

# **Economic Cost of Chronic Disease in Canada 1995-2003**

**Jayadeep Patra, Svetlana Popova,  
Jürgen Rehm, Susan Bondy, Robynne Flint & Norman Giesbrecht**

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## EXECUTIVE SUMMARY

Chronic diseases have serious impacts: they not only cause premature death, but have major adverse effects on the quality of life of affected individuals and create large adverse economic effects on families, communities and societies in general. As both direct and indirect costs of chronic disease are significantly high, an effective prevention approach can indeed minimize the economic and social burden to the health of society as a whole. The objective of cost of illness studies is to estimate direct cost attributable to illness and indirect costs attributable to productivity and other losses due to morbidity or mortality. The cost estimates reported below are derived from existing data and meta-analyses. No original epidemiologic data were generated for the purpose of this report. The main resources used in this overview and analysis are published reports and government documents that provided costs estimates for specific chronic diseases by a province, or, in some cases, multiple diseases for several provinces.

The five direct cost components in this report are organized and measured in terms of hospital care, specialized treatment, physician care, prescription drugs, and additional direct health expenditures (including other professionals, capital, public health, prepayment administration, health research, and other costs). Indirect costs were defined as the value of economic output lost because of illness, disability, or premature death. The three indirect cost components included in this report were: cost of years of life lost due to premature death (mortality costs), and the value of activity days lost due to short-term and long-term disability (morbidity costs due to long and short-term disability).

Data were collected from the following resources: peer-reviewed and non-peer reviewed journals and studies, commissioned work for Health Canada, government documents and publications, web-based statistic tables and fact sheets, unpublished reports/working papers, symposium reports, WHO publications, power-point presentations, media/news/press releases, online (disease) fact databases. A total of 85 abstracts or full-text manuscripts were located in the initial broad search. Of these studies, only 62 contained topic matter on economic cost of chronic disease in Canada. However, 21 of these studies were eliminated because they did not contain data on monetary costs of chronic disease leaving 41 studies examining the economic cost of chronic disease in Canada. Since costs being compared are not from the same year, it was necessary to inflate or deflate cost estimates to make them comparable. This was done using the Consumer Price Index.

Costs for eight types of chronic diseases are presented in the tables: such as cancer, musculoskeletal disease, cardiovascular diseases, diabetes, hypertension, neuropsychiatric diseases, respiratory diseases, and other miscellaneous diseases. In addition, cost estimates were provided for several risk factors: physical inactivity, obesity, and tobacco and alcohol consumption. There was not a full series of data for all chronic diseases, risk factors and jurisdictions for the years 1995 to 2003. There was more extensive information for 1997 and 1998 and 2001 to 2003, and for several provinces, e.g. Nova Scotia, British Columbia and Alberta. Also, some breakdowns are available for cancers, cardiovascular diseases, and other chronic diseases. However the available information with breakdowns is sketchy with regard to musculoskeletal diseases, neuropsychiatric disorders and respiratory diseases, even though all involve substantial contributions to overall economic burden of chronic disease in Canada, particularly the first two.

On a national basis a comparison across diseases is confounded by not having similar data for the same year. Nevertheless, it appears that most costly chronic disease involves neuropsychiatric disorders with an estimated per capita cost \$1,056 or \$34 billion in direct and indirect costs in 2003. Other chronic disease with high economic impact include cardiovascular diseases - \$640 per capita in 1998, musculoskeletal disease -- \$640 per capita in 1998, and cancers - \$571 per capita in 2002. Diabetes is estimated to cost \$306 per capita in 1999, and respiratory diseases \$295 per capita in 1998. It was feasible to provide data on four major risk factors and their estimated cost vis-à-vis chronic disease. The estimated economic burden of physical inactivity on a per capita basis was \$300, for obesity \$343, tobacco use \$341 and alcohol \$223.

Future economic cost studies focusing on chronic disease should have an explicit statement of their underlying rationale, perspective taken, sources used, and the types of costs that are included and excluded. Consideration should be given to developing core guidelines for conducting costs estimates of chronic disease. A valid starting point for setting priorities in cost estimate initiatives is epidemiological data on the extent of various chronic diseases. More attention needs to be paid to a wide range of proximal risk factors and distal conditions that contribute to chronic disease.

## **INTRODUCTION**

In 2005, 35 million people were estimated to have died from chronic diseases worldwide (more than 60% of all deaths globally; WHO, 2005; Strong et al., 2005). Most prevalent were deaths from cardiovascular diseases (30% of all global deaths), following by cancer (13%), chronic respiratory disease (7%), diabetes (2%), and other chronic disease (9%). In absolute numbers, most chronic disease deaths occurred in low and middle income countries, but in relative terms, chronic disease deaths were most prevalent in high income countries such as Canada. Chronic diseases have serious impacts: they not only cause premature death, but have major adverse effects on the quality of life of affected individuals and create large adverse economic effects on families, communities and societies in general. Common and modifiable risk factors underlie the major chronic diseases. These risk factors explain the majority of chronic disease occurrence and mortality at all ages and for both sexes. They include unhealthy diet, physical inactivity, alcohol and tobacco use (Ezzati et al., 2002; 2004).

Chronic diseases and their risk factors continue to be an important issue in public health in Canada and worldwide. A number of reports have shown that chronic disease accounts for a significant portion of morbidity and mortality among Canadians (Canadian Cancer Society, 2005; Health Canada, 2002a, 2002b; Heart and Stroke Foundation, 2003). Recently, \$300 million in funding was provided by the Canadian federal government to combat chronic disease, with particular emphasis on improving diet and the levels of physical activity in all Canadians (Public Health Agency of Canada, 2005). Numerous improvements can be achieved by investing in chronic disease prevention, with greatest improvement in such areas as the health of the general public and healthcare expenditures (Colman, 2000a, 2000b, 2000c, 2000d; WHO, 2005). As both direct and indirect costs of chronic disease are significantly high, an effective prevention approach can indeed minimize the economic and social burden to the health of society as a whole (Health Canada, 2002a; WHO, 2005).

The structure of this report is as follows. First the rationale, audience and scope of the report are presented. Then a definition of chronic disease is provided. In the methods section the resources used are outlined, data extraction and analytical methods noted, and the limitations summarized. The results are organized by type of chronic disease and by risk factor. The concluding sections indicate the main findings and point to recommendations for future cost estimate studies. Appendix 1 provides the World Health Organization's list of chronic disease and the ten tables provide the Canadian data the form the empirical basis of this report.

## **RATIONALE, SCOPE AND AUDIENCE**

The objective of cost of illness studies is to estimate direct cost attributable to illness and indirect costs attributable to productivity losses due to morbidity or mortality. As noted below, these indirect costs include cost of years life lost due to premature death (mortality costs), and the value of active days lost due to short-term and long-term disability (morbidity costs due to long and short-term disability). The intent of this report is to provide a comprehensive overview of the distribution of direct and indirect costs of chronic diseases in Canada. The report will also comment on what possible gains might result if discrete chronic diseases were eliminated or their prevalence reduced. As shown in previous studies, major risk factors for chronic illness result in a significant drain on Canada's economy in terms of both its direct impact on the health care, and its indirect impact on productivity as a result of premature death and illness (Canadian Cancer Society, 2005; Health Canada, 2002a, 2000b; Heart and Stroke Foundation, 2003).

The experience of estimates of social costs focusing on substance abuse has generic lessons for other risk factors of chronic disease, and these lessons are highlighted here. Four reasons for estimating the social costs of substance abuse have been proposed in the *International Guidelines for Estimating the Costs of Substance Abuse* (Single et al., 2003), as developed in a series of world expert meetings hosted by the Canadian Centre on Substance Abuse between 1994 and 2002. These are outlined as follows:

1. Economic estimates are often used to argue that policies on alcohol, tobacco and other drugs should be given a high priority on the public policy agenda.
2. Cost estimates help to appropriately target specific problems and policies.
3. Cost studies help to identify information gaps, research needs and desirable refinements to national statistical reporting systems.
4. The development of improved substance abuse cost estimates can provide baseline measures to determine the effectiveness of drug policies and programs.

This report is intended to provide an overview of the economic impact of chronic disease for a wide range of audiences, including government, policy makers, various industries, program developers, frontline healthcare workers, and individuals in the community. The information provided in this report will be useful to develop preventive efforts which may reduce the burden of disease, as well as improve the health of at risk particular groups and the population as a whole.

The cost estimates reported below are derived from existing data and meta-analyses. No original epidemiologic data were generated for the purpose of this report. The main resources used in this overview and analysis are published reports and government documents that provided costs estimates for specific chronic diseases by a province, or, in some cases, multiple diseases for several provinces.

This report focuses on existing reports and publications in Canada that provide concrete information with regard to economic impact of chronic diseases and their major risk factors. Not only does this analysis provide important estimates of the economic burden of chronic disease, it also serves to be a significant source necessary for healthcare policy and planning. Cost estimates quickly become out of date, due to changes in economic indicators and prevalence rates of diseases and exposure. While completely new cost estimation studies are resource-intensive, Choi et al. (2002) have indicated that estimates of costs based on multiple published studies prove to be more efficient and stable than conducting a new study. Furthermore, it was beyond the scope of this project to undertake the collection, standardization and analysis of raw data for a new multi-province and multi-disease cost impact study.

