarette consumption by 4%, the cumulative 39% price increase in British Columbia in the last 24 months may be expected to lead to a 16% decline in cigarette consumption, equivalent to 700 million cigarettes annually.

However, these anticipated results should be interpreted with caution as the foregoing studies (conducted by the *British Medical Journal,* the U.S. Surgeon General, and the World Bank) did not examine such unique scenarios as that in BC where a dramatic and rapid series of price increases have occurred over a very short period of time. Consequently, it would be very worthwhile for the province of BC to monitor closely the effect of this massive recent price increase and its impact on cigarette demand and consumption in the province. The outcomes of such a study would be a major contribution to the scientific literature on the impact of price on tobacco consumption, and could provide valuable information to governments in Canada and beyond that are striving to reduce both the prevalence of smoking among their citizens and the costs of tobacco-related illnesses.

Two examples of studies on price increases in the United States provide an opportunity through comparative analysis to examine the effectiveness of price increases in controlling tobacco consumption. 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).

[86] Source for average retail figure for carton price in BC is Finance Canada, cited by the National Clearinghouse on Tobacco; www.ncth.ca/NCTHweb.nsf , accessed November 23, 2003. For a source comparing cigarette prices among bordering Canadian provinces and American states see the Smoking and Health Action Foundation, Ottawa, http://www.smokefreeottawa.com/english/taxmap.pdf, accessed November 23, 2003.

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).

> *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.).

5.1.1 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.

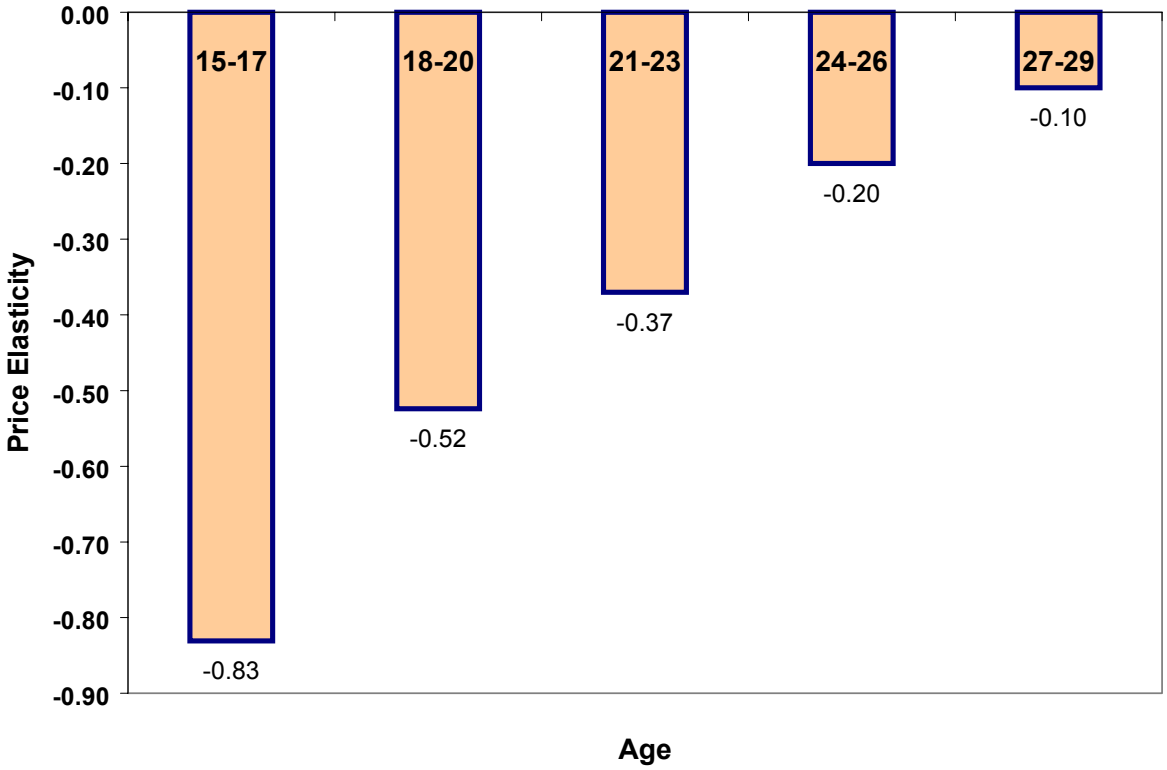
Our results suggest that the main effects of increasing the real price of cigarettes (for example by tax increases) would be to reduce the prevalence of smoking in men and women in lower socioeconomic groups (those with the highest levels of smoking and the greatest mortality from smoking related diseases....This 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.*).

