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Economic Burden of Illness in Canada, 1998

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Economic Burden of Illness in Canada, 1998

Policy Research Division
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Acknowledgements

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Glossary of Abbreviations

ACCS	(Alberta) Ambulatory Care Classification Data Set
AHRIS	Automated Health Research Information System (CIHR)
AHS	Annual Hospital Survey (collected by CIHI)
AMI	Acute myocardial infarction
APP	Alternative payment plan
CDH	Canadian Drug Store and Hospital Purchases Audit (IMS Health)
CDTI	Canadian Disease and Therapeutic Index (IMS Health)
CereVD	Cerebrovascular disease
CIHI	Canadian Institute for Health Information
CIHR	Canadian Institutes of Health Research
CIMMS	Cancer Incidence, Morbidity and Mortality System (Health Canada)
COPD	Chronic obstructive pulmonary disease and allied conditions: includes chronic bronchitis, emphysema, and asthma
CPP	Canada Pension Plan
CS	Canadian CompuScript Audit (IMS Health)
CVD	Cardiovascular diseases (diseases of the circulatory system): includes IHD, stroke, congestive heart failure, aortic aneurysm and others Note: *Cerebro*vascular disease (CereVD), one of the cardiovascular diseases, is sometimes used interchangeably with "stroke" but technically is somewhat broader
DAD	Discharge Abstract Database (CIHI)
EBIC	Economic Burden of Illness in Canada (Health Canada)
FFS	Fee-for-service
ICD	International Classification of Diseases (World Health Organization)
IHD	Ischemic heart disease: includes angina pectoris, acute myocardial infarction ("heart attack"), chronic ischemic heart disease and sudden death
IMS	IMS Health
LCDC	Laboratory Centre for Disease Control (Health Canada)
LPGR	Labour productivity growth rate
MVTA	Motor vehicle traffic accidents
NHEX	National Health Expenditures Database (CIHI)
NIH	National Institutes of Health (US Department of Health and Human Services)
NPHS	National Population Health Survey (Statistics Canada)
OTC	Over-the-counter
QHSS	Quebec Health and Social Survey
QPP	Quebec Pension Plan
RCF	Residential Care Facilities
RIW™	Resource Intensity Weights™ (CIHI)
WHO	World Health Organization

Introduction

Health Canada first published the *Economic Burden of Illness in Canada* (EBIC) in 1991 and again in 1997. The overwhelming response to these original reports and continued requests for more detailed cost-of-illness information indicated the need for an up-to-date revision that would provide even more detail than the first two reports.

The primary goal of this report is to supply objective and comparable information on the magnitude of the economic burden or cost of illness and injury in Canada based on standard reporting units and methods. These estimates, along with other health indicators, provide an important piece of the evidence required for health policy and planning.

The Economic Burden of Illness in Canada, 1998 (EBIC 1998) and a complementary web-based application (EBIC On-line) offer a comprehensive overview of how the principal direct and indirect costs of illness were distributed in Canada. The methods used in this report allow us to determine the "opportunity cost"[1] to society of illness or injury by translating illness, injury, and premature death into direct and indirect costs.[1-3] In others words, these estimates are an approximation of what society could gain if the illnesses and injuries associated with these costs were estimated.

Direct costs are defined as the value of goods and services for which payment was made and resources used in treatment, care, and rehabilitation related to illness or injury.[1,4-6] The five direct cost components in this report are organized and measured in terms of hospital care expenditures; drug expenditures; physician care expenditures; expenditures for care in other institutions; and additional direct health expenditures (including other professionals, capital, public health, prepayment administration, health research, etc.). Other direct costs borne by patients or other payers (such as costs for transportation to health providers, special diets and clothing) are not included.

Indirect costs are defined as the value of economic output lost because of illness, injury-related work disability, or premature death.[1,3,4,6] The three indirect cost components in this report are measured in terms of the value 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). Other indirect costs, including the value of time lost from work and leisure activities by family members or friends who care for the patient, are not included in this report.

With the exception of mortality costs, a prevalence-based approach[1] was used to estimate all direct and indirect costs that accrued to existing (or prevalent) cases of illness, injury, or disability in 1998.[1,4,5,7,8] This approach makes the best use of the survey and administrative data that are available for calculating core direct and indirect costs and, in turn, for distributing these costs across primary diagnostic categories. A limitation of this approach is that the data do not always allow for an assessment of the impact of co-morbid conditions.

For mortality costs, an incidence-based human capital approach most commonly used in cost-of-illness studies was used.[4,9] Mortality cost estimates are based on the discounted value of current and future costs of premature deaths occurring in 1998, rather than a prevalence-based approach in which estimates would be based on the 1998 dollar value of premature deaths that occurred prior to 1998. While it would have been preferable to use a prevalence-based approach for all cost components, this approach is used here for several reasons: the availability of reliable statistics, the relative simplicity of calculations compared with other methods, and consistency across studies using the same approach.[5,10,11] The limitations of this approach, which include the possibility of over-estimating mortality costs and under-valuing

1 For the purpose of this report, opportunity cost is the value of opportunities forgone because of an intervention, action, or health outcome (i.e. the direct and indirect costs of illness and injury).

Introduction

psychosocial consequences,[1,5,12] are discussed further in the mortality cost chapter and EBIC 1993.[13]

As noted above, direct and indirect costs are allocated to principal diagnostic categories, by sex and age group. Diagnostic categories included in this report are birth defects; blood diseases; cancer; cardiovascular diseases; digestive diseases; endocrine and related diseases; genitourinary diseases; ill-defined conditions; infectious and parasitic diseases; injuries; mental disorders; musculoskeletal diseases; nervous system and sense organ diseases; perinatal conditions; pregnancy; respiratory diseases; skin and related diseases; and well-patient care (Appendix 1). Also included are distributions of these costs by sex and the following four age groups: children (0-14 years), individuals aged 15-34 years, individuals aged 35-64 years, and seniors (65 years and over).

The *Economic Burden of Illness in Canada, 1998* generally has the same layout as previous EBIC reports. It begins with a summary of results, which includes a presentation of total, direct, and indirect costs by cost component, diagnostic category, sex, age group, and province/territory. This is followed by detailed chapters on the eight direct and indirect cost components. Chapters for each cost component provide a description of the methods used and explain how data, assumptions, and methodological limitations affect the interpretation of results.[2] Each chapter includes results on the total cost of illness by cost component, and most (with the exception of Expenditures for Care in Other Institutions and most of Additional Direct Health Expenditures) present total costs by diagnostic category, sex, age group, and province/territory (including a portion of health research expenditures). Several chapters (hospitals, drug expenditures, mortality, long- and short-term morbidity) also present total costs by diagnostic subcategory, sex, and age group.

Following the cost component chapters, a discussion section presents the document's strengths and challenges, an analysis of the economic burden over time and across provinces/territories, and opportunities for future work in this area. Finally, an inclusive reference list and appendices providing additional methodological details and figures can be found at the end of this document.

Building on the experience gained from the two previous versions (EBIC 1993 and EBIC 1986),[9,13] specific innovations in EBIC 1998 include the following: the addition of many diagnostic subcategories; additional information by age, sex, and province/territory/region; inclusion of costs by diagnostic category for outpatient care in hospitals; better provincial/territorial data on physician care expenditures; better understanding of alternative payment plans for physicians; and more refined data and methods for the calculation of mortality and short- and long-term disability costs (for example: more recent and detailed cost data; estimates of lost production, which account for the proportion of unpaid labour attributable to those who are in the labour force as well as those who are not in the labour force; and disability weights calculated and assigned by diagnostic category rather than by age).

As with previous versions of this report, however, complete systematic national information on the cost of illness is not always readily available. For diagnostic subcategories in particular, differences in coding practices do not allow for standardized and comprehensive reporting. In this document, data are reported as received and concerns noted as caveats. Where data are unavailable and imputation is reasonable, this method is used and duly noted. Also, it is important to recognize that even though more detailed cost data were used for the calculation of indirect costs, these estimates are based on a certain number of assumptions that affect the resulting estimates. In order to capture the effects of these assumptions, some sensitivity analyses were used to illustrate the possible range of indirect cost estimates.

A secondary goal of the report is to identify the gaps in existing information. The challenges associated with disaggregating and synthesizing data from many data sources and 12 provincial/territorial jurisdictions highlight the need to collaboratively

2 Additional methodological information regarding conventions, definitions, and data sources as well as differences between this version of EBIC and EBIC 1993 are included in Appendix 2.

identify data gaps and inconsistencies, and to improve data collection and analysis in Canada.

Estimates of the cost of illness in Canada should be considered in the context of the limitations described earlier and within the specific cost component and discussion chapters. We do compare EBIC 1998 and the two previous versions (1986 and 1993) in terms of direct, indirect, and total costs (see Discussion section). In general, we must interpret these comparisons with caution, as the differences may reflect improved data sources and refinements to methods rather than actual changes in the distribution and costs of illness.

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Summary of Results

The total cost[3] of illness in Canada in 1998 is estimated to be $159.4 billion: $83.9 billion (52.7%) in direct costs and $75.5 billion (47.3%) in indirect costs.

Burden of illness by cost component

The relative magnitude of the major cost components is given in Table 1. Hospital care expenditures represent by far the largest direct cost, at $27.6 billion (17.3%) of total costs. This is followed by drug expenditures ($12.4 billion, 7.8%), physician care expenditures ($11.7 billion, 7.3%), expenditures for care in other institutions ($8.0 billion, 5.0%), and additional direct health expenditures ($24.2 billion, 15.2%).

Table 1
Economic Burden of Illness by Cost Component in Canada, 1998

Cost Component	1998 cost ($ 1,000,000)	% of Total
Direct Costs		
Hospital Care Expenditures	27,638.4	17.3
Drug Expenditures	12,385.2	7.8
Physician Care Expenditures	11,686.9	7.3
Expenditures for Care in Other Institutions	8,045.1	5.0
Additional Direct Health Expenditures	24,199.3	15.2
Subtotal	**83,954.9**	**52.7**
Indirect Costs		
Mortality Costs	33,481.5	21.0
Morbidity Costs Due to Long-term Disability	32,178.7	20.2
Morbidity Costs Due to Short-term Disability	9,819.4	6.2
Subtotal	**75,479.6**	**47.3**
Total Cost of Illness	**159,434.5**	**100.0**

Source (Direct Costs): Canadian Institute for Health Information, National Health Expenditures Database, 1997-1998.
Note: Due to rounding some discrepancies may occur.

In terms of the principal indirect cost components that were estimated for 1998, the value of lost production due to premature mortality represents the largest indirect cost, estimated at $33.5 billion (21.0% of total costs). This is followed by the value of production lost due to long-term disability, estimated at $32.2 billion (20.2% of total costs), and the value of production lost due to short-term disability, estimated at $9.8 billion (6.2% of the total).

Burden of illness by diagnostic category and cost component

Seventy-four percent of the total cost of illness ($117 of $159.4 billion) by diagnostic category was distributed: $42.5 billion in direct costs, and $74.7 billion in indirect costs[4]. Table 2 provides a detailed breakdown of costs by diagnostic category and cost component.

Cardiovascular diseases, the most costly diagnostic category, accounts for 11.6% ($18.5 billion) of the total cost of illness classifiable by diagnostic category ($6.8 billion in direct costs and $11.7 billion in indirect costs). Musculoskeletal diseases and cancer ranked second and third with total costs of $16.4 billion and $14.2 billion respectively. Direct costs were smaller ($2.6 billion, $2.5 billion) than indirect costs ($13.7 billion, $11.8 billion) for these two categories. Injuries ranked fourth with a total cost of $12.7 billion ($3.2 billion in direct costs and $9.5 billion in indirect costs). Together, these four categories account for more than 50% of the cost of illness that could be classified by diagnostic category.

3 The diagnostic categories, as well as conventions and definitions used in this report, can be found in Appendices 1 and 2.
4 The $42.2 billion that could not be allocated by diagnostic category falls under the categories of "others" and "unattributable", and is explained in Table 2.

Diagnostic categories with the largest direct costs

The relative magnitude of each cost component varies substantially by type of illness. The six diagnostic categories with the largest direct costs, as shown in Table 2, are cardiovascular diseases, mental disorders, digestive diseases, respiratory diseases, injuries, and nervous system and sense organ diseases. These categories represent over half of the direct costs classified by diagnostic category.

Hospital care expenditures account for more than half the total direct cost of cardiovascular diseases, mental disorders, digestive diseases, and injuries. Drug expenditures account for more than 30% of the direct costs of respiratory diseases, as compared with about 7% for injuries. Physician care expenditures make up more than a quarter of the direct costs of nervous system diseases.

Diagnostic categories with the largest indirect costs

Indirect costs are largest for musculoskeletal diseases, cancer, cardiovascular diseases, and injuries. These four diagnostic categories represent over 60% of the total indirect cost of illness in 1998. As shown in Table 2, about 90% of the indirect costs of cancer are mortality costs (i.e. the present value of lost production due to premature death in 1998). Mortality costs also represent a considerable share of the indirect costs of cardiovascular diseases (70.8%) and injuries (62.3%). By contrast, 91.7% and 75.9% of the indirect cost of musculoskeletal diseases and nervous system diseases are the result of morbidity due to long-term disability. Short-term disability has a substantial influence on the indirect costs of respiratory diseases (48.1%).

Diagnostic categories with the largest total costs

The six diagnostic categories with the largest total costs are cardiovascular diseases, musculoskeletal diseases, cancer, injuries, respiratory diseases, and nervous system and sense organ diseases (Table 2). These diagnostic categories represent over two-thirds of the total cost of illness classified by diagnostic category.