## **DEFINITION OF CHRONIC DISEASE**

Chronic diseases are often caused by a complex interaction of factors, have long latent period where disease is not manifested, do not resolve spontaneously and are rarely cured completely. Although chronic diseases are non-communicable, they may have a communicable origin (e.g., cervical cancer can result from exposure to the human papilloma virus). In the US, the Center for Disease Control and Prevention considers the following to be chronic diseases: cardiovascular disease, diabetes, arthritis and other musculo-skeletal diseases, cancers, chronic lung diseases, and chronic neurological disorders. A full list of chronic diseases

according to WHO classification system for diseases and injuries can be found in Appendix 1 (WHO, 2001).

The main non-communicable chronic disease categories that we consider in this report are cardiovascular diseases, cancers, respiratory illnesses, diabetes, genitourinary diseases, musculo-skeletal diseases, and mental illnesses. Communicable chronic diseases such as hepatitis C and HIV were not included in the present analysis.

## **METHODS**

### **Overview**

In the majority of the examined studies, direct costs were defined as the value of goods and services for which payment was made and resources used in treatment, care, and rehabilitation related to chronic disease (see for example Health Canada, 2002a; Rehm et al., 2006). The five direct cost components in this report are organized and measured in terms of hospital care; specialized treatment; physician care; prescription drugs; and additional direct health expenditures (including other professionals, capital, public health, prepayment administration, health research, and other costs).

Indirect costs were defined as the value of economic output lost because of illness, disability, or premature death. The three indirect cost components included in this report were: cost of years of life lost due to premature death (mortality costs), and the value of activity days lost due to short-term and long-term disability (morbidity costs due to long and short-term disability).

The majority of studies used a prevalence-based approach to estimate all direct and indirect costs (with the exception of mortality costs), that accrued to existing (or prevalent) cases of chronic diseases or disability (see for example Health Canada, 2002a). A limitation of this approach is that the data do not always allow for an assessment of the impact of co-morbidity. For mortality costs, an incidence-based human capital approach was most commonly used in cost-of-illness studies.

Direct and indirect costs were allocated to principal diagnostic categories and by sex where available. Diagnostic categories included in this report are cancers; cardiovascular diseases; digestive diseases; endocrine and related diseases; genitourinary diseases; ill-defined conditions; mental disorders; musculoskeletal diseases; nervous system and sense organ diseases; respiratory diseases; skin and related diseases.

### **Resources Used**

Data were collected from the following resources: peer-reviewed and non-peer reviewed journals and studies, commissioned work for Health Canada, government documents and publications, web-based statistic tables and fact sheets, unpublished reports/working papers, symposium reports, WHO publications, power-point presentations, media/news/press releases, online (disease) fact databases.

Search of the literature on economic cost of chronic disease in Canada was performed from 1982 to 2006. The information collected for this project was limited to publications within the past 10 years (1995-2006) in Canada. In addition to the combination of key words noted below, the search was supplemented with text words searches. The following main key search

terms were used: (chronic disease OR non-communicable disease OR each chronic disease category included in this report) AND (economic cost OR price OR burden OR impact) AND Canada; (each risk factor category included in this report) AND (economic cost OR price OR burden OR impact) and Canada. This search was performed in multiple electronic bibliographic databases, including: Ovid MEDLINE (1966-2006), PubMed (1980-2006), EMBASE (1980-2006), and Web of Science (including Science Citation Index, Social Sciences Citation Index, Arts & Humanities Citation Index).

In addition, manual reviews of the content pages of major epidemiology journals were conducted as well as citations in any of the relevant articles. Furthermore, search engines such as: Google, Google-scholar were also used. For a complete listing of all the websites used and/or searched for this project please see the reference section of this report. Reports unreleased and not found through the above strategy were not sought, and thus, the possibility exists that some of the completed but non-published works were not included, although we believe their likely impacts on our conclusions to be minimal. However, given the collective years of experience represented by the group of authors, it is unlikely that major Canadian cost studies focusing on chronic disease were overlooked. We also consulted with experts in the relevant field to obtain more comprehensive data. The search was restricted to the English language.

### ***Search Scope – “engines”***

For the purpose of this economic analysis project, several literature searches were conducted employing various search criteria to gather data. This search was completed online using search engines such as: Google, Google-scholar, the York University online journal archive and also by using the search function of specific websites:

- Public Health Agency of Canada
- Health Canada
- World Health Organization
- York University (journal archives)
- Canadian Centre on Substance Abuse
- Chronic Disease Prevention Alliance of Canada

The appropriate pages in the reference section provide a complete listing of all the websites used and/or searched for this project (those listed above are only a representative sample).

### ***Resource Types:***

From these sources a wealth of data formats were collected including: peer-reviewed journals and studies, commissioned work for Health Canada, government documents and publications, web-based statistic tables and fact sheets, published reports/working papers, symposium reports, WHO publications, power-point presentations, media/news/press releases, online (disease) fact databases and where non-report materials were identified every attempt was made to identify a corresponding scientific report.

### **Scope of Search – Years**

The information collected for this project was limited to publications within the past 10 years, in order to maintain relevance.

## Terminology and Key Words

The search criteria for this project primarily focused on the terms: chronic disease and cost although many synonyms were used in an attempt to garner a larger volume of data. This information is provided below. All combinations of the terms from the two columns were searched.

<b>Chronic Disease</b>	<b>Cost</b>
Illness	economic [+/- cost, burden, impact, price]
Non-communicable disease	Burden
[name of disease] i.e. asthma, Hypertension, Diabetes etc	Impact
Disease	Price

Other terms that were useful in this literature search are listed below. The following terms were used in combination with the primary terms **economic (+/-) cost/burden/ or impact**. To obtain more information, terms listed below were searched on their own as well.

[name of disease] i.e. Asthma, hypertension, stroke, mental illness	[name of province] i.e. Ontario, Quebec etc. +/- "Alliance"
Statistics/figures	Report
health [+/- of Canadians]	physical [+/- (in)activity]
Tables	risk factors

### **Functionality of Search Terms:**

A summary of the effectiveness of search terms is provided below:

*Effective:*

- chronic disease (+ cost or + burden)
- health cost (+disease)
- Public Health Agency of Canada
- Chronic disease (+ risk/ and or/ + factor)
- Alliance
- economic (+burden, cost)
- Economic (+impact) → most successful**
- [name of disease, i.e. diabetes] + impact/cost
- the health of Canadians (however this yields a very broad base of results and must be narrowed down)
- [name of province] + economic impact of c. disease
- cost + of + illness

*Ineffective:* risk-factors (+cost or +burden)  
Nutrition (+chronic disease/ +risk factor)  
“province name” (+health + economic)  
non-communicable disease  
  
price of chronic disease

## Data Extraction

The two reviewers (authors of the report) independently extracted relevant data from the articles and summarized the data into a standardized spreadsheet using MS-Excel. If multiple publications reported same results, findings from the most comprehensive publication were taken to avoid duplication in our database. Each study was coded for: diagnostic category (chronic disease or risk factor); author/year of publication; mid-year of study; Canada/province where the study was done; total sample size; sex; direct costs; indirect costs. Overall there was a 92% agreement between the two reviewers and discrepancies were adjudicated by a third reviewer (author) who was not involved in the original review process.

A total of 85 abstracts or full-text manuscripts were located in the initial broad search. Of these studies, only 62 contained topic matter on economic cost of chronic disease in Canada. However, 21 of these studies were eliminated because they did not contain data on monetary costs of chronic disease leaving 41 studies examining the economic cost of chronic disease in Canada.

## Analytic Methods

Before conducting analysis, the first step was to assess the study design of the cost studies and the time frames of different studies done within Canada. It is not advisable to compare or combine cost estimates from cost studies, which have different study designs or different time frames since different designs are based on different philosophies and approaches. All of the studies used in this report had annual time frame (prevalence-based) for cost estimation. Dollar values presented in this report were adjusted for each study year. Due to variation in different study designs, this report provides economic costs of each chronic disease in a range format.

## Adjustment for Inflation

If the costs being compared are not from the same year, there is a need to inflate or deflate cost estimates to make them comparable. When the costs being compared are for the same year, there is no need to inflate. As an adjusting factor, inflation rate for past costs was used to adjust all costs to a 2005 dollar value. Cost data from the past years was inflated to the same base year value, using a consumer price index (CPI) (Choi & Pak, 2002). The base year value (BYV) of a past year value (PYV) is calculated from the base year CPI (BCPI) and the past year CPI (PCPI) using the following formula.

$$BYV = PYV * [BCPI/PCPI]$$

CPI data for health and personal care were obtained from the Statistics Canada between years 1995 to 2004 (Statistics Canada, 2005, Consumer Price Index Table 326-002). Using method

described above, the total costs of illness at the constant year level, i.e., year 2005, are calculated to make the cost figures directly comparable. Different direct and indirect costs of illness were presented by broad disease category as well as by risk factors. Direct cost components were hospitalizations; special treatment; physician costs; prescription drugs; research; and other costs. Different indirect cost components were primarily costs due to productivity losses such as costs of long-term and short-term disability; and premature mortality (Rehm et al., 2006).