5.1.2 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 23). Note that Figure 23 reflects the effect of price on smoking *prevalence* rather than on level of consumption as discussed above.

Figure 23: 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).

Working from these estimates, and given the greater impact of price increases on youth smoking, the recent 40% price hike in BC should translate into about 11,508 fewer teenage smokers aged 15-19 (a reduction of 28% from the 2002 total of about 41,100), while cigarette consumption by teens in this group would drop by close to 3 cigarettes per day per teen smoker.[87]

In particular, given the evidence examined above, there would be a large group of potential teenage smokers who would never use tobacco. According to the BC Ministry of Health's *bc.tobaccofacts*, every day in BC about 20 youth try a cigarette for the first time[88] and about half of them will become daily smokers. It can then be anticipated that like 90% of current smokers, they will be addicts by the time they turn 20.[89] Given the very high price elasticity for beginning experimental smokers noted above, the recent tax increases are likely to discourage 5-6 BC teenagers every day from starting to smoke.

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.*).

[87] Source for statistics on number of teen smokers aged 15-19 in BC is CTUMS 2002 Table 2. Source for number of cigarettes smoked by teens 15-19 per day in BC is unavailable from CTUMS 2002; therefore this information was retrieved from CTUMS 2001, Table 2.
[88] Source: http://www.tobaccofacts.org/bcleads/index.htm, accessed November 23, 2003.
[89] Based on estimates in U.S. Centers for Disease Control, *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 4.2 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%.[90] Using another Oster estimate, GPI*Atlantic* has already calculated that if 10% of BC smokers quit, they would save the provincial economy nearly $2.9 billion in costs over their lifetimes (see sub-section 4.2). 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 $1.8 billion 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 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.*).

5.1.3 Closing a Tax Loophole

BC and Alberta are the only two provinces where an important loophole for tobacco taxes has been closed. 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

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

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. Federal taxes, and most provincial and territorial taxes, have not adjusted to this new reality.

Federal excise tax and duty on fine-cut tobacco recently increased by $2.50 to $10.80 per 200 grams of fine-cut tobacco, a taxation rate which compares unfavourably to the $15.85 levied for 200 manufactured cigarettes.[91] This tax loophole is further played out in most of the provinces. With British Columbia and Alberta providing the exception, provinces have far lower taxes on 200 grams of fine-cut tobacco than they do on 200 cigarettes. In both BC and Alberta, however, a uniform provincial tax rate has recently been applied to tobacco products, with equal taxation of 200 manufactured cigarettes, 200 tobacco sticks and 200 grams of loose tobacco. [92]

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.*). Despite this recommendation, however, the federal tax rate for fine-cut tobacco and tobacco sticks remains proportionately lower than the levy on manufactured cigarettes which, according to the evidence presented in this report, is counter-productive to the national effort to reduce smoking among Canadians.