The relative proportion of direct costs varies significantly among diagnostic categories. Direct costs account for over 35% of the total cost of cardiovascular diseases, the most costly diagnostic category, but just over 15% of musculoskeletal diseases and cancer, the second and third most costly categories. Direct costs account for more than a third of the total cost of respiratory diseases (40.6%) and nervous system diseases (34.0%), which rank fifth and sixth in terms of total costs. Thus, the potential reduction in treatment costs from a reduction in illness or injury would be more significant for certain diagnostic categories.

For the six diagnostic categories with the largest total costs, however, indirect costs are greater than direct costs, demonstrating the importance of indirect costs of illness for society and individuals.

Categories in which direct costs outweigh indirect costs include skin and related disorders, complications of pregnancy, and genitourinary diseases. Together, however, these categories represent less than 5% of total costs (Table 2).

Table 2
Summary – Economic Burden of Illness in Canada by Diagnostic Category, 1998

	DIRECT COSTS										TOTAL COST		
	Hospitals		Drugs		Physician Care		Other Institutions		Additional Direct		Total Direct Cost		
Diagnostic Category	Cost ($1000000)	% of total	Cost ($1000000)	% of total	Cost ($1000000)	% of total	Cost ($1000000)	% of total	Cost ($1000000)	% of total	Cost ($1000000)	% of total	Rank
Birth Defects	130.5	0.5	10.4	0.1	31.4	0.3	0	0.0	3.5	0.0	175.8	0.2	19
Blood Diseases	110.9	0.4	48.4	0.4	48.2	0.4	0	0.0	5.9	0.0	213.4	0.3	20
Cancer	1,838.7	6.7	210.2	1.7	333.1	2.9	0	0.0	80.4	0.3	2,462.4	2.9	12
Cardiovascular Diseases	4,161.8	15.1	1,772.8	14.3	822.3	7.0	0	0.0	61.2	0.3	6,818.1	8.1	2
Digestive Diseases	2,366.3	8.6	752.2	6.1	410.0	3.5	0	0.0	11.5	0.0	3,540.0	4.2	4
Endocrine and Related Diseases	477.0	1.7	818.2	6.6	255.6	2.2	0	0.0	33.8	0.2	1,584.6	1.9	14
Genitourinary Diseases	1,765.8	6.4	322.5	2.6	499.9	4.3	0	0.0	9.1	0.0	2,597.3	3.1	10
Ill-defined Conditions	674.9	2.4	482.3	3.9	600.0	5.1	0	0.0	3.1	0.0	1,760.3	2.1	13
Infectious and Parasitic Diseases	284.8	1.0	417.3	3.4	184.6	1.6	0	0.0	22.3	0.1	909.0	1.1	17
Injuries (1)	2,477.4	9.0	234.1	1.9	506.0	4.3	0	0.0	7.3	0.0	3,224.8	3.8	6
Mental Disorders	2,682.7	9.7	1,092.9	8.8	884.6	7.6	0	0.0	20.6	0.1	4,680.8	5.6	3
Musculoskeletal Diseases	1,441.6	5.2	614.3	5.0	578.2	4.9	0	0.0	14.3	0.1	2,648.4	3.2	9
Nervous System/Sense Organ Diseases	1,425.6	5.2	536.4	4.3	824.8	7.1	0	0.0	35.7	0.2	2,822.5	3.4	8
Perinatal Conditions	262.6	1.0	4.8	0.0	33.2	0.3	0	0.0	5.2	0.0	305.8	0.4	18
Pregnancy	1,079.3	3.9	23.1	0.2	191.2	1.6	0	0.0	3.5	0.0	1,297.1	1.5	16
Respiratory Diseases	1,560.6	5.6	1,109.7	8.9	776.7	6.6	0	0.0	14.4	0.1	3,461.4	4.1	5
Skin and Related Diseases	723.5	2.6	469.4	3.8	280.9	2.4	0	0.0	0.5	0.0	1,474.3	1.8	15
Well-patient Care (2)	1,662.9	6.0	399.3	3.2	558.0	4.8	0	0.0	3.1	0.0	2,623.3	3.1	11
Others (3)	1,158.1	4.1	0	0	1,973.5	16.9	0	0.0	89.9	0.4	3,221.5	3.8	7
Unattributable (4)	1,353.4	4.9	3,066.9	24.8	1,894.7	16.2	8,045.1	100.0	23,774.0	98.2	38,134.1	45.4	1
TOTAL	27,638.4	100.0	12,385.2	100.0	11,686.9	100.0	8,045.1	100.0	24,199.3	100.0	83,954.9	100.0	

Table 2
Summary – Economic Burden of Illness in Canada by Diagnostic Category, 1998 *(continued)*

	INDIRECT COSTS									TOTAL COST		
	Mortality		Long-term disability		Short-term disability		Total Indirect Cost			Total Direct Cost		
Diagnostic Category	Cost ($1000000)	% of total	Cost ($1000000)	% of total	Cost ($1000000)	% of total	Cost ($1000000)	% of total	Rank	Cost ($1000000)	% of total	Rank
Birth Defects	357.8	1.1	172.4	0.5	0	0.0	530.2	0.7	15	706.0	0.4	18
Blood Diseases	93.1	0.3	103.2	0.3	48.8	0.5	245.1	0.3	18	458.5	0.3	20
Cancer	10,622.1	31.7	962.3	3.0	173.6	1.8	11,758.0	15.6	2	14,220.4	8.9	4
Cardiovascular Diseases	8,250.0	24.6	3,151.5	9.8	253.3	2.6	11,654.8	15.4	3	18,472.9	11.6	2
Digestive Diseases	1,134.3	3.4	487.5	1.5	692.4	7.0	2,314.2	3.1	10	5,854.2	3.7	9
Endocrine and Related Diseases	1,012.3	3.0	815.7	2.5	51.7	0.5	1,879.7	2.5	11	3,464.3	2.2	13
Genitourinary Diseases	319.7	0.9	166.3	0.5	430.5	4.4	916.5	1.2	13	3,513.8	2.2	14
Ill-defined Conditions	1,595.7	4.8	1,485.2	4.6	836.1	8.5	3,917.0	5.2	7	5,677.3	3.6	10
Infectious and Parasitic Diseases	755.2	2.3	268.8	0.8	188.3	1.9	1,212.3	1.6	12	2,121.3	1.3	15
Injuries (1)	5,925.6	17.7	1,833.7	5.7	1,753.0	17.9	9,512.3	12.6	4	12,737.1	8.0	5
Mental Disorders	479.9	1.4	2,246.8	7.0	463.9	4.7	3,190.7	4.2	8	7,871.5	4.9	8
Musculoskeletal Diseases	125.7	0.4	12,597.0	39.2	1,010.2	10.3	13,732.8	18.2	1	16,381.2	10.3	3
Nervous System/Sense Organ Diseases	833.9	2.5	4,155.3	12.9	489.0	5.0	5,478.2	7.3	5	8,300.7	5.2	7
Perinatal Conditions	298.4	0.9	0	0.0	0	0.0	298.4	0.4	17	604.2	0.4	19
Pregnancy	12.3	0.0	0	0.0	378.5	3.9	390.8	0.5	16	1,687.9	1.1	16
Respiratory Diseases	1,646.8	4.9	985.1	3.1	2,437.8	24.8	5,069.7	6.7	6	8,531.1	5.4	6
Skin and Related Diseases	18.7	0.1	122.2	0.4	47.4	0.5	188.3	0.3	19	1,662.6	1.0	17
Well-patient Care (2)	0	0.0	1,821.9	5.7	553.0	5.6	2,374.9	3.1	9	4,998.2	3.1	12
Others (3)	0	0.0	683.8	2.1	0	0.0	683.8	0.9	14	3,905.3	2.4	11
Unattributable (4)	0	0.0	120.0	0.4	11.9	0.1	131.9	0.2	20	38,266.0	24.0	1
TOTAL	33,481.5	100.0	32,178.7	100.0	9,819.4	100.0	75,479.6	100.0		159,434.5	100.0	

(1) Includes an estimated $41.7 million of psychiatric hospital expenditures not coded to Mental Disorders (see Limitations in Hospital Care Expenditures).

(2) Hospitals includes haematology and exam/other from Ambulatory Care Classification Data Set (ACCS) (see Limitations in Hospital Care Expenditures). Long-term disability includes observations where the period of disability could not be attributed to a specific illness or injury. For example, a period of disability related to health service use (being visited at home in relation to recovery), or a period of disability related to a factor that influences general health status (alcohol/drug abuse).

(3) Includes data for which diagnostic coding was not provided, or data that are grouped due to small counts. Specifically, $1.2 billion in hospital care expenditures (ACCS clinical groups like "admitted patient", "transferred patient", "rehabilitation", "telephone contact", "ungroupable", "deceased", or "missing code"); $2.0 billion in provincial/territorial fee-for-service (FFS) physician care expenditures; $89.9 million in health research expenditures (CIHR data that is grouped due to small counts, e.g. basic research, health services, health care delivery, and population health research); and $683.8 million in long-term disability costs (includes small counts associated with complications of pregnancy and perinatal conditions).

(4) Includes data that could not be allocated by ICD-9 code. Specifically, this includes: $1.4 billion in hospital care expenditures (includes health science research undertaken through Acute Care Hospitals Inpatient $3.1 billion in drug expenditures (over-the-counter drugs and personal health supplies purchased in retail drug stores); $1.9 billion in physician care expenditures (this represents the difference between total NHEX expenditures, $11.7 billion, and provincial/territorial FFS expenditures, $9.8 billion, which is assumed to be Alternative Payment Plans APP expenditures); $8.0 billion in expenditures for care in other institutions (e.g. Aged Residential Care, Alcohol/Drug Addiction Residential Care); $23.8 billion in additional direct health expenditures (e.g. $6.4 billion for Dental Services, $2.3 billion for Vision Care, $1.5 billion for Home Care and $33.2 million for CIHR Health Research); $120 million in long-term disability costs (observations for which disability was not indicated, specifically institutionalized population); and $11.9 million in short-term disability costs (observations for which type of disability was not specified).
Note: Due to rounding some discrepancies may occur.

Summary of Results

Burden of illness by sex and cost component[5]

Seventy-five percent of the total cost of illness ($120 billion of $159.4 billion) was distributed by sex and cost component. Figure 1 illustrates the distribution of direct and indirect costs by sex and cost component. Costs for males and females are fairly evenly distributed ($62.9 billion, $57.5 billion).

By contrast, the distribution by sex varies considerably by cost component. According to the information provided in Figure 1, females account for slightly less than half the direct costs categorized by sex.

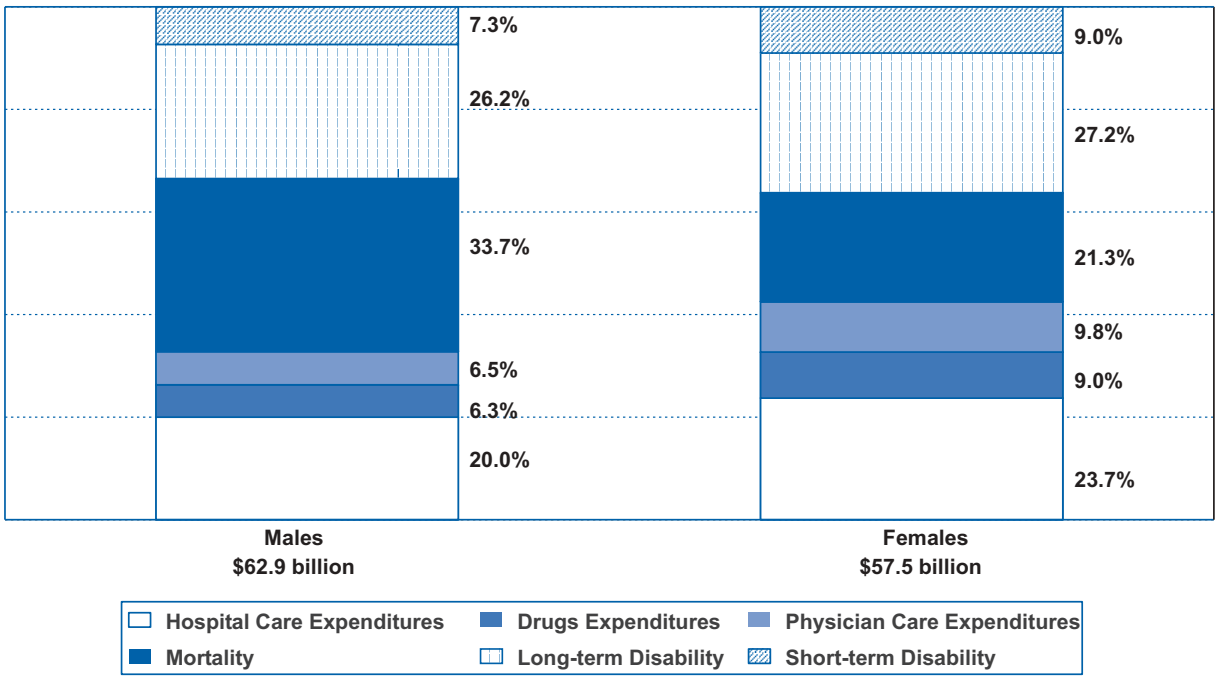
Mortality costs for males are almost twice as large as for females – $21.1 billion as compared with $12.3 billion.