There were 8 broad disease categories used in this report to present costs such as cancer, musculoskeletal disease, cardiovascular diseases, diabetes, neuropsychiatric diseases, respiratory diseases, and other miscellaneous diseases. Miscellaneous diseases consisted of diseases where not too many estimates were found to group in a broad cost category. Similarly, five known risk factors (physical inactivity, obesity/overweight, alcohol, smoking and inadequate nutrition) for chronic illnesses were included. All costs were reported in 2005\$ CAD by chronic disease type and by province or nationally.

## **Limitations**

One of the limitations of this report is that there is overlap between risk factors, such as proximal risk factors and therefore the issue of “double counting” needs to be addressed: tobacco, diet, obesity, lack of exercise, high blood pressure, alcohol consumption, mental illness, illicit drug use may all be linked to a number of chronic diseases. For example, multiplicative interaction effect of drinking alcohol and smoking tobacco have implicated in increased risk of aerodigestive cancers (Taylor & Rehm, 2006; Bagnardi et al., 2001; La Vecchia, Franceschi, & Levi, 2003).and coronary heart disease (Taylor & Rehm, 2006). Clearly, given the epidemiological model of risk, the combined impact for alcohol and tobacco use on burden of disease will be smaller than the addition of alcohol-attributable and tobacco-attributable disease burden (Rothman & Greenland, 1998). However, Collins and Lapsley (2002) found that for Australia in 1998-9, double counting led to an overestimate of 2.2% of the total mortality caused by addictive substances.

A second limitation is that there is not necessarily a good match between the extent of epidemiological evidence regarding risk factors (see WHO 2002) and the attention given to them in prevention and policy initiatives. As the tables indicate, there is no comprehensive overview of costs for all chronic diseases, all risk factors, all jurisdictions in Canada, and for each of the 10 years under study. The fact that there are extensive data for some combinations (disease, risk factor, province) may give the potentially misleading impression that because there are costs estimates for some topics and not others, that the latter do not have a significant impact on damage. Until more comprehensive data are available, it will be difficult to draw comparisons that are appropriate.

## RESULTS<sup>1</sup>

### Main Findings by Type of Chronic Disease

Costs for eight types of chronic diseases: cancer, musculoskeletal disease, cardiovascular diseases, diabetes, hypertension, neuropsychiatric diseases, respiratory diseases, and other miscellaneous diseases are presented in the tables (1-7). There were 2 major type of results observed in the literature. One type was found in discussions of the scope and nature of the cost-study literature. The second involved comprehensive results of studies which included estimates of costs. The first type of result is described briefly but more emphasis was given to studies where full information is available.

#### ***Cancer:***

Cancer is the second leading cause of death in Canada, and accounts for 29% of all deaths in the country. Cancer in general accounted for about \$17.9 billion (\$4.4 billion total direct and \$13.5 billion total indirect costs) in 2002 in Canada (in 2005 dollars) (See Table 1). This translates into per capita costs of about \$570.8. Cancer is the most costly illness in losses due to premature mortality (more than \$12.1 billion annually). In fact, premature death costs make up 68% of all cancer costs, and indirect costs together with productivity losses due to disability (\$13 billion) accounted for about 72.6% of the total direct and indirect costs. Among all direct costs, costs due to hospitalization (\$2.1 billion) accounted for almost half.

Among specific types of cancers available in Canadian studies, colorectal cancer leads the chart with about \$484 million in total direct costs (colon cancer itself accounted for \$365 million followed by breast cancer (\$309 million), and endometrial cancer (\$55.4 million).

In British Columbia, cancer in general accounted for about \$1.9 billion total direct and indirect costs in 1998 --- about 472.3 per capita; and about \$288.5 million and 162.4 million due to breast cancer and colon cancer respectively, in 2003. Similarly, Nova Scotia incurred about \$25.2-26.9 million direct and indirect costs due to breast cancer in 2003, and \$615.7 million for all cancers which is \$657.6 per capita. Among other leading costs, Alberta spent about \$96.9 million on lung cancer health care. Data were not available for the other provinces.

#### ***Musculoskeletal diseases:***

In Canada, costs estimated in 1998 for musculoskeletal diseases translated into \$20.6 billion (\$640 per capita) both direct (\$4.9 billion) and indirect costs (\$15.7 billion) in 2005 dollars. The largest share of total indirect costs was due to short term disability (99%). British Columbia itself had a share of about \$3 billion in 1998 for both direct and indirect costs (please see Table 2), resulting in a per capita estimate of \$757.5. Nova Scotia reported close to half million in total health care costs in 1998, with a per capita estimate of \$523.0.

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<sup>1</sup> The detailed results are provided in Table 1 to 10. The logic of the sorting by rows is as follows: primary sorting was done alphabetically by chronic disease type and secondary sorting was done alphabetically by provinces; both were in ascending order.

## **CVD:**

Cardiovascular diseases, mainly coronary heart disease (also known as coronary artery disease) myocardial infarction and stroke, are responsible for about one-third of deaths in Canada annually, and are the leading causes of death in this country. Medical care costs for people with cardiovascular diseases account for about \$20.6 billion nationally in 1998 (\$640 per capita). Direct medical care expenditures account for about \$7.6 billion a year in Canada. The indirect costs of chronic illness due to productivity losses and premature mortality are particularly high, accounting for over \$13.0 billion annually in 1998. Premature death due to CVD alone costs the Canadian economy \$9.2 billion each year, while stroke alone costs the economy \$3.2 billion due to direct health care costs (see Table 3).

In British Columbia economic burden of CVD was about \$2.46 billion, in 1998, or about \$615.8 per capita. In 2003, stroke itself cost about 488.5 million. In Alberta, heart disease costs about \$1.48 billion in both direct and indirect health care in 2000, or about \$494.5 per capita. Cost of hospitalization was \$518.4 million (80%) out of total \$646.3 million in direct health care. Similarly coronary heart diseases cost Ontario about \$142 million a year in direct health cares. Coronary heart diseases also cost British Columbia about \$1.3 billion in both direct and indirect health cares in 2003 (all costs in \$2005 CAD).

Hypertension costs the Canadian health care system an estimated \$ 2.4 billion each year (\$73 per capita) in hospital, physician, and prescription drug and special treatment costs. No comprehensive data on indirect costs were available nationally or provincially except for British Columbia and Nova Scotia. In BC, total direct health care spending of more than \$320.4 million a year were reported due to hypertension. Productivity losses due to associated premature death and disability cost the economy an additional \$166.3 million a year, for a total economic burden close to half a billion dollars. In absolute terms, not on a per capita basis, Ontario had the second highest expenditures in direct health care costs related to hypertension.

## **Diabetes:**

Diabetes is another major chronic disease that can cause heart disease, kidney failure, and blindness, and often leads to disability and death. Non-insulin-dependent diabetes mellitus (often called adult-onset diabetes, or type 2 diabetes) is very common in Canada and more common than Type I diabetes. Table 4 presents costs associated primarily on principal diagnosis.

In Canada, costs estimated in 1999 for diabetes were translated into \$9.9 billion both direct and indirect costs in present 2005 \$ value. This can be translated into \$306 per capita. Direct costs of Type 2 diabetes in Canada in 1997 were close to \$1 billion.

Total economic costs of type 2 diabetes in British Columbia in 2003 approximated \$333.7 million whereas Alberta spent \$324.7 million (\$129.4 million in direct health care). In Ontario and Quebec, direct costs associated with type 2 diabetes was 176.4 million and 105.9 million each in 2003 (all costs in C\$2005).

## **Neuropsychiatric diseases:**

A study in 2003 showed that the economic burden due to mental illness is increasing in Canada. In that year it was about \$34 billion (\$1,056 per capita) compared to \$12.3 billion in

1998, which is almost a 3-fold increase. Depression and schizophrenia accounted for about \$5 billion and \$2.7 billion each per year in Canada.

British Columbia had an estimated economic burden of \$1.353 billion due to neurological and sensory disorders in 1998 whereas Nova Scotia had an estimated \$357 million due to mental illness in 1998. In Nova Scotia direct health care itself had a share of about 74% and 42% of all direct costs were attributed to hospitalizations (please see Table 5).

### ***Respiratory diseases:***

Respiratory disease as a whole cost the Canadian health care system \$3.85 billion a year in hospital, physician, and drug costs alone in 1998. Other direct costs, including private expenditures for other institutions and home care, add \$16 million to this sum, for total health care spending of \$3.87 billion a year due to respiratory diseases. Productivity losses due to premature death and disability cost the Canadian economy an additional \$5.67 billion a year, for a total economic burden of \$9.53 billion (\$295 per capita) that can be attributed to chronic respiratory disorders (see Table 6). For British Columbia, the estimated economic burden was \$1.32 billion in 1998 (about \$332 per capita) and for Nova Scotia it was \$196 million in 2001 (about \$210 per capita).

### **Main Findings by Risk Factor**

As indicated in the attached tables (7-10) data are not available for all combinations of year, risk factor and province. In the following text the main findings of available data are summarized.

### ***Physical inactivity:***

Physical activity provides proven health benefits. It protects against heart disease, stroke, hypertension, type 2 diabetes, colon cancer, breast cancer, osteoporosis, obesity, depression, anxiety, and stress. Evidence indicates that in British Columbia, 15% of heart disease, 19% of stroke, 10% of hypertension, 14% of colon cancer, 11% of breast cancer, 16% of Type 2 Diabetes, and 18% of osteoporosis cases are attributable to physical inactivity (Colman, 2004).