5.1.4 Government Revenues from Illegal Tobacco Sales to Minors

According to a study by the Canadian Cancer Society, there were an estimated 71,000 underage smokers in BC (smokers aged 0 to 19) with an average cigarette consumption of 8.5 cigarettes per day.[93] Given that CTUMS indicates the rate of smoking prevalence among BC teens age 15-19 declined from 20% in 1999 to approximately 18% in 2002 of BC (a reduction of 10%), it can be estimated that the total number of underage smokers in BC in 2002 might also have reduced by 10%, yielding an approximate number of 63,900.[94] Assuming then, that each underage smoker pays directly or indirectly for his/her cigarettes (indirectly through acquisition of cigarettes purchased by a legal-age smoker), BC children and underage teens will spend upwards of $69 million in 2003 on over 198 million cigarettes. Based on these figures and current levels

[91] Department of Finance Canada, *Backgrounder: Taxes on Tobacco Products Sold in the Domestic Retail Market*; http://www.fin.gc.ca/news02/data/02-052-2e.html, accessed November 23, 2003.
[92] 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. In February 2003 BC introduced a similar uniform tax increase of $0.01 per cigarette or gram of tobacco products; BC Ministry of Provincial Revenue, http://www.rev.gov.bc.ca/ctb/publications/bulletins/049.pdf, accessed November 23, 2003.
[93] Figures are 1999 estimates taken from *Surveying the Damage: Cut-Rate Tobacco Products and the Public Health in the 1990s*, Canadian Cancer Society et al., Table H: "Federal and Provincial Tax Revenues from the underage sale of cigarettes to children". According to this source, 71,339 children under the age of 19 in BC smoked a total of 605,626 cigarettes a day, or 221,053,490 cigarettes a year, averaging 8.4894 cigarettes consumed by each underage smoker per day. Paper available on the Non-Smokers Rights Association's webpage; http://www.jatech.ca/~nsraadnf/news_info.php?news_id=51; accessed November 23, 2003.
[94] CTUMS 1999, Table 3 and CTUMS 2002, Table 3.

of federal and provincial tax, in 2003 the federal and provincial governments will collect over $20 million and $31 million, respectively, from the illegal sale of cigarettes to minors in BC.

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 $51 million smoking prevention budget would go a long way to curbing smoking among teenagers in BC.

5.2 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.

5.2.1 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.*).

5.2.2 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 BC 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; and
- Support 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 3.1) that approximately 37,000 of today's children in BC who do smoke 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 $22.65 million annually, or $19.41 per student, based on a *minimum* program (Health Canada, 1997). The cost of such a program for BC's entire 2002/03 student population of nearly 600,000[95] would be $11.6 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 $19,916 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 BC could result in an initial reduction of at least 3,834 youth smokers (6% of the estimated 63,900 underage smokers) and a longer-term reduction of at least a further 2,556 smokers (4% of 63,900 underage smokers), for a net reduction of approximately 6,390 smokers, or about 10% of the total youth smoking population. Lifetime health care and productivity savings would thus be at least $127,263,240, or about $11 in savings for every dollar invested in the program.

[95] Provincial student enrollment numbers for elementary and secondary schools in BC in 2002/03, accessed from http://www.bced.gov.bc.ca/k12datareports/keyinfo/ski0203.pdf, November 23, 2003.

Stephens *et al.* (2000) also calculated costs of $136.50 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 BC's 600,000 students (2002) and costing $20.47 million a year, such a program could result in an initial reduction of 6,901 youth smokers and a longer-term reduction of a further 4600 smokers, for a net reduction of 11,502 smokers, or about 18% of the total youth smoking population. Lifetime health care and productivity savings would thus be $229,073,832 million, or about $11.20 in savings for every dollar invested in the program.

In summary, investing in either a minimum or more exemplary program would realize an approximate savings of $11 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 63,900 youths in BC who smoke, a minimum to premium program would help between 6,390 and 11,502 of them quit or reduce their smoking.