For both long- and short-term disability, higher rates of disability among females are largely offset by lower labour force participation rates, earnings, and the value of unpaid work for women. As a result, long- and short-term disability costs are fairly evenly distributed between men and women.[6] Long-term disability costs are $16.4 billion for males and $15.6 billion for females, and short-term disability costs are $4.6 billion for males and $5.2 billion for females.

Burden of illness by age group and cost component

Seventy-seven percent of the total cost of illness ($123 of $159.4 billion) was distributed by age group and cost component. Those under the age of 65 years account for approximately 71% of the burden of illness classified by age group. Within this group, the 35-64 age group, which represented 39.2% of the population in 1998, accounts for about half ($59.1 billion) of this burden. Seniors (individuals 65 years of age or over), who represented 12.7% of the population in 1998, account for about 30% ($36.3 billion) of the burden classified by age group.

Figure 1: Burden of Illness by Sex and Cost Component in Canada, 1998



Note: Expenditures for care in other institutions and additional direct/research expenditures are not included as they are not available by age and sex. Due to rounding some discrepancies may occur.

5 Results could be influenced by the age and/or sex structure of the population.

6 For further information, refer to Methods sections in "Morbidity Costs Due to Long-term Disability" and "Morbidity Costs Due to Short-term Disability".

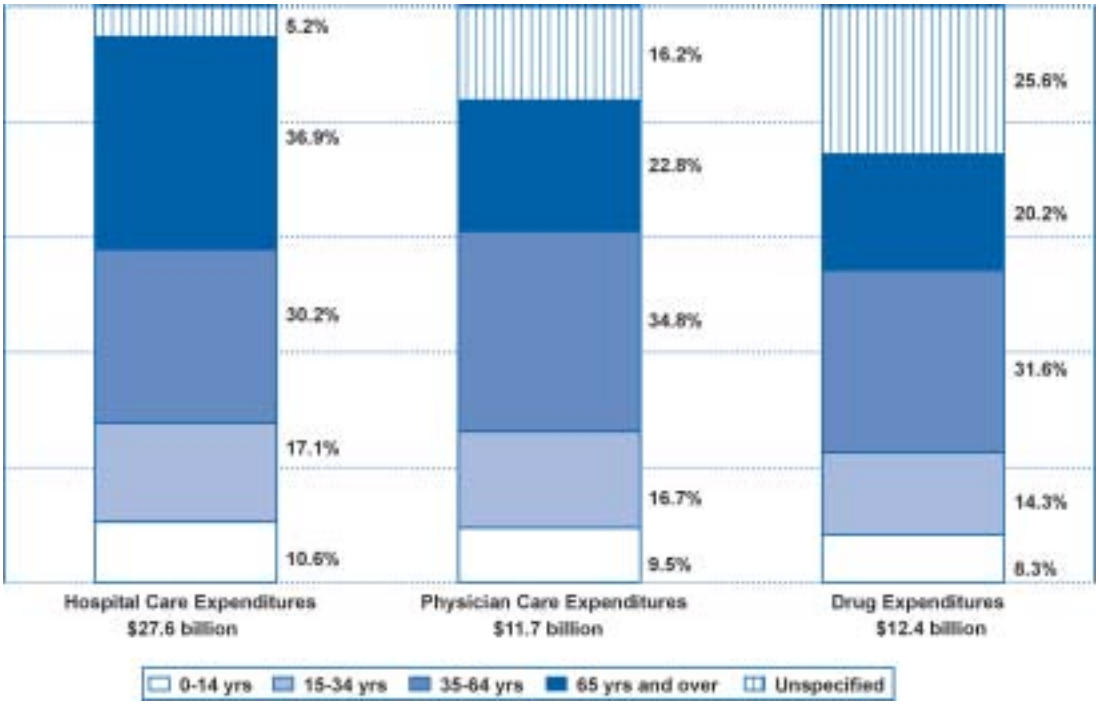
Direct costs by age group are illustrated in Figure 2. Hospital care expenditures are highest for the population aged 65 years and over ($10.2 billion; 36.9%). Drug and physician care expenditures are largest for the population aged 35-64. This group accounts for about 35% of physician care expenditures and 32% of drug expenditures. Seniors account for just over 20% of these direct costs. Children (ages 0-14) are the least costly to the health care system, accounting for approximately 10% ($2.9 billion for hospital care, $1 billion for drugs, $1.1 billion for physician care) of direct costs that were allocated by age group.

Indirect costs by age group are illustrated in Figure 3. The population aged 35-64 accounts for half ($16.9 billion) of the cost of premature mortality. Seniors account for approximately a third ($11 billion) of mortality costs.

The 35-64 age group has the largest long-term disability costs (62.5%, $20.1 billion), followed by the group aged 15-34 (with approximately 18% or $5.8 billion). Similarly, these age groups have the largest short-term disability costs: approximately 59% ($5.7 billion) and 35% ($3.4 billion) respectively. Seniors represent approximately 16% ($5.2 billion) of long-term disability costs, likely because of the large number of elderly people with chronic conditions. Seniors account for approximately 7% ($666 million) of short-term disability costs, possibly because many report long-term disability costs and are therefore excluded from the short-term disability cost calculations in order to avoid double counting.

Although short-term and long-term disability prevalence estimates are available for children in the National Population Health Survey, losses of production could not be attributed to this age group because of the lack of labour and value of production estimates.

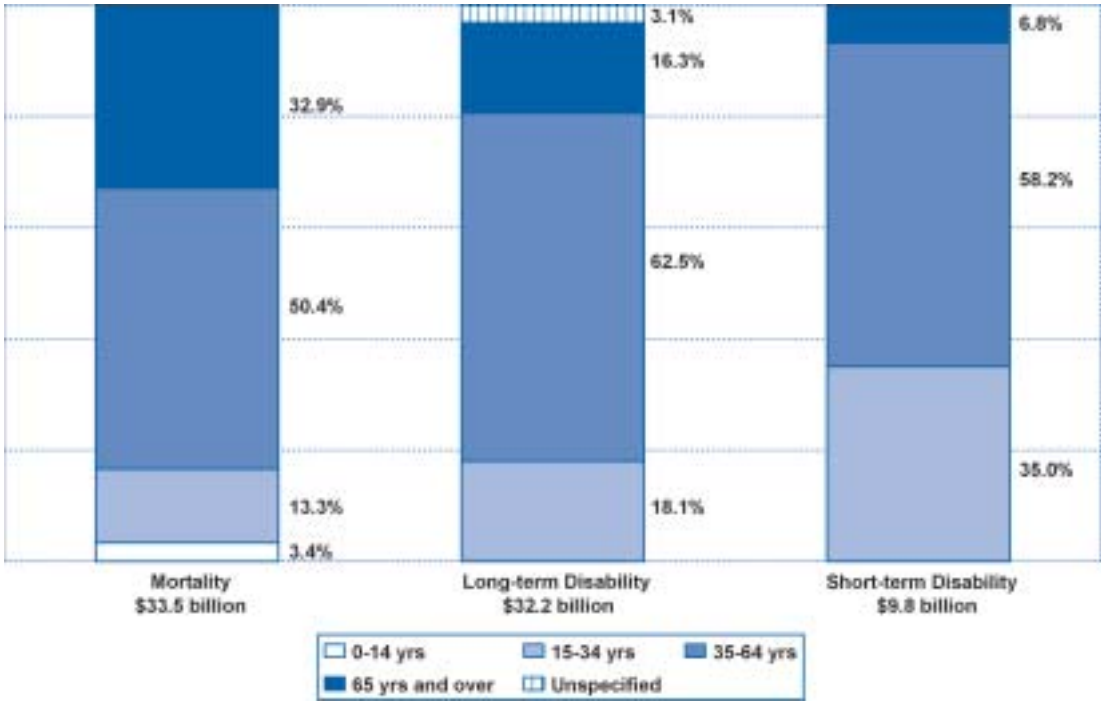
Figure 2: Direct Cost Components by Age Group in Canada, 1998



Note: Expenditures for care in other institutions and additional direct/research expenditures are not included as they are not available by age and sex. Due to rounding some discrepancies may occur.

Summary of Results

Figure 3: Indirect Cost Components by Age Group in Canada, 1998



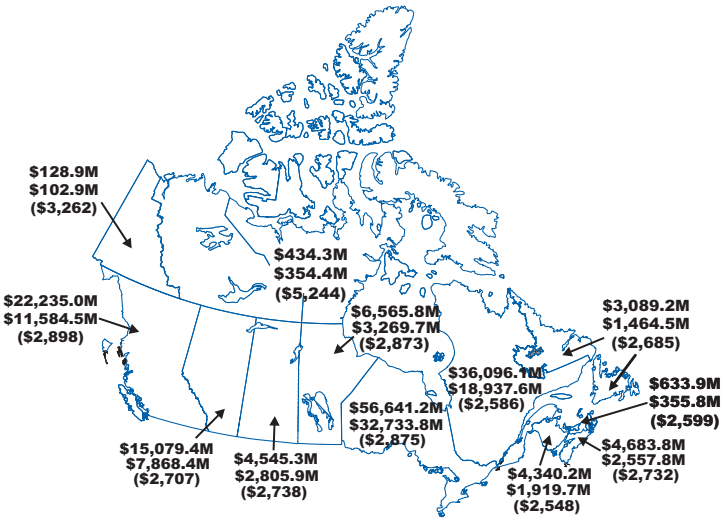
Note: Due to rounding some discrepanices may occur.

Burden of illness by province/territory[7]

Map 1 illustrates the distribution of the economic burden of illness by province/territory. Ontario ($56.6 billion), Quebec ($36.1 billion), and British Columbia ($22.2 billion) account for approximately 70% of the economic burden of illness in Canada in 1998. The per capita direct costs, however, are fairly similar for all provinces/territories, ranging from approximately $2,500 in New Brunswick to $3,200 in the Yukon. The only exception is the Northwest Territories, with a per capita direct cost of $5,244.

With the exception of the Northwest Territories and Yukon, where direct costs represent a larger portion of total costs than indirect costs, the cost of illness is fairly evenly split between direct and indirect costs.

Map 1 – Economic Burden of Illness by Province/Territory in Canada, 1998



Key: *Total Economic Burden of Illness (M denotes $1,000,000)*
Total Direct Cost (M denotes $1,000,000)
(Direct Cost per Capita)

7 The results in this report are based on data from 1998, at which time the territory of Nunavut had not been created; therefore Northwest Territories as used here includes both jurisdictions.

Direct Costs

Hospital Care Expenditures

Methods

The 1998 total for national hospital care expenditures comes from the Canadian Institute for Health Information's (CIHI) *National Health Expenditure Trends* (NHEX) 1975-2000[1] (Appendix 2 for additional information regarding what is included in this total).

In order to distribute total 1998 hospital care expenditures by diagnostic category, CIHI's *Annual Hospital Survey* (AHS) 1997/98[2] was first used to distribute these expenditures across four broad hospital service categories (i.e. acute inpatient, acute emergency room/other outpatient, chronic/rehabilitation, and psychiatric hospitals). The AHS data include hospital statistics from public, federal, and proprietary hospitals operating in Canada. Almost 90% of hospital beds are represented in the AHS data, which provide financial information (e.g. average cost per bed and the number of operating beds) from reporting public hospitals only.[8]

Total hospital expenditures by hospital type were estimated by multiplying the public hospital's average cost per bed for each type of hospital by the total number of operating beds within that hospital type. For provinces/territories not reporting the number of beds or costs, costs were imputed (for all types except emergency room/outpatient) based on the average cost per bed of a province/territory with a similar number of total beds of the same type.

Several administrative databases were then used to allocate total hospital care expenditure estimates for each type of hospital by diagnostic category, sex, age group, and province/territory:

- CIHI's 1997/98 sum of total weighted cases (using RIW™ methods[9])[3,4] was used to allocate the 1998 inpatient acute care hospital expenditure estimates by diagnostic category, subcategory, sex, age group, and province/territory. The sum of total weighted cases represents both typical and atypical acute inpatient cases, and takes into account both the total cost of acute care (fixed and variable) and the total costs of services used for acute care.
- Total clinical group costs from the 1997/98 Ambulatory Care Classification Data Set (ACCS)[5] of Alberta Health and Wellness were used to allocate the 1998 emergency room/other outpatient acute care hospital expenditure estimates by diagnostic category, sex, and age group.
- For outpatient/emergency costs in psychiatric and chronic/rehabilitation hospitals the distribution of inpatient hospitalizations was applied to allocate these costs by diagnostic category, subcategory, age, sex, and province/territory.
- The distribution of length of stay from CIHI's 1997/98 Hospital Morbidity Database[3] (1-year pattern of acute hospital separations for patients who stay 100 or more days during 1997/98) was used to allocate the 1998 chronic/rehabilitation hospital expenditure estimates by diagnostic category and subcategory, sex, age group, and province/territory.
- CIHI's 1997/98 Hospital Mental Health Database[6] length of stay distribution (1-year pattern of days spent in psychiatric hospitals for patients discharged during 1997/98) was used to allocate the 1998 psychiatric hospital expenditure estimates by diagnostic category,

8 Hospital expenditures from CIHI`s AHS include the costs, on an accrual basis, of operating and maintaining the reporting public hospital during the year. This includes gross salaries and wages covering some medical staff remuneration, employee benefits, supplies, and other expenses.

9 CIHI's relative resource allocation method for estimating a hospital's inpatient specific costs for both acute and day procedure care.

subcategory, sex, age group and province/territory.