It was estimated that physical inactivity costs the Canadian health care system \$9.14 billion in 1999 in direct costs (hospital, physician, drug, research and other costs), which translates to \$283.8 per capita. Physical inactivity costs the Canadian economy an additional \$23 million each year in indirect productivity losses due to premature death (disability data not available). Adding direct and indirect costs, the total economic burden of physical inactivity in Canada was estimated at \$9.16 billion annually (see Table 9). The per capita estimate is \$300.4

The only comprehensive study identified on physical inactivity was done in Nova Scotia for 3 different years. Nova Scotia incurred a total economic burden of \$625.5 million in 2003, and translated into per capita costs the estimate is \$668. Total direct costs including hospital, physician, drugs, research and other costs were \$218.7 million where as total productivity losses due to mortality and disability approximated \$407 million.<sup>2</sup>

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<sup>2</sup> Please note all \$ figures were converted into 2005 Canadian dollars, using CPI to account for inflation.

## **Obesity:**

Studies show that almost one-fourth of adult Canadians are at increased risk of disability, disease and premature death because of being obese (Tjepkema, 2004). The total direct cost of obesity in Canada in 1997 was estimated to be between \$2.1 billion to \$11 billion (or between \$64.4 and \$343.4 per capita). This corresponded to a range of about 2.4% to 12% of the total health care expenditures for all diseases in Canada in 1997. When the contributions of the co-morbidities to the total cost were considered, the 3 largest contributors were: hypertension (\$749.2 million); type 2 diabetes mellitus (\$482.9 million); and, coronary artery disease (\$394.8 million) in 2005 \$CAD.

In 1997, the economic burden of comorbidity from with obesity or obesity-related chronic diseases in Ontario and Quebec were very high - \$2.7 billion and \$1.7 billion respectively, with the per capita estimate for Ontario being \$237 and \$229 for Quebec. Diabetes and hypertension also represent a significant economic burden for Quebec and British Columbia (see Table 9).

## **Tobacco and alcohol:**

Smoking tobacco is a key risk factor for chronic bronchitis, asthma and emphysema (COPD) ], and causes a decline in lung function that is irreversible. It is estimated that smokers experience an annual decline in lung volume two to three times as great as the normal decline in volume that occurs with age in non-smokers. The risks of lung cancer and heart disease diminish rapidly when smokers quit, with light smokers returning to the risk levels of non-smokers after several years (Jacobs et al., 2004). By contrast, COPD risks diminish much more gradually upon cessation, and never return to non-smoker levels. All tobacco related diseases cost the Canadian health care system about \$4.7 billion a year in hospital, physician, and drug costs alone. Productivity losses due to premature death and disability as a result of most tobacco related diseases cost the Canadian economy an additional \$13 billion a year, for a total economic burden of \$17.7 billion in 2002. The estimated per capita cost is \$541 for Canada in 2002 (Rehm et al., 2006).

Similarly, all alcohol related diseases cost the Canadian health care system about \$2.7 billion a year in hospital, physician, and drug costs alone. Productivity losses due to premature death and disability as a result of most alcohol-related diseases cost the Canadian economy an additional \$4.6 billion a year, for a total economic burden of \$7.3 billion in 2002.<sup>3</sup> The estimated per capita cost is \$223 (Rehm et al., 2006). (For details see Table 10.). There were no comprehensive provincial estimates available on this risk factor.

## **MAIN CONCLUSIONS**

The conclusions are organized along two dimensions, scope and quality of the basic information and central findings. As is evident from the tables and noted above, the existing Canadian literature does not include detailed economic burden estimates for all major chronic diseases, risk factors, provinces and for every year for the ten years that were examined. Considerably more information is available on Nova Scotia, Halifax Region, British Columbia and Alberta than for other jurisdictions. Also, some breakdowns are available for cancers, cardiovascular diseases, and other chronic diseases (see Table 7); however available

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<sup>3</sup> This does not include estimated costs associated with alcohol-related trauma, as well as social and family disruption.

information is sketchy regarding subclasses of musculoskeletal diseases, neuropsychiatric disorders and respiratory diseases, even though all these major classes of chronic disease involve substantial contributions to overall economic burden of chronic disease in Canada. The health care and disability-associated costs of musculoskeletal and neuropsychiatric disorders are particularly noteworthy.

A second shortcoming is that the current information is uneven depth and quality of information regarding the various risk factors for chronic disease. There is some information on proximal risk factors such as diet, exercise, weight and alcohol and tobacco consumption. However, distal factors such as air, water and land environments, working conditions and social determinants of health should be the foci of future cost studies. The methodology is no doubt challenging for all risk factors, but particularly for the latter.

Arguably the most thorough and up-to-date analysis to date of any of the risk factors is the 2006 report focusing on tobacco, alcohol and illicit drugs (Rehm et al. 2006). The methodology employed in that research is a useful template for future work examining a wide range of chronic diseases and potential risk factors.

On a national basis, a comparison across diseases is confounded by not having similar data for the same year. Nevertheless, it appears that most costly chronic disease involves neuropsychiatric disorders with an estimated per capita cost \$1,056 or \$34 billion in direct and indirect costs in 2003. Other chronic disease groupings with documented high economic impact include cardiovascular diseases - \$640 per capita in 1998, musculoskeletal disease -- \$640 per capita in 1998, and cancers - \$571 per capita in 2002. Diabetes was estimated to cost \$306 per capita in 1999, and respiratory diseases \$295 per capita in 1998. It was feasible to provide data on just four major risk factors. The estimated economic burden of physical inactivity on a per capita basis was \$300.4, for obesity \$343, tobacco use \$341 and alcohol \$223.

While it may be tempting to offer sums of estimated economic burden across risk factors or across main chronic diseases, this would likely lead to inflated estimates. Persons suffer from more than one disease, and may be treated for more than one at one time, thus a summation would involve some "double-counting" (Taylor & Rehm, 2006). Also, there is an overlap of risk factors. The populations who drinking in a risk manner, are physically inactive, use tobacco, or are obese are not four discrete groups. There is considerable overlap. Here, again to sum the estimated economic impact would lead to "double counting".

However, there are also factors that would make these under-estimations. It is only feasible to add into the sum those costs that were counted within the available studies, and it was not feasible -- without primary data collection that was beyond the scope of this project -- to assess what cost factors were not included.

Finally, there is not necessarily a mechanical and simple relationship between cost and savings estimates. If population level prevention strategies and policies, combined with individual level interventions, result in reducing the prevalence of some chronic diseases, this may lead to net economic gain in the short run with regard to the treatment of that particular disease, but not necessarily in the long term. If someone does not acquire one chronic disease they may get another or die due to an acute illness. Also, health care systems and their attendant costs are driven by many factors, and the ebb and flow of the epidemiology of specific chronic diseases may not be the major contributor to changes in costs.

Nevertheless, there are some noteworthy developments which suggest that a change prevalence of a risk factor can have an impact on costs. This is evident in a comparison of two Canadian costs estimates focusing on tobacco and alcohol. Between 1992 and 2002, there has been a change in the exposure to both tobacco and alcohol that has seen the prevalence of tobacco use decrease, while alcohol prevalence in hazardous and harmful drinking categories has increased (see Patra et al, in press). Tobacco-attributable outcomes tend to be related to both cumulative use and, consequently, to more chronic disease outcomes. Alcohol, on the other hand, is linked to more acute outcomes such as injury as well that is based on current exposure. Therefore, tobacco-related indicators with high chronic disease contributions like PYLL and older age deaths related to exposure prior to 2002, whereas hospital days and younger deaths may reflect the decreasing prevalence. For alcohol, relative and actual increases may reflect the increasing prevalence of heavy drinking occasions and the related impact in more acute categories.

For example, using the Single et al. (1996) method, the relative risks for 1992 were kept the same for the 2002 calculations, so theoretically the only methodological difference between the 1992 and 2002 data is exposure measurement. The differences seen between 1992 and 2002 can be attributed to a combination of the true exposure change (e.g. higher volume of alcohol consumed per person) and the exposure measurement change (i.e. improvements in measuring both volume of alcohol (for more information see Rehm et al., 2001), or epidemiological shifts, not accounted for in the calculations.

Cost estimates studies provide a useful cross-sectional snapshot of burden of chronic disease in a jurisdiction. If resources were diverted into effective prevention strategies, real economic advantage could be achieved. A substantial challenge is to convince governments to provide additional financial resources for prevention – that is, in addition to carrying the current costs of treating existing disease. The expected benefits of such a long-term and insightful perspective will be realized long after governments may have changed. Furthermore, these costs are so high that significant gains could often be made if even a modest impact was observed in disease incidences. While a review of the effectiveness of prevention strategies is beyond the scope of the current report, if such review was carried out, a reasonable hypothesis is that real potential for savings would likely be shown in some areas (such as the result of comprehensive screening for colon cancer), but not for others (such as for schizophrenia).

## **RECOMMENDATIONS**

In planning future cost estimate studies, several considerations are noted below for framing the scope, foci and methodology of these initiatives: There is a wide range of points of view, types of costs included and variations in the basic methodology – as noted by Choi, Robson and Single (1997). Their analysis focuses on estimating the economic costs of the abuse of tobacco, alcohol and illicit drugs. It provides a useful resource for other risk factors for chronic disease. A central point is that cost estimate studies need to provide an explicit statement of their underlying rationale, perspective taken, sources used, and what types of costs are include and excluded.