To re-emphasize, youth-focused anti-smoking programs generally yield better results when positioned within a comprehensive school health approach to address the issue. Such an approach should address, among other things, the factors that contribute to cigarette use in the first place, as well as or substance abuse more generally and involve activities providing services/support, promoting healthy environments and awareness/education. Building a strong framework for health promotion and understanding involving young people in program design and implementation of tobacco control initiatives are among the ingredients for program success. In short, a holistic and comprehensive approach is warranted, rather than one that is fragmented and single-program oriented.

5.3 Smoking Cessation Programs for Pregnant Women

The high costs of smoking among pregnant women were briefly noted in sub-section 3.1. 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 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.*).[96]

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 $232.6 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 $804 for a total of $416.7 million (Lightwood, *op cit.*).[97]

Even though smoking during pregnancy produces great risks for mother and child at high cost, it continues to occur in BC. According to the 2002 CTUMS, among Canadian women between the ages 20-44 who were pregnant in the last five years, 11% self-reported that they smoked "regularly" during their last pregnancy.[98] Using an estimate based on this self-reported rate, it is possible then that, of the 41,739 live births in BC in 1999, up to 11% or 4,591 may have been delivered to mothers who smoked during pregnancy.[99] Given that there were 1,981 low birth-weight babies (<2,500 grams) among those nearly 42,000 live births,[100] it can be estimated that as many as 500 of them may be attributable to smoking during pregnancy. The 1992 Canadian Centre on Substance Abuse study also attributed 181 smoking-related deaths in Canada due to neonatal conditions, stillbirths, and sudden infant death syndrome.[101]

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-

[96] 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.

[97] All values are in 2002 Canadian dollars, converted using Statistics Canada's exchange rates (CANSIM database, Matrix 926, Table B3400), and adjusted using the Canadian Consumer Price Indexes for Health and Personal Care.

[98] The Daily, July 30, 2003, Statistics Canada, www.statcan.ca/Daily/English/030730/d030730b.htm, accessed November 27, 2003. Note that this statistic is entirely derived from self-reporting in the 2002 CTUMS.

[99] Source for live births in BC in 1999: http://www.vs.gov.bc.ca/stats/annual/1999/b_summ.html#summ, accessed November 23, 2003.

[100] About half of low birth weights are attributable to premature births; the rest are due to lack of nourishment, pregnancy-induced hypertension, and heavy smoking by the mother during pregnancy (Health Canada, 1999a, *op cit.*). See also: Kathleen Adams and Cathy Melvin, "Costs of Maternal Conditions Attributable to Smoking During Pregnancy," *American Journal of Preventive Medicine*, vol. 15, no. 3, 1988, p. 213; Grossman., Michael and Frank Chalooupa, "Cigarette Taxes: The Straw to break the Camel's Back," *Public Health Reports*, vol. 112, July-August, 1999, p. 294; Chang Qing Li, Richard Windsor, and Mahmud Hassan, "Cost Differences between Low Birthweight Attributable to Smoking and Low Birthweight for All Causes," *Preventive Medicine*, vol. 23, 1994, pp. 28-34; Lightwood, James, Claran Phibbs, and Stanton Glantz, "Short-term Health and Economic Benefits of Smoking Cessation: Low Birth Weight", *Pediatrics*, vol. 104, no. 6, December, 1999, pp. 1312-1320; Marks, James, Jeffrey Koplan, Carol Hogue, and Michael Dalmat, "A Cost-Benefit/Cost-Effectiveness Analysis of Smoking Cessation for Pregnant Women", *American Journal of Preventive Medicine*, vol. 6, no. 5, 1990, pp. 282-289.

[101] E. Single et al., "Costs of Substance Abuse in Canada", Table 2.

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. According to one U.S. study (Lightwood, *op cit*), an annual drop of one percentage point in the estimated smoking prevalence among pregnant women would shift 1300 low birth-weight babies to normal weight and save over $35 million ($CDN 2002) in direct medical costs ($27,229/baby). In seven years it would prevent 57,200 low birth weight infants and save $877 (CDN 2002$) 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*.)