- Regional RIW™ methodology (sum of total weighted cases[10]) was applied to provincial/territorial estimates derived from AHS 1997/98 and NHEX.[1,2]

These databases classify Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick as the Atlantic region and British Columbia, Yukon, and Northwest Territories as the BC/Territories region. Diagnostic and regional distributions from these databases[3-6] were used to allocate provincial/territorial hospital estimates (from AHS and NHEX) for each hospital service category by diagnostic category and province/territory. A provincial/territorial distribution was not possible for emergency room/other outpatient acute care hospital expenditures, which are based on Alberta's data.

Assumptions

1997/98 AHS

- Non-reported beds have the same usage patterns as reported beds.
- Per bed costs in reporting public hospitals reflect those in hospitals that did not provide complete financial information.
- Per bed costs in reporting public hospitals reflect those of proprietary and federal hospitals.
- The ratio of reported beds to the total number of beds, which represents mainly inpatient beds, can be used to estimate average per bed costs in emergency room and other outpatient care settings.

Acute care hospitals (inpatient)

- The characteristics of acute care hospitals identified through the AHS are the same as those used in calculating the sum of total weighted cases; the majority of operating costs for "general with long-term units" and "teaching" hospitals are assumed to be for treatment of acute disease. Diagnostic category, age group, and sex distributions for long-term care in these hospitals are similar to those in acute care.

Acute care hospitals (emergency room/other outpatient)

- At the time this work was undertaken, the Alberta ACCS was the only data source available for determining the distribution of the cost of illness and injury treated in ambulatory care; this distribution was assumed to represent the distribution of ambulatory care in the rest of Canada.
- The ACCS definition of ambulatory care services (emergency room, day surgery, clinics, and telephone contacts) corresponds to the AHS definition of emergency room/other outpatient hospital expenditures.
- Diagnostic groupings within ACCS correspond to diagnostic categories as described in Appendix 1.

Chronic/rehabilitation hospitals

- Expenditures for hospitals of this type do not include long-term care units in other hospital care settings.
- The CIHI Hospital Morbidity Database reports hospitalizations in general, allied and specialty hospitals. The 1-year pattern of acute care hospital separations during 1997/98 for stays of 100 or more days reflects the distribution of patients hospitalized in chronic/rehabilitation hospitals.[11] The pattern of hospital separations reflects the distribution of costs.
- The average cost per day in chronic and rehabilitation hospitals is similar for all diagnostic categories and for emergency/outpatient care included within this hospital expenditure.

10 CIHI's relative resource allocation method for estimating a hospital's inpatient specific costs for both acute and day procedure care.
11 One hundred days is the criterion for insurance co-payment in some provinces and reflects the average length of stay in extended care hospitals.

- The pattern of hospitalization in public hospitals (on which hospital morbidity data are based) reflects that of proprietary and federal hospitals.[12]

Psychiatric hospitals

- The 1997/98 1-year pattern of days spent in psychiatric hospitals for patients discharged during 1997/98 reflects the distribution of patients in psychiatric hospitals. Approximately 20% of psychiatric beds were in specialty psychiatric short-term hospitals. The Hospital Mental Health Database 1-year pattern of days reflects the distribution of patients in these hospitals.
- The pattern of hospital separations reflects the distribution of costs.
- The average cost per bed in psychiatric hospitals is similar for all diagnostic categories.

Limitations

General

- Hospital care expenditures are distributed across principal or main diagnostic categories only. Secondary or other diagnostic categories that may have contributed to hospital use are not included.

1997/98 AHS

- The AHS routinely reports hospital statistics from all public, proprietary, and federal hospitals operating in Canada. CIHI's 1997/98 AHS includes financial information from reporting public hospitals only. Proprietary and federal hospitals, which represent 1.2% of approved hospital beds, report various hospital statistics but are not required to report financial information. There was also under-reporting of financial information by public hospitals; 89.6% of approved beds in public hospitals were reported.
- No chronic/rehabilitation hospitals were reported for Newfoundland, Nova Scotia, Prince Edward Island, Yukon, or Northwest Territories. No psychiatric hospitals were reported for Prince Edward Island, Yukon, or Northwest Territories.
- No approved beds or financial information were reported in Saskatchewan for psychiatric or chronic/rehabilitation hospitals or in British Columbia for psychiatric hospitals.
- Quebec did not provide financial information on hospital-based physicians.

Acute care hospitals (inpatient)

- The sum of total weighted cases is derived from the CIHI 1997/98 Discharge Abstract Database (about 80% coverage overall – 100% for all provinces/territories except Manitoba and Quebec) and the Hospital Morbidity Database (for Manitoba and Quebec only).
- Hospital service categories do not always include a homogeneous pattern of care (e.g. non-teaching hospitals with long-term care units provide both acute and long-term care). Thus, the hospitals used in calculating the sum of total weighted cases may differ from those included in the inpatient acute care hospital service category.
- Some beds in acute care hospitals may be allocated for long-term care, but the total sum of weighted cases reflects only acute care provided within these hospitals.
- The sum of weighted cases is not adjusted for provincial variations in the cost of specific treatments.
- Privacy and confidentiality guidelines for the Hospital Morbidity Database and Discharge Abstract Database, especially in Atlantic provinces and the territories, limit the use of these data at provincial/territorial levels.

Acute care hospitals (emergency room/other outpatient)

- In Alberta, ACCS data are limited to acute care hospitals and one rehabilitation centre, and therefore exclude provincial facilities such as Mental Health, Cancer Board and private clinics located outside of acute care

12 Less than 10% of beds in chronic or rehabilitation hospitals are federal or proprietary, and it is unclear how "long-term care" is defined.

Burden of Illness by Cost Component

facilities (i.e. those offering rehabilitation or diagnostic services).

- ACCS diagnostic groups do not always correspond to ICD-9 diagnostic categories. For example, hematology services, which were allocated to well-patient care, should ideally be allocated to specific diagnostic categories. Neurology services, which were allocated to nervous system and sense organ diseases, might be for treatment of brain tumours (neoplasms), stroke (cardiovascular diseases), or other diseases. Refer to Appendix 2 for more information on ACCS.
- ACCS does not include the physician payment portion of services, for both fee-for-service physicians and those who are on salary. Physicians represent approximately 2.5% of the total expenditure for acute care hospitals emergency room/other outpatient.
- One rehabilitation facility is included in the Alberta totals for acute outpatient expenses. This may bias the estimates.

Chronic/rehabilitation hospitals

- The 1997/98 1-year pattern of acute hospital separations for patients who stay 100 or more days in these hospitals was used to reflect that of patients in chronic/rehabilitation hospitals. Information on the distribution of illness and injury in this hospital care setting is not available.
- The distribution of patients in separation data, which represent counts of patient deaths and discharges during the reporting year, may not accurately represent the distributions of costs for patients being treated in hospital during that year.

Psychiatric hospitals

- The distribution of patients in separation data may not accurately represent the distribution of costs for patients being treated in hospital during that year.
- The Hospital Mental Health Database specifies diagnostic codes for mental disorders only; all other diagnoses are coded to 999, "Complications of Medical Care not elsewhere classified." Thus $41.7 million (3.8% of the psychiatric hospital expenditure) is allocated by default to Injuries and Poisonings (ICD-9 800-999).
- Privacy and confidentiality guidelines for the Hospital Mental Health Database, especially in Atlantic provinces and the territories, limit the use of these data at provincial levels.

Results

NHEX[1] reports that $27.6 billion was spent on national hospital care in 1998. Acute care, chronic/rehabilitation and psychiatric hospitals are estimated to represent approximately $25.4 billion (92.0%), $1.1 (4.0%) billion, and $1.1 (4.0%) billion respectively. Inpatient and outpatient costs in acute care hospitals are $17.1 billion and $8.3 billion respectively. Hospital-based drug and physician care expenditures represent $983 million and $722 million of total hospital care expenditures.

Distribution by diagnostic category/ subcategory

About $25.1 billion of the $27.6 billion of hospital care expenditures was allocated by diagnostic category. As noted in Table 3, the remaining $2.5 billion for other hospital expenditures, such as health science research conducted in hospitals, admitted or transferred patients, or rehabilitation, could not be allocated by diagnostic category.

Table 3: Hospital Care Expenditures by Diagnostic Category in Canada, 1998

Diagnostic Category	1998 Cost ($1,000,000)	% of Total
Birth Defects	130.5	0.5
Blood Diseases	110.9	0.4
Cancer	1,838.7	6.7
Cardiovascular Diseases	4,161.8	15.1
Digestive Diseases	2,366.3	8.6
Endocrine and Related Diseases	477.0	1.7
Genitourinary Diseases	1,765.8	6.4
Ill-defined Conditions	674.9	2.4
Infectious and Parasitic Diseases	284.8	1.0
Injuries (1)	2,477.4	9.0
Mental Disorders	2,682.7	9.7
Musculoskeletal Diseases	1,441.6	5.2
Nervous System and Sense Organ Diseases	1,425.6	5.2
Perinatal Conditions	262.6	1.0
Pregnancy	1,079.3	3.9
Respiratory Diseases	1,560.6	5.6
Skin and Related Diseases	723.5	2.6
Well-patient Care (2)	1,662.9	6.0
Others (3)	1,158.1	4.1
Unattributable (4)	1,353.4	4.9
Total	27,638.4	100.0

(1) Includes an estimated $41.7 million (3.8%) of the psychiatric hospital expenditures not coded to Mental Disorders (see Limitations).

(2) Includes hematology and exam/other from ACCS data (See Limitations).

(3) Includes data for which diagnostic coding was not provided, or data that are grouped due to small counts. Specifically, this includes the following ACCS clinical groups: "admitted patient," "transferred patient," "rehabilitation," "telephone contact," "ungroupable," "deceased patient" and "missing code."

(4) Includes data that could not be allocated by ICD-9 code (diagnostic category). Specifically, this includes health science research undertaken by Acute Care Hospitals.

Note: Due to rounding some discrepancies may occur.

Table 3 illustrates the distribution of hospital care expenditures by diagnostic category. The three largest categories, cardiovascular diseases ($4.2 billion), mental disorders ($2.7 billion) and injuries[13] ($2.5 billion), represent about one-third of total hospital care expenditures.

All hospital care costs except outpatient care in acute care hospitals can be allocated to diagnostic subcategories ($19.3 billion, 70.0%). Table 4 illustrates the contribution of selected diseases to the six diagnostic categories with the largest costs. Ischemic heart disease ($1.3 billion) and stroke ($714 million) account for almost half the hospital care expenditure for cardiovascular diseases. Schizophrenia ($656 million) accounts for about a quarter of mental disorders. Lung cancer ($228 million) and colorectal cancer ($216 million) account for one-quarter of the hospital expenditure for cancer. Pneumonia/influenza ($386 million) and chronic obstructive pulmonary disease excluding asthma ($345 million) account for over 45% of the cost of respiratory diseases. Arthritis ($458 million) accounts for nearly one-third of hospital costs for musculoskeletal diseases, while diabetes ($204 million) accounts for over 40% of the cost of endocrine and related diseases.

13 Injuries would remain the third most costly hospital expenditure overall ($2.4 billion) even if the $41.1 million allocated to injuries/other costs from psychiatric hospitals were subtracted from the total cost of injuries.

Burden of Illness by Cost Component

Table 4
Hospital Care Expenditures by Selected Diagnostic Category/Subcategory in Canada, 1998

Diagnostic Category/Subcategory	1998 Cost ($1,000,000)	% of Category Total	% of Total
Birth Defects			
Congenital CVD	48.5	37.2	0.2
All Other Dx Sub*	82.0	62.8	0.3
Unattributable (Out-patient Acute Care)**	0.0	0.0	0.0
Category Total	**130.5**	**100.0**	
Cancer			
Breast Cancer	84.8	4.6	0.3
Colorectal Cancer	216.3	11.8	0.8
Lung Cancer	227.5	12.4	0.8
Prostate Cancer	77.4	4.2	0.3
All Other Dx Sub*	1,124.4	61.1	4.1
Unattributable (Out-patient Acute Care)**	108.3	5.9	0.4
Category Total	**1,838.7**	**100.0**	
Cardiovascular Diseases			
Aortic Aneurysm	103.2	2.5	0.4
Cerebrovascular Disease (excluding Stroke)	158.8	3.8	0.6
Ischemic Heart Disease	1,274.8	30.6	4.6
Stroke	714.4	17.2	2.6
All Other Dx Sub*	1,306.8	31.4	4.7
Unattributable (Out-patient Acute Care)**	603.8	14.5	2.2
Category Total	**4,161.8**	**100.0**	
Endocrine and Related Diseases			
Diabetes	203.5	42.7	0.7
All Other Dx Sub*	153.3	32.1	0.6
Unattributable (Out-patient Acute Care)**	120.2	25.2	0.4
Category Total	**477.0**	**100.0**	
Injuries			
Poisoning	57.7	2.3	0.2
All Other Dx Sub*	1,681.6	67.9	6.1
Unattributable (Out-patient Acute Care)**	738.1	29.8	2.7
Category Total	**2,477.4**	**100.0**	
Mental Disorders			
Depressive Disorder	96.9	3.6	0.4
Schizophrenia	656.3	24.5	2.4
All Other Dx Sub*	1,740.0	64.9	6.3
Unattributable (Out-patient Acute Care)**	189.5	7.1	0.7
Category Total	**2,682.7**	**100.0**	
Musculoskeletal Diseases			
Arthritis	457.5	31.7	1.7
All Other Dx Sub*	459.0	31.9	1.7
Unattributable (Out-patient Acute Care)**	525.1	36.4	1.9
Category Total	**1,441.6**	**100.0**	
Nervous System and Sense Organ Diseases			
Alzheimer's (Disease)	68.3	4.8	0.2
All Other Dx Sub*	386.0	27.1	1.4
Unattributable (Out-patient Acute Care)**	971.3	68.1	3.5
Category Total	**1,425.6**	**100.0**	
Perinatal Conditions			
Slow Fetal Growth/ Fetal Malnutrition	162.4	61.8	0.6
All Other Dx Sub*	100.2	38.2	0.4
Unattributable (Out-patient Acute Care)**	0.0	0.0	0.0
Category Total	**262.6**	**100.0**	
Respiratory Diseases			
Acute Respiratory Infections	83.4	5.3	0.3
Asthma	101.8	6.5	0.4
COPD (other than asthma)	344.5	22.1	1.2
Pneumonia and Influenza	386.1	24.7	1.4
All Other Dx Sub*	273.7	17.5	1.0
Unattributable (Out-patient Acute Care)**	371.1	23.8	1.3
Category Total	**1,560.6**	**100.0**	
All Other Dx Category	8,668.4	31.4	
Others	1,158.1	4.2	
Unattributable	1,353.4	4.9	
Total	**27,638.4**		100.0

** All other diagnostic subcategories.*
*** Hospital costs for outpatient care in acute hospitals were not allocated by diagnostic subcategories. The remaining hospital costs (for inpatient acute care, psychiatric hospitals and long term hospitals) were allocated by diagnostic category ($19.3 billion, 70.0% of total hospital expenditures).*
Note: Due to rounding some discrepancies may occur.