It may be optimistic and premature to assume that is feasible to come up with some common core guidelines for conducting costs estimates focusing on chronic disease. However, this would seem to be a worthy medium range goal, and if achieved, would be a significant step in generating comparable methods for assembling, analyzing and reporting the findings.

Epidemiological data on chronic diseases in a jurisdiction is an important starting point for these studies, and much preferable to popular and high profile agendas which may be out of step with epidemiological profiles. Furthermore, future work in Canada needs to consider more detailed analyses of some diseases, such as neuropsychiatric or musculoskeletal diseases, in order to provide breakdown of costs for these diseases.

Also, more attention needs to be devoted to a number of risk factors and conditions for chronic disease, and not only those which are currently receiving media or programming attention. Both proximal risk factors and distal conditions that impact the burden of chronic disease in Canada need to be considered.

Cost estimates studies are also a tool, however not the only one, in raising awareness of the burden of chronic disease in Canada. As indicated above, and the tables, the estimates costs run into billions for all major chronic disease. This suggests that a combination of policies and prevention efforts are required to curtail the risk factors and prevalence and incidence of these diseases. Costs estimates alone may be too crude a tool to assess whether a prevention effort has had a harm reduction or risk management impact. Nevertheless, they provide an additional resource, along with mortality and morbidity statistics, survey data and treatment statistics, for those seeking to stimulate population level policies and coordinated strategies for curtailing chronic disease.

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### **List of websites included in this literature search**

Public Health Agency of Canada [www.phac-aspc.gc.ca](http://www.phac-aspc.gc.ca)

Google [www.google.ca](http://www.google.ca)

Google Scholar <http://scholar.google.com>

Heart and Stroke Foundation [ww2.heartandstroke.ca](http://ww2.heartandstroke.ca)

Canadian Medical Association [www.cma.ca](http://www.cma.ca)

Neuro Science Canada [www.neurosciencecanada.ca/](http://www.neurosciencecanada.ca/)

World Health Organization [www.who.int](http://www.who.int)

Canadian Health Network [www.canadian-health-network.ca](http://www.canadian-health-network.ca)

Alzheimer Society [www.alzheimer.ca](http://www.alzheimer.ca)

Health Canada [www.hc-sc.gc.ca](http://www.hc-sc.gc.ca)

Here To Help [www.heretohelp.bc.ca](http://www.heretohelp.bc.ca)

Canadian Institutes of Health Research [www.cihr-irsc.gc.ca](http://www.cihr-irsc.gc.ca)

Canadian Association of Gastroenterology [www.cag-acg.org](http://www.cag-acg.org)

Canadian Nurses Association [www.cna-nurses.ca](http://www.cna-nurses.ca)

Ministry of Health British Columbia [www.healthservices.gov.bc.ca](http://www.healthservices.gov.bc.ca)

Parliament of Canada [www.parl.gc.ca](http://www.parl.gc.ca)

Public Health Research Education and Development [www.phred-redsp.on.ca](http://www.phred-redsp.on.ca)

Institute of Health Economics [www.ihe.ca](http://www.ihe.ca)

Centre for Health Economics and Policy Analysis [www.chepa.org](http://www.chepa.org)

Department of Health, Nova Scotia [www.gov.ns.ca](http://www.gov.ns.ca)

SpringerLink [www.springerlink.com](http://www.springerlink.com)

Canadian Aids Society [www.cdn aids.ca](http://www.cdn aids.ca)

Avert Organization [www.avert.org](http://www.avert.org)

Ministry of Health and Long-Term care, Ontario [www.health.gov.on.ca](http://www.health.gov.on.ca)

TD Bank Financial Group [www.td.com/economics](http://www.td.com/economics)

Aids Committee of Toronto [www.actoronto.org](http://www.actoronto.org)

BC Centre for Disease Control [www.bccdc.org](http://www.bccdc.org)

University of Manitoba <http://umanitoba.ca>

Saskatchewan Health [www.health.gov.sk.ca](http://www.health.gov.sk.ca)

Genuine Progress Index (GPI) Atlantic [www.gpiatlantic.org](http://www.gpiatlantic.org)

Canadian Centre on Substance Abuse [www.ccsa.ca](http://www.ccsa.ca)

York University Electronic Resources [www.yorku.ca](http://www.yorku.ca)

Statistics Canada [www.statcan.ca](http://www.statcan.ca)

Disease Surveillance Online <http://dsol-smed.phac-aspc.gc.ca>

Provincial websites:

[www.gov.ns.ca](http://www.gov.ns.ca)

[www.tsa.gov.bc.ca](http://www.tsa.gov.bc.ca)

[www.health.gov.sk.ca](http://www.health.gov.sk.ca)

Alliance for the Prevention of Chronic Disease (Manitoba) [www.apcd.mb.ca](http://www.apcd.mb.ca)

BC Healthy Living Alliance [www.bchealthyliving.ca](http://www.bchealthyliving.ca)

Alberta Centre for Active Living [www.centre4activeliving.ca](http://www.centre4activeliving.ca)

Chronic Disease Prevention Alliance of Canada [www.cdpc.ca](http://www.cdpc.ca)

Canadian Diabetes Association [www.diabetes.ca](http://www.diabetes.ca)

Canadian Medical Journal Association [www.cmaj.ca](http://www.cmaj.ca)

Global Cardiovascular InfoBase [www.cvdinfobase.ca](http://www.cvdinfobase.ca)

University of Alberta [www.uofaweb.ualberta.ca](http://www.uofaweb.ualberta.ca)

University of Toronto [www.utoronto.ca](http://www.utoronto.ca)

Canadian Fitness and Lifestyle Institute [www.cflri.ca](http://www.cflri.ca)

## APPENDIX 1.

### List of chronic diseases (Source: New Global Burden of Disease Study classification system for diseases and injuries: WHO, 2001)

#### Nutritional deficiencies

1. Protein-energy malnutrition
2. Iodine deficiency
3. Vitamin A deficiency
4. Anaemia

Other nutritional disorders

#### Malignant neoplasms

1. Mouth and oropharynx cancers
2. Oesophagus cancer
3. Stomach cancer
4. Colon and rectum cancers
5. Liver cancer
6. Pancreas cancer
7. Trachea, bronchus and lung cancers
8. Melanoma and other skin cancers
9. Breast cancer
10. Cervix uteri cancer
11. Corpus uteri cancer
12. Ovary cancer
13. Prostate cancer
14. Bladder cancer
15. Lymphomas and multiple myeloma
16. Leukaemia

Other malignant neoplasms

#### Diabetes mellitus

#### Endocrine disorders

#### Neuro-psychiatric conditions

1. Unipolar major depression
2. Bipolar disorder
3. Schizophrenia
4. Epilepsy
5. Alcohol use
6. Dementia and other degenerative and hereditary CNS disorders
7. Parkinson disease
8. Multiple sclerosis
9. Drug use
10. Post-traumatic stress disorder
11. Obsessive-compulsive disorders
12. Panic disorder
13. Sleep disorders
14. Migraine
15. Mental Retardation

Other neuropsychiatric disorders

#### Sense organ diseases

1. Glaucoma
2. Cataracts
3. Presbyopia
4. Deafness

Other sense organ disorders

#### Cardiovascular diseases

1. Rheumatic heart disease
2. Hypertensive disease
3. Ischaemic heart disease
4. Cerebrovascular disease
5. Inflammatory heart diseases

Other cardiac diseases

#### Respiratory diseases

1. Chronic obstructive pulmonary disease
2. Asthma

Other respiratory diseases

#### Digestive diseases

1. Peptic ulcer
2. Cirrhosis of the liver
3. Appendicitis

Other digestive diseases

#### Genito-urinary diseases

1. Nephritis and nephrosis
2. Benign prostatic hypertrophy

Other genitourinary system diseases

#### Skin diseases

#### Musculo-skeletal diseases

1. Rheumatoid arthritis
2. Osteoarthritis
3. Gout
4. Low back pain

Other musculoskeletal

#### Congenital anomalies

1. Abdominal wall defect
2. Anencephaly
3. Anorectal atresia
4. Cleft lip
5. Cleft palate
6. Oesophageal atresia
7. Renal agenesis
8. Down syndrome
9. Congenital heart anomalies
10. Spina bifida

Other congenital anomalies

#### Oral conditions

1. Dental caries
2. Periodontal disease
3. Edentulism

Other oral diseases

**TABLES 1-10**

Table 1: Economic burden of cancers related to chronic disease in Canada (2005 Dollars) - Direct and indirect costs