Taking the estimates provided by the Lightwood study discussed above, and applying them to BC numbers, a one percentage point annual reduction in smoking among pregnant women would bring the rate of prevalence down to approximately 9% in seven years.[102] This 44% reduction over seven years would likely shift over 574 low birth-weight babies to normal weight, and save the province over $8.8 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.

According to another US Study, compared to the cost of caring for low birth-weight babies in a neonatal intensive care unit, smoking cessation support would save $3.41 for every $1 invested ($CDN 2002) (Marks, *op cit.*). 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 $6.68 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.

[102] Note that this estimated calculation is adjusted to allow for the lower rate of smoking prevalence in BC but is not adjusted for differential in health care costs.

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 doubled 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. To arrive at this estimated cost, and taking an average smoking prevalence rate among pregnant women of 11%, a quit ratio of 15% would mean that 693 pregnant women 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 $33 million for all 693 quitters.

If each of these 693 former smokers continues to abstain and lives for 55 years after pregnancy, that lifetime saving amounts to about $850 a year in avoided medical costs and lost productivity for each quitter, or approximately $600,000 a year for all 693 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.

5.4 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.[103] This report examines what action BC 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).

Applying a 17.4% media-attributable decline to BC, it is possible to project that a similarly effective anti-tobacco media campaign in the province would produce a decline in consumption of over 74.2 million packs of cigarettes over two years.[104]

Any consumption decline will reflect a mixture of outright quitting and reduced consumption by smokers who do not quit. At the 17.4% rate of decline noted above, smokers and ex-smokers would save $593.7 million over the two years – money that would available for spending on more productive activities. And, if the 17.4% consumption decline translated into, for example, a 10% quit rate against the 542,240 smokers in 2002, there would have been 54,224 fewer smokers in BC that year.

5.4.1 Cost Effectiveness of Media Advertising

California spent an average of 74 cents ($CDN 2002) 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 74 cents yields an estimated reduction of 2.6 packs per capita per year for each per capita dollar spent on the media campaign (Goldman, *op cit*).

Assuming the BC advertising campaign yielded similar results for the same investment, then an investment of $3,064,541 per year for seven years would reduce cigarette consumption by an additional 8.0 million packs a year for seven years.[105] That would produce annual savings of approximately $53.6 million a year in avoided medical care costs and productivity losses due to

[103] 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

[104] Per capita extrapolations are based on the 1990 California population of 30 million, *Statistical Abstract of the United States, 1997;* 117th edition, U.S. Department of Commerce, p. 28, Table 26: "Resident Population - States: 1970-1996."

[105] This calculation uses the 2002 population of BC, 4,141,272, according to Statistics Canada, as cited by BC Vital Statistics Agency in "British Columbia Population - 1931- 2002"; www.bcstats.gov.bc/data/pop/pop/BCPop.htm, accessed November 15, 2003.

premature deaths of smokers, or a savings of $17.5 for every dollar invested in the media campaign. In addition, BC smokers would save another $64.0 million a year in money they were not spending on cigarettes.

After seven years, the media campaign will have brought cigarette consumption down by almost 26%. British Columbians will be living longer, getting sick less, and saving a lot of money, both in terms of avoided health care and lost productivity costs, as well as money not spent on cigarettes. Specifically, in those seven years they will have saved over $823.2 million for an investment of nearly $21.4 million. Gradually, BC 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 2.6 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.

5.4.2 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 and 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.

British Columbians, 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*).[106]

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

[106] 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 , accessed November 23, 2003.

5.4.3 What Type of Advertising Works Best?

In selecting the most appropriate form of anti-tobacco advertising, it is fortunate that BC 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, BC 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.

5.5 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 sectors 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. Consequently, the evidence suggests that it would be wise for BC 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.

5.6 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 5.2 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 3.4, daily smokers who work in smoke-free work places smoke over three fewer cigarettes per day on average than those who have no such restrictions.

5.6.1 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.*).