Distribution by sex

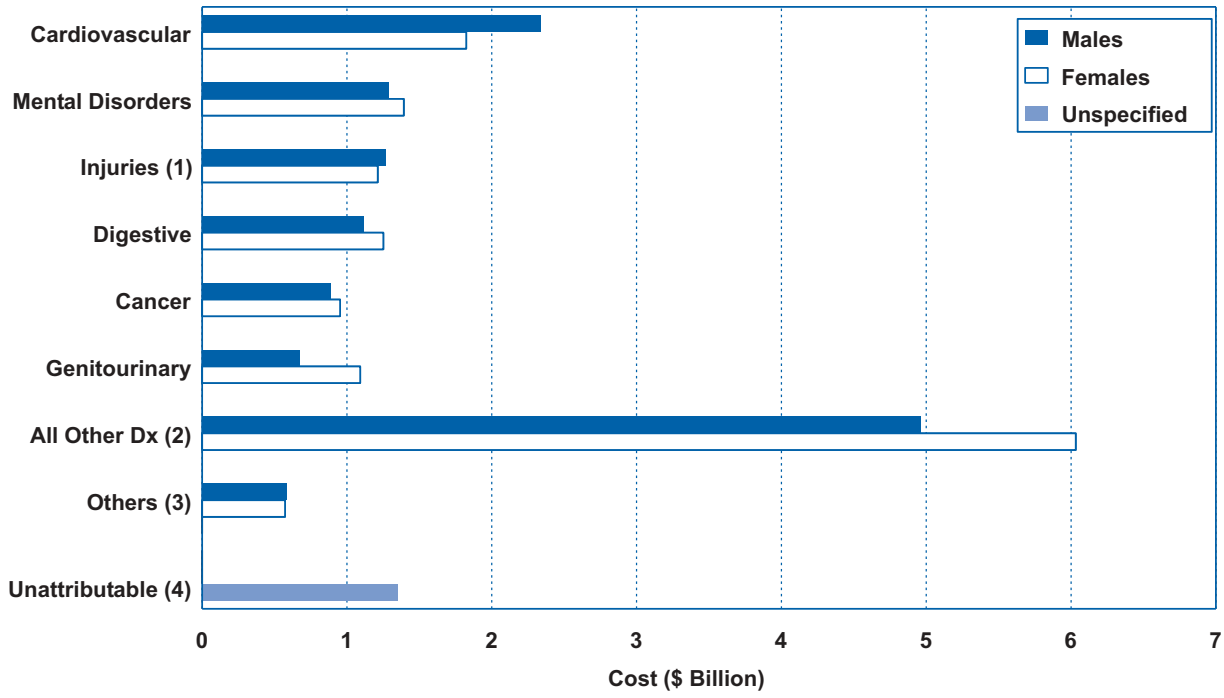
All hospital care expenditures were distributed by sex. Females account for nearly half ($13.7 billion) the total hospital care expenditure. Cardiovascular diseases, mental disorders, injuries, and digestive diseases were the four most costly diagnostic categories for both sexes combined. There is variation in the sex distribution of hospital care costs within diagnostic category (Figure 4) and subcategory. Males account for over 55% ($2.3 billion) of the cost of cardiovascular diseases; females account for more than 60% ($1.1 billion) of genitourinary diseases. Males account for nearly 65% of the cost of ischemic heart disease ($820 million) and almost 60% of schizophrenia ($392 million); females account for about 60% of the cost of arthritis ($278 million).

Distribution by age group

Almost all of the hospital care expenditure was distributed by age group. Seniors (65+ years) and individuals aged 35-64 years account for over two-thirds of hospital care expenditures. This represents $10.2 billion and $8.3 billion respectively. Age group was unspecified for 5% ($1.4 billion) of hospital care expenditures.

Well-patient care ($448 million) and nervous system diseases (348 million) account for the main hospital care expenditure for children (0-14 years); pregnancy ($882 million) and mental disorders ($744 million) are the main expenditures for those aged 15-34 years; cardiovascular disease ($1.3 billion) and mental disorders ($1.1 billion) for adults aged 35-64 years; and cardiovascular diseases ($2.7 billion) and cancer ($971 million) for seniors (aged 65+).

Figure 4: Hospital Care Expenditures by Diagnostic Category and Sex in Canada*, 1998



* *Based on total hospital care expenditures of $27.6 billion*

(1) Includes an estimated $41.7 million of the psychiatric hospital expenditure not coded to Mental Disorders (see Limitations).

(2) Refers to all other diagnostic categories.

(3) Refers to data for which coding was not provided, or data that are grouped due to small counts. For more details see Table 2, third footnote.

(4) Refers to data that could not be allocated by ICD-9 code. For more details see Table 2, fourth footnote.

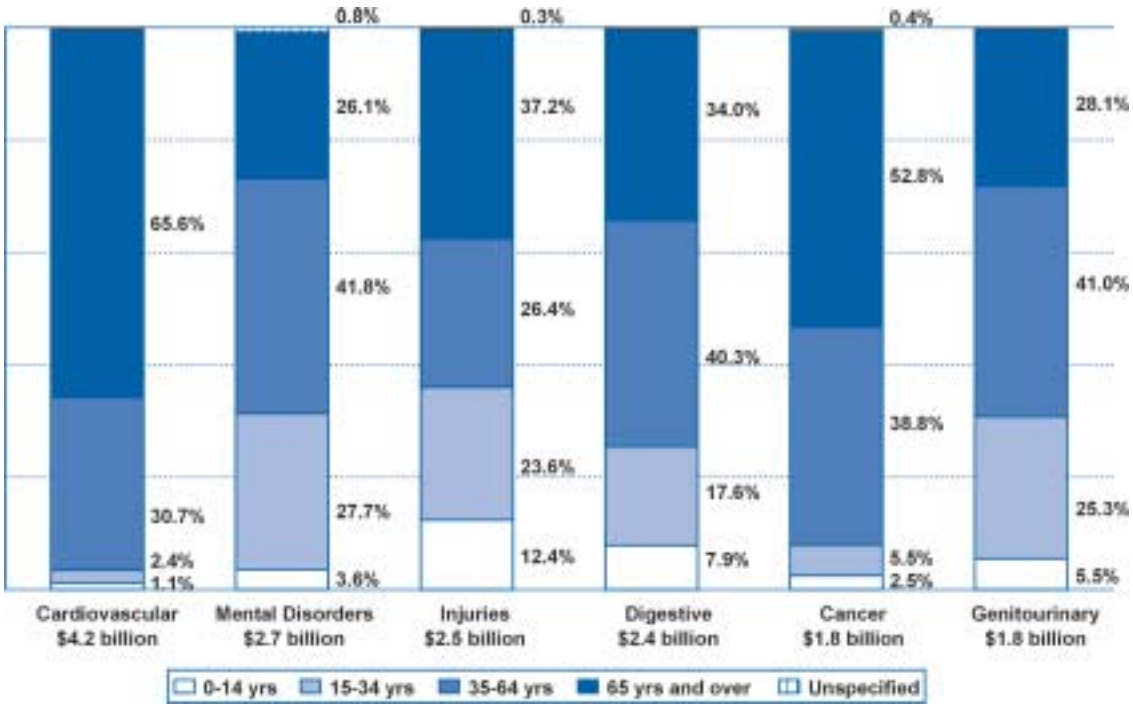
Burden of Illness by Cost Component

In the six most costly diagnostic categories, adults aged 35-64 account for over 40% of the hospital care costs of mental disorders ($1.1 billion), digestive diseases ($967 million), and genitourinary diseases ($738 million), and seniors represent two-thirds of cardiovascular diseases ($2.8 billion) and over half of cancer ($950 million) (Figure 5). Similarly, seniors account for a considerable portion of hospital care expenditures for ischemic heart disease ($739 million, 58.0%), stroke ($573 million, 80.3%), arthritis ($320 million, 70.2%), pneumonia/influenza ($265 million, 68.6%), and COPD excluding asthma ($201 million, 81.7%). Hospital care costs for schizophrenia ($346 million, 52.8%) are highest among adults aged 35-64 years.

Distribution by province/territory

Map 2 illustrates the distribution of hospital care expenditures by province/territory. This distribution includes acute inpatient, chronic/rehabilitation, and psychiatric hospitals. Ontario ($10.1 billion), Quebec ($7.3 billion), and British Columbia ($3.6 billion) account for 76% of total hospital care expenditures. With the exception of the Northwest Territories, however, the per capita costs are fairly similar across provinces/territories (ranging from $743 to $1,113), with an average of $935 for all provinces/territories.

Figure 5: Hospital Care Expenditures by Most Costly Diagnostic Categories and Age Group in Canada, 1998



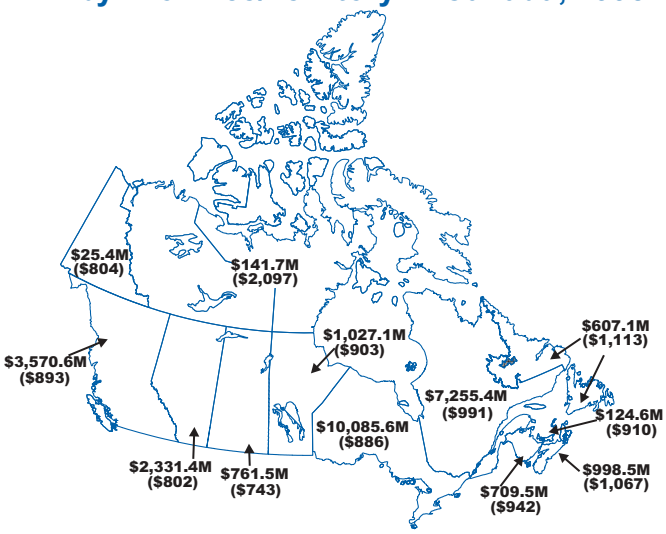
Note: Age groups that represent less then 0.3% of diagnostic categories are not shown here.
Due to rounding some discrepancies may occur.

Considerations

Direct comparisons of the distributions of 1993 and 1998 hospital care expenditures by diagnostic category and subcategory, age, sex, and province/territory are not advised. In 1993, it was assumed that the distribution by diagnosis of acute outpatient costs (which was not available) reflected inpatient costs. The cost of hospital-based drugs in the 1993 report was also excluded. In the 1998 report, Alberta's ACCS was used to allocate acute outpatient hospital costs by diagnosis, and hospital-based drug costs were included.

Attempts to use the Ontario Chronic Care Database to improve estimates of chronic/rehabilitation hospital expenditures by illness/injury were unsuccessful because of difficulties in identifying the primary diagnosis where there are co-morbidities.

Map 2 – Hospital Care Expenditures by Province/Territory in Canada, 1998



Key: *Total Cost (M denotes $1,000,000)*
(Cost per Capita)

References

1. Canadian Institute for Health Information (2000). *National Health Expenditure Trends (NHEX)*, 1975-2000.
2. Canadian Institute for Health Information. *Annual Hospital Survey (AHS), 1997/98.* (Unpublished tabulations)
3. Canadian Institute for Health Information (1997/98). *Hospital Morbidity Database (HMDB).* (Unpublished tabulations)
4. Canadian Institute for Health Information (1997/98). *Discharge Abstract Database (DAD).* (Unpublished tabulations)
5. Alberta Health and Wellness (1997/98). *Ambulatory Care Classification System Database (ACCS).* (Unpublished tabulations)
6. Canadian Institute for Health Information (1997/98). *Hospital Mental Health Database (HMHDB).* (Unpublished tabulations)

Burden of Illness by Cost Component

Drug Expenditures

Methods

The 1998 total for national drug expenditures comes from the Canadian Institute for Health Information's (CIHI) *National Health Expenditure Trends (NHEX)* 1975-2000.(1) This includes public and private expenditures for prescribed drugs and non-prescribed products. Drugs dispensed in hospitals and other institutions are included in the chapters dealing with hospital care expenditures and expenditures for care in other institutions[14] (Appendix 2 for additional information regarding what is included in this total).