Chronic disease	Years of the estimate	Provincial / National	DIRECT COSTS										INDIRECT COSTS: Productivity losses					TOTAL HEALTH CARE COSTS†
			Hospitalizations	Special treatment	Physician costs	Prescription drugs	Research	Other direct costs	TOTAL DIRECT HC COST	Disability (short and long term)	Long-term Disability	Short-term Disability	Premature mortality	TOTAL INDIRECT HC COST				
Breast Cancer	2001	British Columbia	\$ 34,727,356	n/a	\$ 8,155,587	\$ 3,332,049	n/a	\$ 33,553,205	\$ 79,778,774	\$ 26,222,697	\$22,129,037	\$4,093,660	\$ 156,246,655	\$ 208,692,049	\$ 288,470,823			
Breast Cancer	2003	Halifax Region	\$ 3,718,575	n/a	\$ 414,437	\$ 392,032	\$ 78,365	\$ 2,117,614	\$ 6,721,023	\$ 18,390,096	n/a	n/a	\$ 1,825,732	\$ 20,215,828	\$ 26,936,851			
Breast Cancer	2001	Nova Scotia	\$ 9,591,012	n/a	\$ 1,581,401	\$ 1,013,366	n/a	\$ 6,675,734	\$ 18,861,513	n/a	n/a	\$ 6,312,911	\$ 6,312,911	\$ 25,174,424				
Breast Cancer	1999	Canada	\$ 193,299,731	n/a	\$ 52,653,234	\$ 56,425,220	\$ 6,258,142	n/a	\$ 308,636,327	n/a	n/a	\$ 594,134	\$ 594,134	\$ 309,230,461				
Colon Cancer	2001	British Columbia	\$ 21,991,524	n/a	\$ 5,172,609	\$ 2,115,587	n/a	\$ 21,251,068	\$ 50,530,788	\$ 16,607,356	\$14,015,762	\$2,591,594	\$ 95,307,180	\$ 111,914,536	\$ 162,445,324			
Colon Cancer	2003	Halifax Region	\$ 3,019,690	n/a	\$ 336,485	\$ 318,313	\$ 63,704	\$ 1,719,593	\$ 5,457,785	\$ 10,424,214	n/a	n/a	\$ 1,482,536	\$ 11,906,750	\$ 17,364,535			
Colon Cancer	2001	Nova Scotia	\$ 6,719,103	n/a	\$ 1,107,510	\$ 709,779	\$ 8,462	\$ 4,670,158	\$ 13,215,012	n/a	n/a	n/a	n/a	n/a	\$ 13,215,012			
Colon Cancer	2001	Nova Scotia	\$ 6,719,103	n/a	\$ 1,107,510	\$ 709,779	n/a	\$ 4,678,620	\$ 13,215,012	n/a	n/a	n/a	\$ 8,005,380	\$ 21,220,392				
Colon Cancer	1999	Canada	\$ 278,896,726	n/a	\$ 50,577,053	\$ 26,428,015	\$ 8,255,397	n/a	\$ 364,157,191	n/a	n/a	n/a	\$ 924,087	\$ 365,081,278				
Colorectal cancer	1997	Canada	\$ 273,524,737	\$8,104,665	\$ 65,301,563	\$ 43,991,048	\$17,936,347	n/a	\$ 484,305,337	n/a	n/a	n/a	n/a	\$ 484,305,337				
Endometrial cancer	1997	Canada	\$ 26,469,915	\$ 935,373	\$ 7,534,315	\$ 9,897,843	\$ 1,554,772	n/a	\$ 55,400,317	n/a	n/a	n/a	n/a	\$ 55,400,317				
Lung cancer only	2000	Alberta	\$ 22,397,614	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 48,367,457	n/a	\$ 96,907,486			
Cancer, in general	1998	British Columbia	n/a	n/a	n/a	n/a	n/a	n/a	\$ 330,384,089	n/a	n/a	n/a	\$ 1,611,076,411	\$ 1,944,835,301				
Cancer, in general	2001	Nova Scotia	\$ 75,526,445	n/a	\$ 12,481,961	\$ 7,933,450	n/a	\$ 52,466,550	\$ 148,408,406	\$ 15,338,004	n/a	\$ 451,889,317	\$ 467,227,320	\$ 615,741,506				
Cancer, in general	2002	Canada	\$ 2,107,254,026	n/a	\$ 381,748,918	\$ 240,867,879	n/a	\$ 1,703,436,883	\$ 4,433,307,706	\$ 1,301,816,104	n/a	\$ 12,173,397,749	\$ 13,475,213,853	\$ 17,908,521,558				

n/a: not available

†: as reported, may not sum total direct and indirect costs only  
Halifax Region: Halifax Regional Municipality (Nova Scotia)





Table 4: Economic burden of diabetes and/or diabetes related in Canada (2005 Dollars) - Direct and Indirect costs

Chronic disease	Years of the estimate	National/Provincial	INDIRECT COSTS: Productivity losses														
			Hospitalizations	Special treatment	Physician costs	Prescription drugs	Research	Other direct costs	TOTAL DIRECT HC COST	Disability (short and long term)	Long-term Disability	Short-term Disability	Premature mortality	TOTAL INDIRECT HC COST	TOTAL HEALTH CARE COSTS†		
Diabetes in general	1999	Canada	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 9,865,698,730
Type 2 diabetes	2000	Alberta	\$114,025,493	n/a	n/a	\$ 15,417,100	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 324,710,400
Type 2 diabetes	2001	British Columbia	\$ 32,886,795	n/a	n/a	\$ 29,343,187	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 333,680,911
Type 2 diabetes	2003	Halifax Region	\$ 1,054,161	n/a	n/a	\$ 862,016	\$ 30,148	n/a	\$ 1,073,158	\$ 3,405,941	\$ 90,737,513	\$ 85,215,832	\$ 5,521,681	\$ 190,487,426	\$ 4,666,287	\$ 8,072,228	
Type 2 diabetes	1997	Manitoba	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 3,605,828	n/a	n/a	n/a	n/a	n/a	\$ 21,284,630
Type 2 Diabetes	1997	New Brunswick	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 13,584,443
Type 2 Diabetes	2001	Nova Scotia	\$ 7,835,075	n/a	\$ 3,034,809	\$ 12,422,725	n/a	\$ 12,865,940	\$ 36,158,550	n/a	n/a	n/a	n/a	\$ 6,972,974	\$ 6,972,974	\$ 43,131,524	
Type 2 diabetes	1997	Ontario	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 176,352,030	n/a	n/a	n/a	n/a	n/a	n/a	\$ 176,352,030
Type 2 diabetes	1997	Quebec	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 105,885,364	n/a	n/a	n/a	n/a	n/a	n/a	\$ 105,885,364
Type 2 diabetes	1997	Saskatchewan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 17,354,167	n/a	n/a	n/a	n/a	n/a	n/a	\$ 17,354,167
Type 2 diabetes	1997	Canada	\$347,051,898	\$41,896,725	\$ 146,927,705	\$ 2,177,577,987	\$20,528,015	n/a	n/a	\$ 952,078,527	n/a	n/a	n/a	n/a	n/a	n/a	\$ 952,078,527

n/a: not available

†: as reported, may not sum total direct and indirect costs only  
Halifax Region: Halifax Regional Municipality (Nova Scotia)

Table 5: Economic burden of neuropsychiatric related disorders in Canada (2005 Dollars) - Direct and Indirect costs

Chronic disease	Years of the estimate	National/ Provincial	DIRECT COSTS					INDIRECT COSTS: Productivity losses					TOTAL HEALTH CARE COSTS†			
			Hospitalization	Special treatment costs	Physician costs	Prescription drugs	Research	Other direct costs	TOTAL DIRECT HC COST	Disability (short and long term)	Long-term Disability	Short-term Disability		Premature mortality	TOTAL INDIRECT HC COST	
Mental illness	2001	Nova Scotia	\$ 110,222,067	n/a	\$ 18,722,942	\$ 41,465,499	n/a	\$ 93,297,373	\$ 263,707,881	\$76,478,459	n/a	n/a	n/a	\$16,924,694	\$ 93,403,152	\$ 357,005,254
Neurological & sensory disorders	1998	BC	n/a	n/a	n/a	n/a	n/a	n/a	\$ 416,039,223	n/a	n/a	n/a	n/a	n/a	\$929,467,160	\$ 1,353,999,260
Depression	1998	Canada	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mental illness	2003	Canada	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 5,028,677,151
																\$34,071,794,872

n/a: not available

†: as reported, may not sum total direct and indirect costs only

Table 6: Economic burden of respiratory diseases in Canada (2005 Dollars) - Direct and Indirect costs

Chronic disease	Years of the estimate	National/ Provincial	DIRECT COSTS					INDIRECT COSTS: Productivity losses					TOTAL HEALTH CARE COSTS†			
			Hospitalizations	Special treatment	Physician costs	Prescription drugs	Research costs	Other direct costs	TOTAL DIRECT HC COST	Disability (short and long term)	Long-term Disability	Short-term Disability		Premature mortality	TOTAL INDIRECT HC COST	
Asthma	1995	Ontario	n/a	n/a	\$ 32,813,847	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 32,813,847
Respiratory diseases	1998	BC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 1,329,381,092
Respiratory diseases	2001	Nova Scotia	\$ 22,848,336	n/a	\$ 3,384,939	\$ 17,559,370	n/a	\$ 24,011,909	\$ 67,804,553	\$ 82,613,660	n/a	n/a	n/a	n/a	\$ 45,908,231	\$ 196,220,665
Respiratory Diseases	1998	Canada	\$ 1,743,945,236	n/a	\$ 867,949,676	\$ 1,240,074,785	n/a	\$ 16,091,767	\$ 3,868,058,464	\$ 3,825,035,338	\$ 1,100,833,302	\$ 2,724,202,035	\$ 1,840,272,340	\$ 5,665,307,678	\$ 9,533,366,142	

n/a: not available

†: as reported, may not sum total direct and indirect costs only

Table 7. Economic burden of other miscellaneous diseases in Canada (2005 Dollars) - Direct and indirect costs