The issue of smoking bans in public places has been a provincial issue in BC since 1992 when the Capital Region banned smoking in all workplaces except restaurants and long-term care facilities.[107] The municipalities of Vancouver and Pitt Meadows were the first municipalities to extend the smoking bans to restaurants in the spring and summer of 1996.[108] Enforcement of these bylaws was up to the restaurant proprietor. In 1997 and 1998 a few more municipalities in the Lower Mainland introduced similar smoking bylaws for restaurants. This effort was supported by the Workers' Compensation Board's 1998 requirement that approximately 85% of workplaces be smoke-free or provide separately ventilated areas, to the exclusion of bars, restaurants, pubs, and long-term care and correctional facilities (which constitute the other 15% of workplaces).[109] Then in 1999, the municipalities surrounding Victoria and the Capital Regional District brought into effect the most stringent smoking bans to date, barring smoking from all restaurants and bars as of January 1st. The CRD's bylaws were also difficult to enforce,

[107] The Lung Association, "Smoking Bans", *Second Wind*, Spring 1999, p. 3; www.lung.ca/ca/articles/smokingbans.html; accessed November 14, 2003.
[108] Canadian Cancer Society, "Provinces and Municipalities in Canada with Smoke-Free Laws for Restaurants and Bars", September 4, 2001, www. Ncth.ca/ncthweb.nsf/0/4b5f6f3f6ef6e9b685256ac30046b8ee?OpenDocument; accessed November 14, 2003.
[109] Clean Air Coalition of BC, Recent News: "WCB Second-Hand Smoke Regulation Becomes Effective on May 1, 2002"; http://www.cleanaircoalitionbc.com/WCBReg_Update_May12002.doc, accessed November 12, 2003.

however, as it was initially left up to the smoker to comply before a court decision prompted the region to amend the bylaws so as to make enforcement the responsibility of the proprietor.[110]

More Lower Mainland municipalities introduced similar bylaws affecting smoking in bars and restaurants early in 2000; however this timing overlapped with the Workers' Compensation Board's (WCB) plans to extend workplace smoking restrictions to all restaurants, bars, public entertainment venues and long-term residential facilities. These regulations permitted smoking only outside or in designated enclosed areas inside. The impetus for this shift in responsibility for ETS regulation stems from the WCB's mandate of regulating the safety and occupational health of all provincial employees and the recognition that, regardless of where they are employed, all workers are entitled to protection from environmental tobacco smoke (ETS):

> *The WCB is a regulatory agency that administers the Workers' Compensation Act, which is an act of the B.C. Legislature. Under the Act, the Board has the authority to make and enforce regulations to protect workers from known workplace hazards such as ETS and to ensure that the workplace parties comply.*[111]

Thus, the onus of enforcing no-smoking bylaws essentially changed hands to the WCB but, three months later, in March of 2000, a provincial ruling found that the WCB had not undertaken the necessary consultations and public hearings prior to implementing its ban.[112] After more consideration, in the spring of 2001 the WCB announced that it intended to re-introduce the workplace smoking restrictions essentially unchanged in September 2001.[113] In a controversial decision, the BC Minister of Labour ordered the WCB to delay implementation until the anticipated impact on business could be further studied. The WCB persisted but was overruled by the Cabinet who forced a delay until April 30, 2002.[114] After much debate and discussion between the provincial government, the WCB, and special interest groups, in January 2002 the government presented its new regulations for smoke-free workplaces, which would come into effect as of May 1, 2002. The crucial difference in the government-imposed ban is that "smoking sections" are still permitted and as a result, employees can still be exposed to ETS while working. The legislation states that an employee can refuse to work in an ETS-contaminated