Expenditures for prescribed drugs were allocated by disease category and subcategory, by sex, age group, and province/territory. However, expenditures for non-prescribed drugs could not be allocated to diagnostic categories since many of these over-the-counter drugs and personal health supplies could easily be allocated to more than one disease category.[15]

Distributions provided by IMS Health were used to allocate the total cost of prescribed drugs for 1998 by diagnostic category and subcategory, sex, age group, and province/territory. These IMS Health distributions are based on the Canadian Drug Store and Hospital Purchases Audit (CDH),(2) the Canadian Disease and Therapeutic Index (CDTI),(3) and Canadian CompuScript Audit (CS).(4)

The CDH estimates the dollar value of pharmaceutical and diagnostic products purchased by Canadian retail pharmacy outlets by therapeutic class, and the CDTI provides treatment data from office-based Canadian physicians categorized by type of drug therapy (both are categorized by diagnostic category and subcategory, sex, and age group). The IMS Health CS data monitor prescriptions as they are dispensed by the pharmacist to the consumer through computerized independent and chain drug stores and retail pharmacies[16].

Provincial/territorial distributions by diagnostic category were inferred from regional distributions provided by IMS Health (BC, Prairies, Ontario, Quebec, and Atlantic). Since no information was available for the territories, the BC distribution was used for the Yukon and Northwest Territories. These inferred distributions by diagnostic category were then applied to provincial/territorial estimates for prescription drug expenditures as reported in NHEX.

Assumptions

- The 1998 national drug expenditures include all drugs sold in retail drug stores.
- The distribution of drug expenditures by diagnostic category and subcategory, age group, sex, and region based on IMS Health audits reflects the distribution of drug expenditures in Canada.
- The British Columbia distribution of drug expenditures is assumed to be representative of the Northwest Territories and Yukon populations.
- The distribution of drugs within a therapeutic class for each diagnostic category is similar to the overall distribution of drugs prescribed through office-based physicians, on which CDTI(3) distributions are based. Although the specific drugs may differ, therapeutic drug classes are fairly broad.

14 These expenditures, can, however, be removed and added to the totals presented in this chapter – see Results section for more details.

15 Non-prescription drugs include over-the-counter drugs (OTC) and personal health supplies purchased in retail drug stores (Appendix 3 for listing).

16 In general, the IMS Health audits include prescription drugs used in hospitals or purchased in chain and independent retail drug stores with computerized tracking of sales (costs may be paid through provincial or other third party plans or directly by the patient); and some non-prescription drugs prescribed by a physician and dispensed by a pharmacist in a retail drug store. They exclude non-prescription products sold in retail outlets other than drug stores; prescription drugs supplied by dispensing physicians; drugs prescribed by specialized health centres/clinics (e.g. cancer, family planning) outside of hospital; drugs prescribed in other institutions (these are included in "Expenditures for Care in Other Institutions").

Limitations

- Prescription drug expenditures are distributed across principal or main diagnostic categories only. Secondary or other diagnostic categories that may have contributed to drug prescription are not included in the results.
- IMS Health estimates overall drug use by projecting patterns of drug use from sample data collected according to pre-designed panels onto a Canadian Universe. Thus, drug costs for some categories or subcategories may be underestimated and the distributions may not correspond exactly with the usage patterns that contribute to NHEX estimates.
- CDTI data,[3] gathered during patient visits to the physician, do not track whether or not the prescribed drug is actually filled. CDH data[2] reflect prices actually paid by drug stores regardless of whether purchases were made directly from manufacturers or through wholesalers. These prices could be influenced by added mark-ups for volumes moving through wholesalers or cash discounts offered by wholesalers or manufacturers for prompt payment. CS data,[4] which estimate direct costs to the consumer, are limited to prescription drugs and to non-prescription products prescribed by a physician and dispensed by a pharmacist.
- CDH data[2] do not track all drug purchases. For example, drugs purchased in grocery stores and specialty health clinics (such as family planning centres and cancer clinics) or through military accounts would not be included. This may underestimate drug costs for some major diagnostic categories and subcategories (e.g. cancer, AIDS treatment). NHEX data do, however, include these costs.
- The distribution of drug expenditures for British Columbia is used to impute the values for the Northwest Territories and Yukon. This may introduce a bias to the results, as the BC numbers may not be representative of the population in the NWT and Yukon.

Results

NHEX reports that $12.4 billion was spent on drugs in Canada in 1998, $9.3 billion for prescription drugs and $3.1 billion for non-prescription drugs dispensed in retail drug stores (see Appendix 3).[1] This does not include hospital-based drug expenditures ($983 million of total hospital care expenditures), which are included in the Hospital Care Expenditures chapter of this report.

Distribution by diagnostic category/ subcategory

Only prescription drug expenditures ($9.3 billion) were allocated to diagnostic categories and subcategories. Table 5 illustrates the distribution by diagnostic category. The three largest categories, cardiovascular diseases ($1.8 billion), respiratory diseases ($1.1 billion), and mental disorders ($1.1 billion) represent over 40% of the total prescription drug expenditures.

Burden of Illness by Cost Component

Table 5
Drug Expenditures by Diagnostic Category in Canada, 1998

Diagnostic Category	1998 Cost ($1,000,000)	% of Total	% of Subtotal
Birth Defects	10.4	0.1	0.1
Blood Diseases	48.4	0.4	0.5
Cancer	210.2	1.7	2.3
Cardiovascular Diseases	1,772.8	14.3	19.0
Digestive Diseases	752.2	6.1	8.1
Endocrine and Related Diseases	818.2	6.6	8.8
Genitourinary Diseases	322.5	2.6	3.5
Ill-defined Conditions	482.3	3.9	5.2
Infectious and Parasitic Diseases	417.3	3.4	4.5
Injuries	234.1	1.9	2.5
Mental Disorders	1,092.9	8.8	11.7
Musculoskeletal Diseases	614.3	5.0	6.6
Nervous System and Sense Organ Diseases	536.4	4.3	5.8
Perinatal Conditions	4.8	0.0	0.1
Pregnancy	23.1	0.2	0.2
Respiratory Diseases	1,109.7	8.9	11.9
Skin and Related Diseases	469.4	3.8	5.0
Well-patient Care	399.3	3.2	4.3
Sub-Total (prescription drugs)	9,318.3	75.2	100.0
Unattributable (1)	3,066.9	24.8	
Total	12,385.2	100.0	100.0

(1) Includes data that could not be allocated by ICD-9 code, specifically $3.1 billion in non-prescription drug expenditures (over-the-counter drugs and personal health supplies purchased in retail drug stores).

Note: Due to rounding some discrepancies may occur.

Table 6 illustrates the distribution of selected diagnostic subcategories for the six diagnostic categories with the largest prescription drug costs. Hypertension ($880 million) and ischemic heart disease ($513 million) together account for more than 75% of the prescription drug expenditure for cardiovascular diseases. Drugs used for the treatment of acute respiratory infections ($440 million) and asthma ($301 million) account for two-thirds of respiratory disease prescription drug costs. Depressive disorders ($253 million) account for almost one-quarter of the prescription drug costs for mental disorders. Arthritis ($263 million) accounts for more than 40% of the prescription drug costs for musculoskeletal diseases. Diabetes ($181 million) is responsible for almost a quarter of the costs of prescription drugs for the treatment of endocrine and related diseases.

Table 6
Drug Expenditures by Selected Diagnostic Category/Subcategory in Canada, 1998

Diagnostic Category/Subcategory	1998 Cost ($1,000,000)	% of Category Total	% of Total
Cancer			
Breast Cancer	34.8	16.6	0.3
Prostate Cancer	25.7	12.2	0.2
All Other Dx Sub*	149.7	71.2	1.2
Category Total	**210.2**	**100.0**	
Cardiovascular Diseases			
Cerebral Infarction	29.1	1.7	0.2
Hypertension	880.0	49.6	7.1
Ischemic Heart Disease	512.7	28.9	4.1
All Other Dx Sub*	351.0	19.8	2.8
Category Total	**1,772.8**	**100.0**	
Endocrine and Related Diseases			
Diabetes	181.0	22.1	1.5
All Other Dx Sub*	637.2	77.9	5.1
Category Total	**818.2**	**100.0**	
Infectious and Parasitic Diseases			
Sexually Transmitted Diseases	97.0	23.2	0.8
All Other Dx Sub*	320.3	76.8	2.6
Category Total	**417.3**	**100.0**	
Mental Disorders			
Anxiety States	108.3	9.9	0.9
Depressive Disorder	252.7	23.1	2.0
Schizophrenia	108.4	9.9	0.9
All Other Dx Sub*	623.5	57.1	5.0
Category Total	**1,092.9**	**100.0**	
Musculoskeletal Diseases			
Arthritis	262.7	42.8	2.1
Osteoporosis	60.3	9.8	0.5
All Other Dx Sub*	291.3	47.4	2.4
Category Total	**614.3**	**100.0**	
Nervous System and Sense Organ Diseases			
Disorders of Conjunctiva	88.5	16.5	0.7
Ear Infections	92.7	17.3	0.8

Burden of Illness by Cost Component

Diagnostic Category/Subcategory	1998 Cost ($1,000,000)	% of Category Total	% of Total
Glaucoma	54.7	*10.2*	*0.4*
Parkinson's Disease	24.1	*4.5*	*0.2*
All Other Dx Sub*	276.4	*51.5*	*2.2*
Category Total	**536.4**	*100.0*	
Respiratory Diseases			
Acute Respiratory Infections	439.7	*39.6*	*3.6*
Asthma	300.8	*27.1*	*2.4*
COPD (other than asthma)	122.9	*11.1*	*1.0*
Pneumonia and Influenza	52.5	*4.7*	*0.4*
All Other Dx Sub*	193.8	*17.5*	*1.6*
Category Total	**1,109.7**	*100.0*	
All Other Dx Category	2,746.5	*22.2*	
Unattributable (Non-prescription drugs)	3,066.9	*24.8*	
Total	**12,385.2**		*100.0*

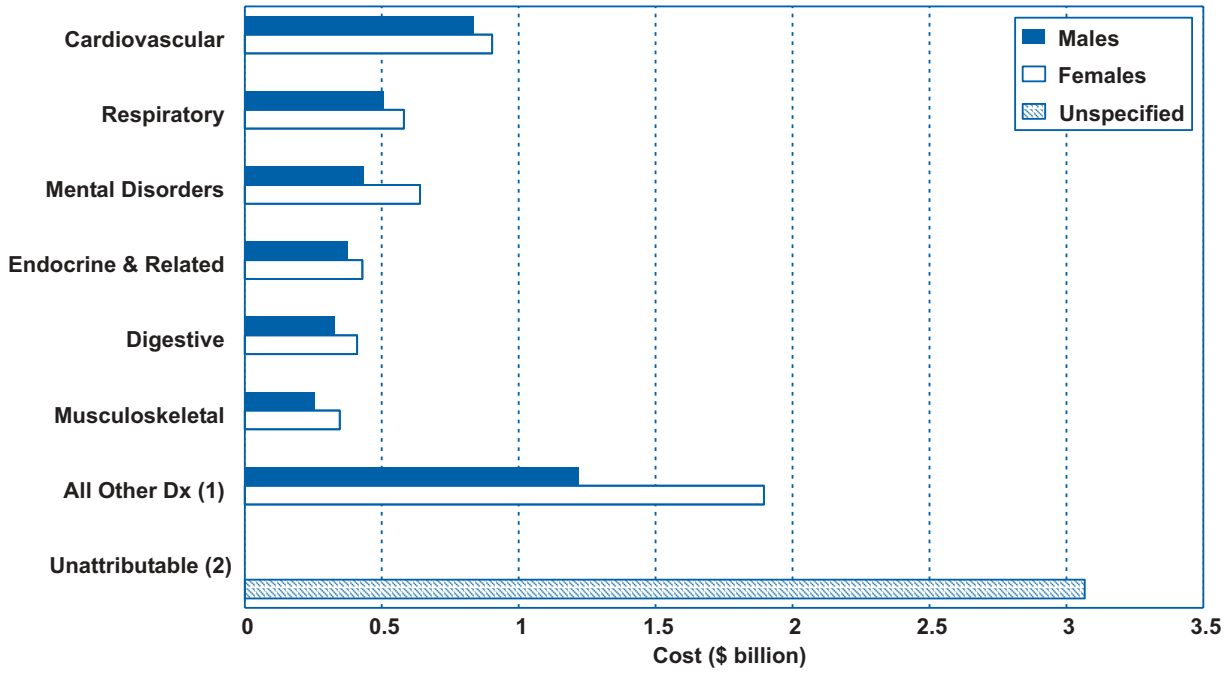
** All other diagnostic subcategories.*
Note: Due to rounding some discrepancies may occur.

Distribution by sex

Of the $9.3 billion spent on prescription drugs, females account for over 55% ($5.2 billion) and males over 40% ($4.0 billion). Sex was unspecified for about 2% ($154 million) of these drug expenditures.

In the most costly diagnostic categories and subcategories, females account for nearly 60% ($640 million) of prescription drug expenditures for the treatment of mental disorders, over 55% ($347 million) of prescription drug costs for musculoskeletal diseases (Figure 6), and more than three-quarters ($301 million) in well-patient care costs. Females also account for more than 55% ($490 million) of prescription drug costs associated with hypertension, over 60% ($162 million) associated with arthritis and nearly two-thirds ($168 million) associated with depressive disorders. Males account for over 60% ($315 million) of the prescription drug expenditure for the treatment of ischemic heart disease.

Figure 6: Prescription Drug Expenditures by Diagnostic Cateogory and Sex in Canada*, 1998



** Based on prescription drug expenditures of $9.3 billion*
(1) Refers to all other diagnostic categories.
(2) Refers to data that could not be allocated by ICD-9 code.