Chronic disease	Years of the estimate	National/Provincial	Hospitalizations	Special treatment	DIRECT COSTS				INDIRECT COSTS: Productivity losses				TOTAL HEALTH CARE COSTS†			
					Physician costs	Prescription drugs	Research	Other direct costs	TOTAL DIRECT HC COST	Disability (short and long term)	Long-term Disability	Short-term Disability		Premature mortality	TOTAL INDIRECT HC COST	
Chronic diseases	2000 Alberta		\$ 894,111,986	n/a	n/a	\$ 151,994,443	n/a	n/a	n/a	\$ 1,046,106,429	\$ 90,688,443	n/a	n/a	\$ 213,323,093	\$ 304,011,536	\$ 1,350,117,964
Digestive disorders	1998 British Columbia		n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 489,457,909	n/a	n/a	n/a	n/a	\$ 297,429,491	\$ 787,781,388
Endocrine	2001 Nova Scotia		\$ 19,569,177	n/a	n/a	\$ 7,616,112	\$ 30,993,345	n/a	n/a	\$ 31,839,580	\$ 90,018,214	\$ 28,560,420	n/a	\$ 46,331,349	\$ 74,891,769	\$ 164,804,203
Endocrine and related diseases	1998 British Columbia		n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 208,019,611	\$ 2,886,440,173	\$ 994,116,017	n/a	\$ 1,160,098,355	\$ 2,154,214,372	\$ 369,272,525
Endocrine	2002 Canada		\$ 546,695,368	n/a	n/a	\$ 292,953,074	\$ 937,742,694	n/a	n/a	\$ 1,109,059,048	\$ 2,886,440,173	\$ 994,116,017	n/a	\$ 1,160,098,355	\$ 2,154,214,372	\$ 5,040,654,545
Gallbladder disease	1997 Alberta		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 15,535,594	n/a	n/a	n/a	n/a	\$ 15,535,594
Gallbladder disease	1997 Manitoba		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 6,905,607	n/a	n/a	n/a	n/a	\$ 6,905,607
Gallbladder disease	1997 New Brunswick		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 4,815,721	n/a	n/a	n/a	n/a	\$ 4,815,721
Gallbladder disease	1997 Nova Scotia		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 5,935,931	n/a	n/a	n/a	n/a	\$ 5,935,931
Gallbladder disease	1997 Ontario		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 56,008,310	n/a	n/a	n/a	n/a	\$ 56,008,310
Gallbladder disease	1997 Saskatchewan		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 5,893,503	n/a	n/a	n/a	n/a	\$ 5,893,503
Gallbladder disease	1997 Canada		\$ 299,994,652	\$ 18,236,351	\$ 146,927,705	\$ 168,264,476	\$ 6,324,034	n/a	n/a	\$ 379,329,880	\$ 666,914,339	\$ 185,637,558	\$ 481,076,761	\$ 357,259,574	\$ 1,024,173,913	\$ 492,363,367
Genitourinary diseases	1998 British Columbia		\$ 1,973,252,914	n/a	n/a	\$ 558,630,157	\$ 360,388,529	n/a	n/a	\$ 10,169,103	\$ 2,902,440,703	\$ 666,914,339	\$ 185,637,558	\$ 3,572,595,574	\$ 3,926,614,616	
Hyperlipidemia	1997 Alberta		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 6,932,696	n/a	n/a	n/a	n/a	\$ 6,932,696
Hyperlipidemia	1997 Manitoba		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 3,081,598	n/a	n/a	n/a	n/a	\$ 3,081,598
Hyperlipidemia	1997 New Brunswick		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 2,210,888	n/a	n/a	n/a	n/a	\$ 2,210,888
Hyperlipidemia	1997 Nova Scotia		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 2,695,610	n/a	n/a	n/a	n/a	\$ 2,695,610
Hyperlipidemia	1997 Ontario		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 24,639,093	n/a	n/a	n/a	n/a	\$ 24,639,093
Hyperlipidemia	1997 Saskatchewan		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 2,653,433	n/a	n/a	n/a	n/a	\$ 2,653,433
Hyperlipidemia	1997 Canada		\$ 144,114,742	n/a	n/a	\$ 425,147,558	n/a	n/a	n/a	\$ 623,983,902	n/a	n/a	n/a	n/a	n/a	\$ 623,983,902
Nervous system	2001 Nova Scotia		\$ 58,495,972	n/a	n/a	\$ 29,512,434	\$ 20,309,632	n/a	n/a	\$ 59,236,427	\$ 167,554,466	\$ 167,766,025	n/a	\$ 31,733,800	\$ 199,499,825	\$ 367,054,291
Ophthalmic	1996 Saskatchewan		\$ 405,852	n/a	n/a	\$ 1,901,829	\$ 405,528	n/a	n/a	\$ 1,161,160	\$ 3,874,369	n/a	n/a	n/a	n/a	\$ 5,441,057
Pulmonary embolism	1997 Alberta		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 4,328,381	n/a	n/a	n/a	n/a	\$ 4,328,381
Pulmonary embolism	1997 Manitoba		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 1,923,974	n/a	n/a	n/a	n/a	\$ 1,923,974
Pulmonary embolism	1997 New Brunswick		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 1,307,363	n/a	n/a	n/a	n/a	\$ 1,307,363
Pulmonary embolism	1997 Nova Scotia		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 1,621,151	n/a	n/a	n/a	n/a	\$ 1,621,151
Pulmonary embolism	1997 Ontario		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 15,741,643	n/a	n/a	n/a	n/a	\$ 15,741,643
Pulmonary embolism	1997 Saskatchewan		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 1,612,671	n/a	n/a	n/a	n/a	\$ 1,612,671
Pulmonary embolism	1997 Canada		\$ 105,880,801	n/a	n/a	\$ 1,015,262	\$ 830,142	n/a	n/a	\$ 79,977	\$ 5,121,688	n/a	n/a	n/a	n/a	\$ 146,418,954
Renal diseases	1996 Saskatchewan		\$ 3,196,306	n/a	n/a	\$ 1,015,262	\$ 830,142	n/a	n/a	\$ 79,977	\$ 5,121,688	n/a	n/a	n/a	n/a	\$ 146,418,954
Skin and related disorders	1998 British Columbia		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 6,091,807
Birth defects	1998 Canada		\$ 808,499,537	n/a	n/a	\$ 313,901,203	\$ 524,546,901	n/a	n/a	\$ 558,742	\$ 1,647,506,383	\$ 189,525,254	\$ 136,556,522	\$ 20,896,947	\$ 210,422,202	\$ 246,181,694
Blood diseases	1998 Canada		\$ 145,831,637	n/a	n/a	\$ 35,098,992	\$ 11,621,832	n/a	n/a	\$ 3,911,193	\$ 196,453,654	\$ 192,654,209	n/a	\$ 399,835,708	\$ 592,489,917	\$ 789,943,571
Nervous system/ Sense organ diseases	1998 Canada		\$ 1,593,084,921	n/a	n/a	\$ 53,862,720	\$ 54,086,216	n/a	n/a	\$ 6,593,154	\$ 238,471,045	\$ 115,324,329	\$ 54,533,210	\$ 104,037,743	\$ 273,895,282	\$ 512,366,327
Nervous system/ Sense organ diseases	1998 Canada		\$ 1,593,084,921	n/a	n/a	\$ 921,700,648	\$ 599,418,316	n/a	n/a	\$ 39,894,172	\$ 3,154,098,057	\$ 5,189,930,065	\$ 4,643,480,481	\$ 931,869,750	\$ 6,121,799,815	\$ 9,275,897,872

n/a: not available

†: as reported, may not sum total direct and indirect costs only

Table 8: Economic burden due to physical inactivity in Canada (2005 Dollars) - Direct and Indirect costs