[110] The Lung Association, "Smoking Bans", *op cit.*, p. 6.
[111] Workers' Compensation Board of BC, WorkSafe, Frequently Asked Questions, www.worksafebc.com/news/campaigns.ets.new_30_20_20.asp , accessed November 14, 2003.
[112] Pacific Analytics Inc, for the Workers' Compensation Board of British Columbia, "The Economic Impacts of the Proposed Amendment to the ETS Regulation", February 2001, p. 1; http://www.worksafebc.com/news/campaigns/ets/assets/pdf/ecoimpact.pdf, accessed November 13, 2003. See also: Airspace Action on Smoking and Health, http://airspace.bc.ca/news20020323.html, accessed November 24, 2003.
[113] WCB, WorkSafe BC, "Environmental Tobacco Smoke", http://www.worksafebc.com/news/campaigns/ets/default.asp, accessed November 24, 2003. For a timeline of events during the discussion of the amended workplace smoking ban, see: Canadian Council for Tobacco Control, "British Columbia", http://airspace.bc.ca/news20020323.html, accessed November 13, 2003.
[114] Airspace Action on Smoking and Health, http://airspace.bc.ca/news20020323.html, accessed November 24, 2003.

zone; however, there is no specific provision to prevent discrimination against employees who exercise this right. [115]

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 tobacco control by-laws in BC towns and municipalities.

A word of caution about no-smoking by-laws is in order. As briefly touched on above, among the 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 BC numbers by population size, those immediate and short-term savings amount to $48-$96 million a year. [116]

5.6.2 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 5.2, clearly are not subject to external regulation but are dependent on education within the home environment. School-based bans, also covered in sub-section 5.2, 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.

[115] Airspace Action on Smoking and Health, *op cit.*; see also, Rabble Rousers, "BC Hacks Workplace Smoking Rules", http://www.rabble.ca/in_cahoots.shtml?x=5519, accessed November 24, 2003.
[116] U.S. Environmental Protection Agency, "Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders", 1992, p. 7. Source for U.S. Population of 288,400,000 in 1992 is http://www.worldbank.org/data/countrydata/aag/usa_aag.pdf, accessed November 24, 2003; source for BC population of 3,470,307 in 1992 is: www.bcstats.gov.bc.ca/data/pop/pop/BCPop.htm, accessed November 15, 2003.

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 BC, 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*.).

5.6.3 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.*).

5.6.4 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.*).

These findings are further supported by a study commissioned by the WCB to evaluate the economic impact of the first three months of the workplace smoking ban, which was in effect from January to March 2000 (before the provincial court ruled that more public hearings on the matter were necessary and the ban was lifted).[117] Although the timeframe for this study was only the initial three-month period, its conclusions show that the initial financial impact of smoking bans for businesses is indeed short-lived. Examining liquor sales, the study found that the hotel, dining, and pub businesses did experience a "significant" economic impact for the first month of the ban, January 2001, but not for the following two months. Interestingly, the ban did not appear to have a negative impact on liquor sales among cabarets in the first month, nor the consecutive two months that the regulations were in effect.[118] The study examined the impact outside the Capital Regional District and found that areas outside the CRD experienced "greater short-term negative impacts" than businesses in Victoria where tourism is more of a factor in revenues. The anticipated longer-term effect for businesses outside the CRD, however, was "an insignificant decline of 4.1 percent."[119] Overall the study found that with the reintroduction of the WCB's smoke-free workplace regulations the province would experience "some short-term impacts but generally no longer-term effects."[120]

In addition to the evidence suggesting that the regulations would not be bad for business over the longer-term, the majority of the BC public is in favour of the smoking ban. According to a survey commissioned by the Clean Air Coalition in November 1999, people in the province are dramatically in favour of smoke-free workplaces, with three quarters of bar patrons indicating that a smoking ban might prompt them to actually stay longer in a smoke-free bar rather than deter them from patronizing such establishments.[121]

5.7 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.[122] In that case, a rough comparison of cost-benefit results would be:

[117] Pacific Analytics Inc., "The Economic Impacts of the Proposed Amendment to the ETS Regulation", (prepared for the Workers' Compensation Board of British Columbia), February 2001; www.worksafte.com/news/campaign/ets/assets/pdf/ecoimpact.pdf, accessed November 20, 2003.
[118] Pacific Analytics Inc., *op cit*., pp. 16, 17.
[119] Pacific Analytics Inc., *op cit.,* pp. 24, 25.
[120] Pacific Analytics Inc., *op cit.,* p. 29.
[121] Clean Air Coalition of B.C., "The Economics of Smoke-free Regulations"; www.cleanaircaolitionbc.com/caccontenteconomics.htm; accessed November 14, 2003.
[122] See Appendix A for a discussion on prevalence-based versus incidence-based approaches.

- School-based prevention programs: 15:1 ($15 benefit for every $1 invested)[123]
- 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.

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.*).

[123] This ratio matches closely to the analysis in 5.2 regarding cost-benefit of a premium school-based program.

6. Conclusion

Canada and BC have made encouraging progress in recent years to prevent and curb tobacco use. 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 BC in 2002 contributed $1.493 billion to the provincial and national GDP (see Introduction), the smoking of those cigarettes resulted in $525 million in medical care costs, at least $904.3 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 BC's (4,141,272 in 2002), the U.S. Centers for Disease Control and Prevention recommended *minimum* funding of about $10 per capita per year (i.e. $41.9 million 2002$) to implement any kind of effective tobacco control policy.[124] Comparatively, the 2003/04 budget for Health Canada's Tobacco Control Programme in BC has dropped from $6.5 million three years ago to $3.4 million,[125] an amount which clearly fails to meet the recommended minimum expenditure on prevention measures.

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 has been attempted in British Columbia – it 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 5,761 premature deaths due to tobacco-related disease each year in BC?[126] How much, for example, is spent to save or prolong a single life using high-technology intensive care treatment?

[124] 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.
[125] Source, conversation with Clare Avison of the Tobacco Control Programme, November 14, 2003.
[126] Selected Vital Statistics and Health Status Indicators, Annual Report 2002; Table 42, *op.cit*.

On any given day in BC there is an average of one motor vehicle traffic fatality, compared to 15 deaths attributable to smoking.[127] Further, over 11,000 potential years of life are lost annually in BC due to premature mortality from smoking-related illnesses, which also cause more than 376,500 hospital bed-days a year in the province (see sub-section 3.1).[128]

Yet the percentage of the public purse allocated to illness and disease prevention pales against spending for each lane of new roadway designed to make roads safer and reduce the likelihood of road accidents.

For example the federal government and the Province of British Columbia will contribute joint funding of $7.06 million to upgrade two sections of Highway 3/95 in the Moyie Bluffs area. A 1.2 kilometre stretch of existing highway between Loop Road and Bluff #2, and 1.9 kilometres of existing highway between Jerome and Peavine Creek.[129] That's an investment of more than $2 million per kilometre.

Where road accident deaths represent barely 1% of the total annual deaths in BC, smoking-attributable mortality constitutes nearly 20%.[130] 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 BC 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.

This is a provocative example.[131] 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.

[127] BC Vital Statistics, "Selected Vital Statistics and Health Status Indicators, Annual Report 1998: On a Typical Day in British Columbia", www.vx.gov.bc.ca/stats/annual/1998/box1.html, accessed November 24, 2003.
[128] 11,000 figure extrapolated by multiplying the number of cigarettes smoked by British Columbians by 28 minutes of life lost per pack smoked, then divided by the number of minutes per year. See, Manning, *op cit.*
[129] Transport Canada press release No. H075/02, July 3, 2002. http://www.tc.gc.ca/mediaroom/releases/nat/2002/02_h075e.htm, accessed Dec. 4, 2003
[130] BC Vital Statistics, "Selected Vital Statistics… On a Typical Day in British Columbia", *op cit.*
[131] The example is adapted from Colman, 2000b, *op cit*.

7. References

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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.