Burden of Illness by Cost Component

Distribution by age group

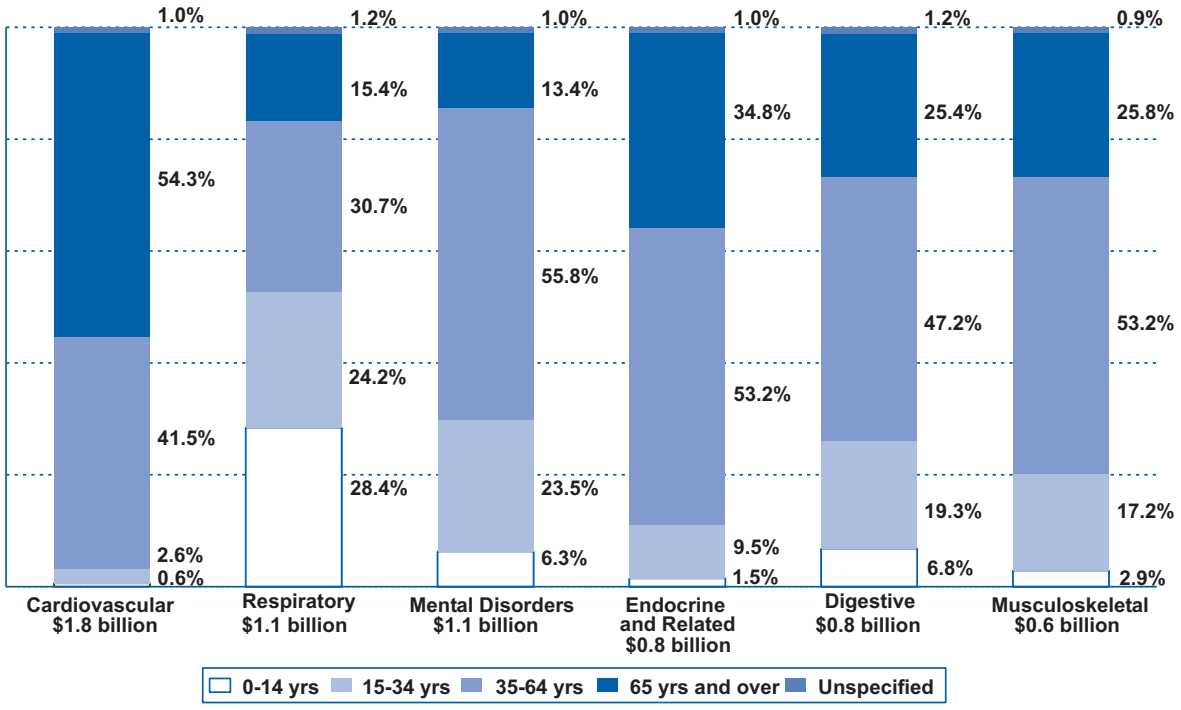
Adults aged 35-64 years account for over 40% ($3.9 billion) of the total $9.3 billion spent on prescription drugs. Seniors (65+ years) account for more than one-quarter ($2.5 billion). About 1% ($100 million) of prescription drug expenditures is not specified by age group.

Respiratory diseases ($315 million, 30.7%) and nervous system and sense organ diseases ($149 million, 14.5%) account for the largest prescription drug expenditure for children aged 0-14 years. Respiratory diseases ($269 million, 15.2%) and mental disorders ($257 million, 14.5%) represent the largest costs for individuals aged 15-34 years. Cardiovascular diseases ($735 million, 18.8%) and mental disorders ($610 million, 15.6%) account for the largest expenditures for adults aged 35-64 years. For seniors, the largest expenditures are for cardiovascular diseases ($963 million, 38.6%) and endocrine and related diseases ($285 million, 11.4%).

Figures 7 illustrates the prescription drug expenditures for the six largest diagnostic categories distributed by age. Seniors account for over half ($963 million) of prescription drug expenditures for cardiovascular diseases, whereas adults aged 35-64 years account for over half the prescription drug expenditures for mental disorders ($610 million), endocrine and related diseases ($435 million), and musculoskeletal diseases ($327 million) respectively.

In terms of subcategories, seniors account for almost half the prescription drug expenditures for hypertension ($413 million), and arthritis ($129 million), and nearly two-thirds of the expenditures for ischemic heart disease ($331 million). Similarly, adults aged 35-64 years account for about half the prescription drug expenditures for hypertension ($442 million), and arthritis ($123 million), and over 60% of the expenditures for depressive disorder ($159 million). Children account for one-third of prescription drug expenditures for acute respiratory infections ($153 million).

Figure 7: Prescription Drug Expenditures by Most Costly Diagnostic Categories and Age Group in Canada, 1998

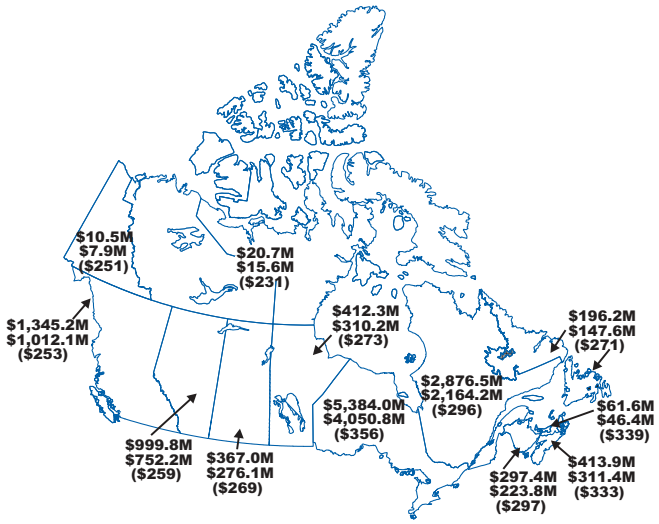


Note: Due to rounding some discrepancies may occur.

Distribution by province/territory

Map 3 illustrates the distribution of drug expenditures by province/territory. Ontario ($4.0 billion), Quebec ($2.2 billion), and British Columbia ($1.0 billion) account for almost 80% of total prescription drug expenditures. The per capita distribution, however, is fairly similar across provinces/territories (ranging from $231 in the Northwest Territories to $356 in Ontario), with an average of $264.

Map 3 – Drug Expenditures by Province/Territory in Canada, 1998



Key: *Total Drug Cost (M denotes $1,000,000)*
Total Prescription Drug Cost (in $1,000,000)
(Total Prescription Drug Cost per Capita)

Considerations

In contrast to previous EBIC reports, the cost of drugs dispensed in hospitals ($983 million) is included in Hospital Care Expenditures rather than Drug Expenditures. This is consistent with other data sources.

The NHEX database provides a national total for non-prescription drugs (over-the-counter drugs and personal health supplies) sold in Canada at retail stores ($3.1 billion). These expenditures are not incorporated into distributions by diagnostic category, age group, sex, or region (see Appendix 3 for a list of non-prescription drugs).

Data from provincial drug administration databases were not available or were too costly to obtain for this report. As well, the 1998 provincial drug administration data are limited to seniors and those on social assistance.

References

1. Canadian Institute for Health Information (2000). *National Health Expenditure Trends (NHEX)*, 1975-2000.
2. IMS HEALTH. *Canadian Drug store and Hospital Purchases Audit (CDH)*, 1997, 1998.
3. IMS HEALTH. *Canadian Disease and Therapeutic Index (CDTI)*, 1997, 1998.
4. IMS HEALTH. *Canadian CompuScript Audit (CS)*, 1997, 1998.

Burden of Illness by Cost Component

Physician Care Expenditures

Methods

The total physician care expenditures for 1998 come from the *National Health Expenditure Trends (NHEX) 1975-2000.*[1] These expenditures include fee-for-service (FFS) payments made by provincial/territorial medical care insurance plans to physicians in private practice[17] as well as payments made through alternative payment plans (APP) (i.e. other forms of professional incomes such as salaries, sessional fees, and capitation). Expenditures on non-traditional practitioners and other health care professionals are not included. Rather, they can be found under "Additional Direct Health Care Expenditures" (Appendix 2 for additional information regarding what is included in this total).

Physician care expenditures were allocated to diagnostic categories for FFS expenditures only. Although it is recognized that APPs have gained greater acceptance in the medical community,[18] these expenditures could not be allocated by disease category.[19]

Nine provinces (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Nova Scotia, Prince Edward Island, Newfoundland) and two territories (Yukon, Northwest Territories) submitted FFS expenditures disaggregated by diagnostic category (defined by ICD-9), sex, and age group. The distribution of physician care expenditures by diagnostic category, sex, and age group for New Brunswick is estimated to be the same as the average for the rest of Canada.

Based on reported provincial/territorial FFS expenditures ($9.8 billion in total) and the NHEX total for physician expenditures ($11.7 billion),[1] it was assumed that the remaining $1.9 billion was reimbursed through APP payments. Since the profile for services paid through APP is unlikely to be similar to that of FFS, the FFS disease distribution is not applied to the $1.9 billion of APP expenditures.

Assumptions

- The distribution of physician care expenditures by diagnostic category, sex, and age group in New Brunswick is assumed to be the same as the Canadian average for the remainder of Canada combined.
- The portion of physician expenditures not accounted for by FFS (NHEX total physician expenditures minus FFS expenditures from provincial/territorial databases) represents the expenditures associated with APP payments.

Limitations

- FFS physician care expenditures are distributed across principal or main diagnostic categories only. Secondary or other diagnostic categories that may have contributed to physician visits are not included in the results.
- The extent and quality of ICD-9 coding varied from province/territory to province/territory. Some jurisdictions provided only aggregated data for subcategories, which resulted in some missing values. Others – Nova Scotia, British Columbia, Prince Edward Island, and the Northwest Territories – were able to provide only three- instead of four-digit coding (i.e. subcategory information). As a result, the allocation of physician care expenditures by subcategory was not undertaken.
- There was also some variability in the "Others" category. For the most part, this category consists of data for which coding was not provided (uncoded and miscoded data) or data that were grouped because of small counts. No adjustment was made for this

17 Fees for services rendered in hospitals are included when paid directly to physicians by the plans.

18 In 2001, 35% of physicians identified remuneration based solely on FFS as the preferred payment method (compared with 50% in 1995).[2]

19 Some provinces are attempting to track APPs by what is known as "shadow billing". Essentially, shadow billing involves the documentation of physician practices that are reimbursed through APP. However, the amount of shadow billing included in the 1998 provincial databases is limited to between 2.7% and 5.9% of total provincial/territorial physician care expenditures (calculated from Saskatchewan and Nova Scotia FFS physician databases), an amount which is inadequate for imputing APP expenditures by disease category.

shortcoming in the data. That is, "Others" are neither excluded nor redistributed.

- There may be an over-classification to categories that capture poorly defined conditions (i.e. ill-defined diseases and well-patient care).
- Data on FFS physician care expenditure from New Brunswick were not available. Values for the province of New Brunswick were imputed on the basis of the average of the remaining provinces/territories. This may have introduced a bias to the results, as the average of the remaining provinces/territories may not be representative of the New Brunswick population.
- The costs of private practice physicians not working in publicly reimbursed programs are not included in this expenditure component.
- The results in this section are not directly comparable to EBIC 1993 because the methodology is significantly different. For instance, EBIC 1993 used Manitoba Health's distribution of physician expenditures to reflect national medical care costs by diagnostic category, whereas this version was able to use data provided by 11 of 13 provinces and territories.

Results

NHEX[1] reports that $11.7 billion was spent on physician care in Canada in 1998. This does not include hospital-based physician care expenditures ($722 million), which are included under the Hospital Care Expenditures chapter of this report.

Distribution by diagnostic category

Almost 84% of this amount is allocated by diagnostic category using provincial/territorial databases on FFS expenditures. At the national level, mental disorders account for almost 8% of physician care expenditures. This is followed by nervous system diseases (7.1%), cardiovascular diseases (7.0%), and respiratory diseases (6.6%) (Table 7). As noted in the limitations section, physician care expenditures were not distributed by diagnostic subcategory.

Table 7
Physician Care Expenditures by Diagnostic Category in Canada, 1998

Diagnostic Category	1998 Cost ($1,000,000)	% of Total
Birth Defects	31.4	0.3
Blood Diseases	48.2	0.4
Cancer	333.1	2.9
Cardiovascular Diseases	822.3	7.0
Digestive Diseases	410.0	3.5
Endocrine and Related Diseases	255.6	2.2
Genitourinary Diseases	499.9	4.3
Ill-defined Conditions	600.0	5.1
Infectious and Parasitic Diseases	184.6	1.6
Injuries	506.0	4.3
Mental Disorders	884.6	7.6
Musculoskeletal Diseases	578.2	4.9
Nervous System and Sense Organ Diseases	824.8	7.1
Others (1)	1,973.5	16.9
Perinatal Conditions	33.2	0.3
Pregnancy	191.2	1.6
Respiratory Diseases	776.7	6.6
Skin and Related Diseases	280.9	2.4
Unattributable (2)	1,894.7	16.2
Well-patient Care	558.0	4.8
Total	**11,686.9**	**100.0**

(1) Includes provincial/territorial fee-for-service physician care expenditures for which diagnostic coding was not provided (for diagnostic categories), and/or data that are grouped due to small counts.

(2) Includes data that could not be allocated by ICD-9 code. Assumed to represent Alternative Payment Plan (APP) expenditures (estimated as the difference between NHEX total for physician care expenditures $11.7 billion and provincial/territorial fee-for-service expenditures $9.8 billion).

Note: Due to rounding some discrepancies may occur.