Chronic disease	Years of the estimate	National/ Provincial		DIRECT COSTS										INDIRECT COSTS:				
		Hospitalizations	Special treatment	Physician costs	Prescription drugs	Research	Other direct costs	TOTAL DIRECT HC COST	Disability (short and long term)	Productivity losses	Premature mortality	TOTAL INDIRECT HC COST	TOTAL HEALTH CARE COSTS†					
Breast cancer	2003	\$ 3,718,575	n/a	\$ 414,437	\$ 392,032	\$ 78,365	\$ 2,117,614	\$ 6,721,023	\$ 18,390,096	\$ 1,825,732	\$ 20,215,828	\$ 26,936,851						
Chronic disease	2003	\$ 48,579,255	n/a	\$ 7,048,525	\$ 18,920,068	\$ 362,606	\$ 34,458,974	\$ 109,369,429	\$ 125,727,298	\$ 77,675,019	\$ 203,402,317	\$ 312,771,746						
Colon cancer	2003	\$ 3,019,690	n/a	\$ 336,485	\$ 318,313	\$ 63,704	\$ 1,719,593	\$ 5,457,785	\$ 10,424,214	\$ 1,482,536	\$ 11,906,750	\$ 17,364,535						
Coronary Heart Disease (CHD)	2003	\$ 20,393,931	n/a	\$ 2,470,515	\$ 7,581,387	\$ 11,048	\$ 14,010,116	\$ 44,466,996	\$ 73,639,164	\$ 8,578,865	\$ 82,218,029	\$ 126,685,025						
Heart disease	2001	n/a	n/a	n/a	n/a	n/a	n/a	\$ 41,209,513	n/a	n/a	n/a	\$ 146,271,664						
Hypertension	2003	\$ 1,428,124	n/a	\$ 879,775	\$ 4,891,574	\$ 146,612	\$ 3,379,199	\$ 10,725,285	n/a	\$ 1,528,068	\$ 1,528,068	\$ 12,253,353						
Hypertension	2001	n/a	n/a	n/a	n/a	n/a	n/a	\$ 18,662,648	n/a	n/a	n/a	\$ 50,046,319						
Osteoporosis	2003	\$ 7,513,863	n/a	\$ 1,860,423	\$ 3,014,218	\$ 28,806	\$ 5,711,982	\$ 18,129,292	\$ 620,107	\$ 57,457,126	\$ 58,077,233	\$ 76,206,525						
Stroke	2003	\$ 11,450,911	n/a	\$ 700,434	\$ 1,860,526	\$ 3,923	\$ 6,447,313	\$ 20,463,107	\$ 19,047,889	\$ 5,742,233	\$ 24,790,122	\$ 45,253,229						
Stroke	2001	n/a	n/a	n/a	n/a	n/a	n/a	\$ 15,918,732	n/a	n/a	n/a	\$ 83,365,751						
Type 2 Diabetes	2003	\$ 1,054,161	n/a	\$ 386,457	\$ 862,016	\$ 30,148	\$ 1,073,158	\$ 3,405,941	\$ 3,605,828	\$ 1,060,459	\$ 4,666,287	\$ 8,072,228						
Type 2 Diabetes	2001	n/a	n/a	n/a	n/a	n/a	n/a	\$ 7,195,110	n/a	n/a	n/a	\$ 18,456,378						
Chronic diseases (comorbidity with physical inactivity)	1999	\$ 4,867,698,483	n/a	\$ 1,032,529,779	\$ 1,780,472,515	\$ 30,831,405	n/a	\$ 9,136,577,554	n/a	\$ 23,392,668	\$ 23,392,668	\$ 9,159,970,221						

n/a: not available

†: as reported, may not sum total direct and indirect costs only  
Halifax region: Halifax Regional Municipality (Nova Scotia)

Table 9: Economic burden due to obesity/ overweight in Canada (2005 Dollars) - Direct and Indirect costs

Chronic disease	Years of the estimate		National/ Provincial		DIRECT COSTS				TOTAL HEALTH CARE COSTS†
	Years of the estimate	Years of the estimate	National/ Provincial	Hospitalizations	Special treatment	Research	TOTAL DIRECT HC COST	TOTAL INDIRECT HC COST	
Colorectal cancer	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 2,620,071	n/a	\$ 2,620,071
Colorectal cancer	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 5,003,105	n/a	\$ 5,003,105
Comorbidity with obesity	1997 Alberta	n/a	n/a	n/a	n/a	n/a	\$ 365,023,607	\$ 387,837,583	\$ 752,861,190
Comorbidity with obesity	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 433,465,534	\$ 456,279,509	\$ 889,745,042
Comorbidity with obesity	1997 Manitoba	n/a	n/a	n/a	n/a	n/a	\$ 159,697,828	\$ 168,253,069	\$ 327,950,897
Comorbidity with obesity	1997 NB	n/a	n/a	n/a	n/a	n/a	\$ 109,507,082	\$ 114,069,877	\$ 223,576,959
Comorbidity with obesity	1997 Nova Scotia	n/a	n/a	n/a	n/a	n/a	\$ 136,883,853	\$ 159,697,828	\$ 296,581,681
Comorbidity with obesity	1997 Ontario	n/a	n/a	n/a	n/a	n/a	\$ 1,254,768,650	\$ 1,425,873,466	\$ 2,680,642,115
Comorbidity with obesity	1997 Saskatchewan	n/a	n/a	n/a	n/a	n/a	\$ 136,883,853	\$ 142,587,347	\$ 279,471,199
Coronary Heart Disease (CAD)	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 86,566,489	n/a	\$ 86,566,489
Coronary Heart Disease (CAD)	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 46,569,683	n/a	\$ 46,569,683
Endometrial cancer	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 1,746,828	n/a	\$ 1,746,828
Endometrial cancer	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 3,232,740	n/a	\$ 3,232,740
Gallbladder disease	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 34,353,284	n/a	\$ 34,353,284
Gallbladder disease	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 18,357,059	n/a	\$ 18,357,059
Hyperlipidemia	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 8,071,839	n/a	\$ 8,071,839
Hyperlipidemia	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 15,329,851	n/a	\$ 15,329,851
Hypertension	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 89,171,185	n/a	\$ 89,171,185
Hypertension	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 164,286,859	n/a	\$ 164,286,859
Obesity related chronic diseases	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 455,938,440	\$ 912,559,018	\$ 1,711,048,159
Postmenopausal breast cancer	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 2,487,148	n/a	\$ 2,487,148
Postmenopausal breast cancer	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 4,949,492	n/a	\$ 4,949,492
Pulmonary embolism	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 5,177,826	n/a	\$ 5,177,826
Pulmonary embolism	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 9,571,603	n/a	\$ 9,571,603
Stroke	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 14,492,382	n/a	\$ 14,492,382
Stroke	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 26,759,653	n/a	\$ 26,759,653
Type 2 diabetes	1997 BC	n/a	n/a	n/a	n/a	n/a	\$ 59,193,000	n/a	\$ 59,193,000
Type 2 diabetes	1997 Quebec	n/a	n/a	n/a	n/a	n/a	\$ 105,885,364	n/a	\$ 105,885,364
Chronic diseases (comorbidity with obesity)	1997 Canada	n/a	n/a	n/a	n/a	n/a	n/a	n/a	\$ 2,078,452,404
Chronic diseases (comorbidity with obesity)	1997 Canada	\$ 4,970,575,509	\$ 209,870,323	\$ 58,266,893	\$ 11,081,789,333	n/a	\$ 11,081,789,333	n/a	\$ 11,081,789,333

n/a: not available

†: as reported, may not sum total direct and indirect costs only

Table 10: Economic Burden of Chronic Disease due to alcohol, smoking and inadequate nutrition in Canada (2005 Dollars) - Direct and Indirect costs

Chronic disease	Years of the estimate	National/provincial	DIRECT COSTS						INDIRECT COSTS: Productivity losses					TOTAL HEALTH CARE COSTS†
			Hospitalizations		Physician costs		Prescription drugs	Research	Other direct costs	TOTAL DIRECT HC COST	Disability (short and long term)	Premature mortality	TOTAL INDIRECT HC COST	
			Special treatment											
All tobacco-attributable diseases	2001	New Brunswick	\$ 63,467,601	n/a	\$ 7,510,333	\$ 14,068,651	n/a	\$ 528,897	\$ 85,575,482	n/a	n/a	n/a	n/a	n/a
All tobacco-attributable diseases	2001	Newfoundland & Labrador	\$ 39,984,588	n/a	\$ 4,865,849	\$ 10,472,154	n/a	\$ 740,455	\$ 56,063,047	n/a	n/a	n/a	n/a	n/a
All tobacco-attributable diseases	1999	Nova Scotia	\$ 85,765,808	n/a	\$ 8,528,348	\$ 17,966,534	n/a	\$ 3,014,519	\$ 115,275,209	n/a	\$ 322,652,196	\$ 443,759,129	n/a	n/a
COPD	2001	Alberta	n/a	n/a	n/a	\$ 7,654,193	n/a	n/a	n/a	n/a	\$ 9,890,368	n/a	n/a	n/a
Diabetes	2001	Alberta	n/a	n/a	n/a	\$ 12,898,732	n/a	n/a	n/a	n/a	\$ 3,956,147	n/a	n/a	n/a
Heart disease	2001	Alberta	n/a	n/a	n/a	\$ 121,191,384	n/a	n/a	n/a	n/a	\$ 83,079,089	n/a	n/a	n/a
All alcohol-attributable diseases	2002	Canada	\$ 1,078,570,967	\$ 572,739,937	\$ 187,094,663	\$ 802,814,463	\$ 55,432,035	n/a	\$ 2,696,652,065	\$ 3,970,691,607	\$ 590,796,717	\$ 4,561,488,324	\$ 7,258,140,389	
All tobacco-attributable diseases	2001	Canada	\$ 2,039,743	n/a	\$ 395,191,594	\$ 532,387,391	n/a	\$ 143,965,674	\$ 3,113,403,152	n/a	n/a	n/a	\$ 3,113,403,152	
All tobacco-attributable diseases	2002	Canada	\$ 2,668,228,941	\$ 1,517,693	\$ 469,048,176	\$ 1,422,953,326	\$ 81,683,810	n/a	\$ 4,643,431,946	\$ 11,083,687,619	\$ 1,959,470,130	\$ 13,043,157,749	\$ 17,686,589,695	

n/a: not available

†: as reported, may not sum total direct and indirect costs only