Burden of Illness by Cost Component

Distribution by sex

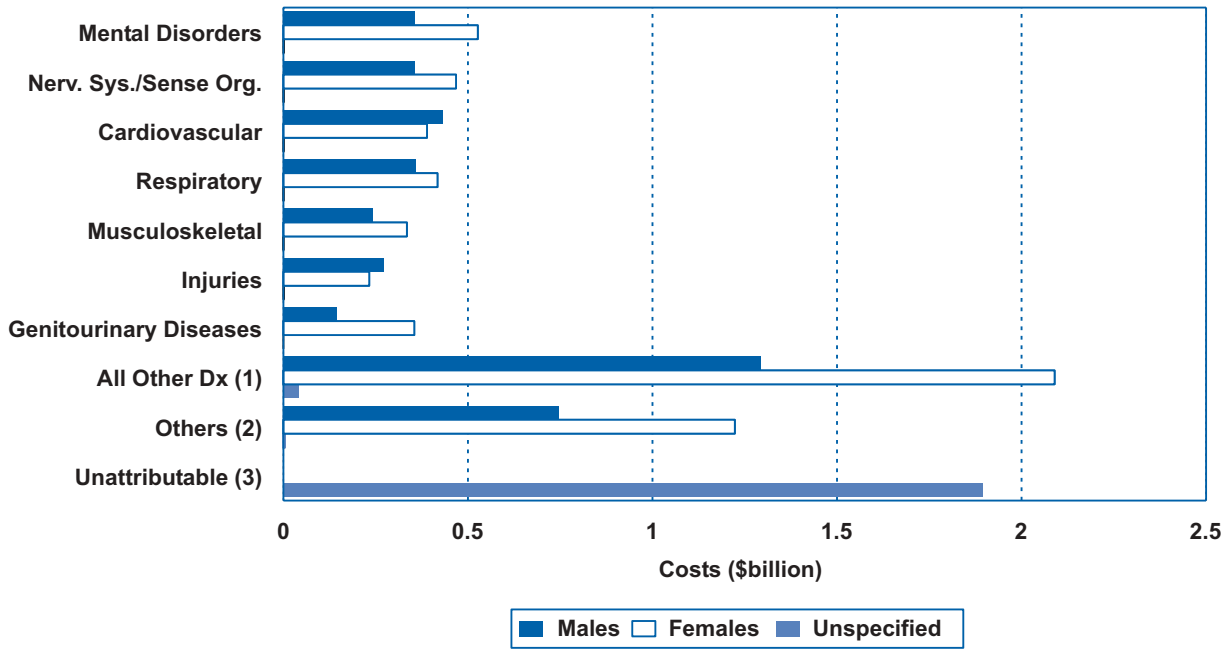
The top four previously mentioned disease categories are the same for men and women, but some differences in other categories are evident. Injuries and poisonings rank fifth for males and ninth for females, and physician care expenditures for genitourinary diseases are more than double for females than males, ranking fifth for females and eleventh for males (Figure 8).

Distribution by age group

The proportion of disease-related expenditures differs from one age cohort to another. Over 40% of FFS physician costs are expended on those in the 35-64 age group, followed by the 65 and over age group (27.2%), the 15-34 age group (20.0 %), and the 0-14 age group (11.3 %). Respiratory disease ranks first in the 0-14 age cohort but declines to 13th place in the 15-34 age cohort, and then rises to fifth in the 65 and over age group. Mental disorders rank first in both the 15-34 and 35-64 age groups. Cardiovascular disease ranks highest in the seniors group, followed by diseases of the nervous system.

Figure 9 illustrates physician care expenditures for the six largest diagnostic categories distributed by age. Seniors account for over 55% of physician care expenditures for cardiovascular diseases, and adults aged 35-64 years account for over half of such expenditures for mental disorders and musculoskeletal diseases. Children aged 0-14 years account for just under one-third of physician care expenditures for respiratory diseases.

Figure 8: Physician Care Expenditures by Diagnostic Category and Sex in Canada*, 1998



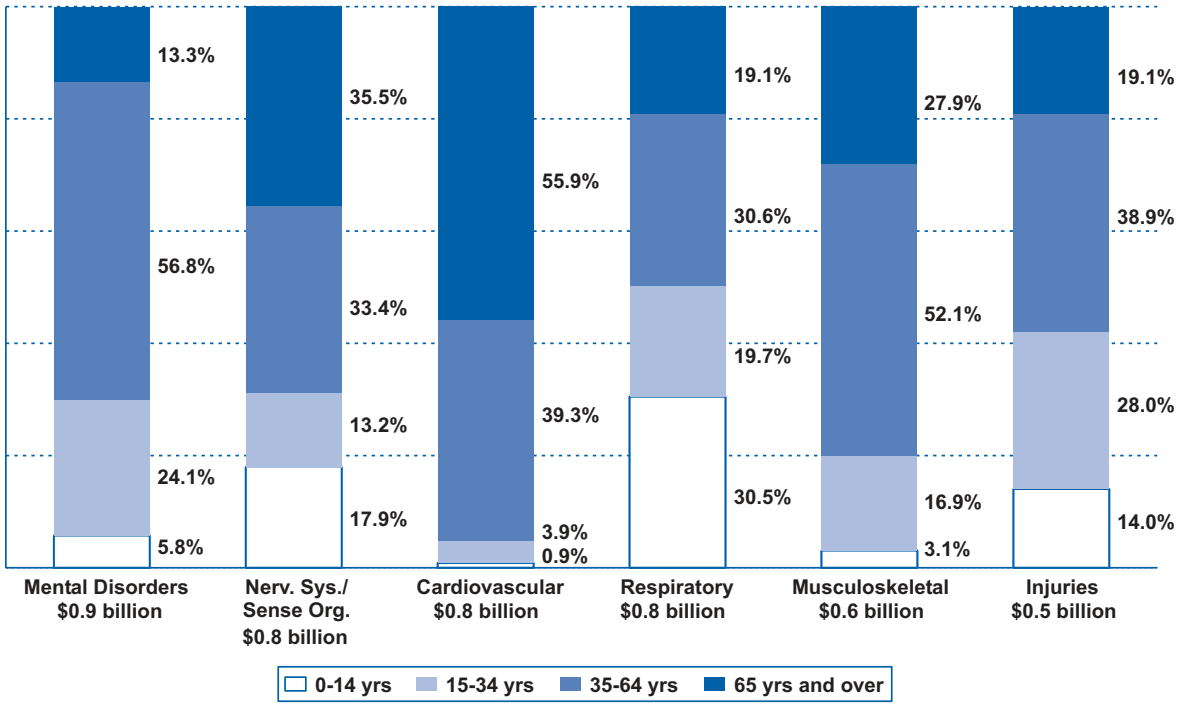
* *Based on total physician care expenditures of $11.7 billion.*

(1) Refers to all other disgnostic categories.

(2) Refers to data for which coding was not provided, or data that are grouped due to small counts, specifically, $2.0 billion in provincial/territorial fee-for-service (FFS) physician care expenditures.

(3) Refers to data that could not be allocated by ICD-9 code. Specifically, this includes $1.9 billion in physician care expenditures. This represents the difference between total NHEX expenditures $11.7 billion and provincial/territorial FFS expenditures $9.8 billion , which is assumed to be alternative payment plan expenditures $1.9 billion .

Figure 9: Physician Care Expenditures by Most Costly Diagnostic Categories and Age Group in Canada, 1998

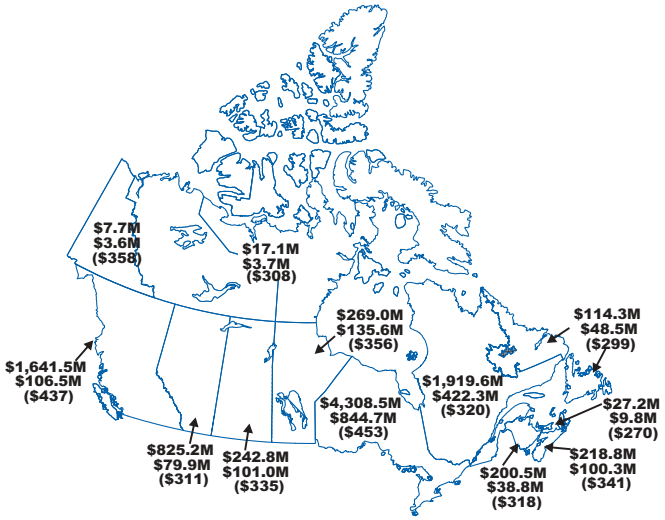


Note: Due to rounding some discrepancies may occur.

Distribution by province/territory

Map 4 illustrates the distribution of FFS, APP, and total per capita physician care expenditures by province/territory. FFS expenditures are highest in Ontario ($4.3 billion), Quebec ($2.0 billion), and British Columbia ($1.6 billion), which account for approximately 80% of total FFS physician care expenditures in Canada in 1998. APP expenditures are highest in Ontario ($0.8 billion), Quebec ($0.4 billion), and Manitoba ($0.1 billion), which together account for approximately three-quarters of total APP expenditures. The ratio of FFS expenditures to total physician care expenditures is highest in British Columbia, Alberta, and Nova Scotia, and the ratio of APP expenditures to

Map 4 – Fee-For-Service (FFS) and Alternative Payment Plans (APP) Physician Care Expenditures by Province/Territory in Canada, 1998



Key: Total FFS Cost (M denotes $1,000,000)
Total APP Cost (M denotes $1,000,000)
(FFS + APP = Total Cost per Capita)

Burden of Illness by Cost Component

total physician care expenditures is highest in Saskatchewan, Manitoba, and Yukon. Total per capita physician care expenditures, however, are fairly similar across provinces/territories, ranging from $270 in P.E.I. to $453 in Ontario (with an average of $342).

Considerations

New Brunswick data will likely be available for future studies on the economic burden of illness in Canada.

Further studies should examine the availability of data on APP expenditures (e.g. tracking and quantifying of shadow billing), especially since support for APPs appears to be increasing.

References

1. Canadian Institute for Health Information (2000). *National Health Expenditure Trends (NHEX)*, 1975-2000.
2. Martin S (2001). Interest in alternative forms of payment on the rise: CMA survey. *Can. Med. Assoc J, 165(5):626.*

Expenditures for Care in Other Institutions

Methods

The total national expenditures for care in other institutions in 1998 come from the *National Health Expenditures in Canada (NHEX), 1975–2000.*[1] The NHEX describes "other institutions" as residential care facilities for the chronically ill or disabled who reside at the institution more or less permanently. They include homes for the aged (including nursing homes); facilities for people with physical disabilities, developmental delays, psychiatric disabilities, and alcohol and drug problems; and facilities for emotionally disturbed children (Appendix 2 for more information regarding what is included in this total).

Although these expenditures could not be distributed by diagnostic category and sub-category a supplementary analysis of data from the 1997-98 Residential Care Facilities (RCF) survey[2] and the institutional component of the 1996-97 National Population Health Survey (NPHS)[3] was undertaken. This analysis is meant to provide the reader with a better understanding of the distribution of these expenditures by type of care/resident in these facilities as well as the diseases that lead to the institutionalization of individuals on a longer-term basis.

The RCF survey is an annual census that collects information from residential care facilities with four or more beds that are funded, approved, or licensed by a provincial/territorial department of health and/or social services (does not include facilities with fewer than four beds or Quebec facilities). The definition of "other institutions" for the RCF survey is different from that of NHEX, as it includes homes for transients, young offenders, and others.[4]

The survey is designed in part to collect administrative cost data. The distribution of these data from the 1997-98 RCF survey was used to allocate NHEX total expenditures for other institutions by "principal characteristic of predominant group of residents." The resulting distribution of expenditures is based on the 3,872 facilities (78% of facilities defined as above) that completed this survey in 1997-98.

The NPHS is designed to collect information related to the health of Canadians. The "institutional component" of the NPHS collects data on long-term residents who are expected to stay in health care facilities with four or more beds for longer than 6 months. This includes both hospitals and residential care facilities. NPHS data consist of information obtained at the individual level, excluding residents of the Yukon and Northwest Territories.[3]

The NPHS institutional component provides the number of people living in Canadian long-term health care facilities by age, sex, and cause of restriction of activities. Data from the 1996-97 version of this survey were analyzed to identify activity limitations, both physical and mental, that are attributable to selected major disease categories and subcategories, and that are important determinants of the search for institutionalized care for mostly aged individuals. These data are based on 85% of the estimated population of approximately 220,000 living in long-term health care facilities who reported activity limitation due to various causes in 1996-97.

Assumptions

- The 1997-98 distribution of total expenditures for reporting RCFs (which provide predominantly level 2 care and higher, see footnote 31 in Appendix 2) is consistent with the 1998 distribution of NHEX expenditures for care in other institutions.
- The distribution of RCFs in Quebec by predominant type of care and principal characteristic of residents is similar to that found in the RCF survey.

Limitations

- The 1998 expenditures for care in other institutions could not be distributed by disease categories and subcategories.
- Seventy-eight percent of facilities (3,872 of 4,975) completed the 1997-98 RCF survey questionnaire. This does not include facilities

Burden of Illness by Cost Component

with fewer than four beds or facilities from the province of Quebec, and for this reason imputed cost figures are approximate, and caution is advised in the interpretation of Table 8.

- The NPHS provides unique information on only a limited number of disease categories and subcategories.
- The population covered by both NHEX and RCF is limited to individuals receiving level 2 care or higher.

Results

NHEX[1] reports that $8.0 billion was spent on care in other institutions in Canada in 1998. This represents almost 10% of total direct costs in Canada in that year. Care for seniors accounts for over 90% of expenditures in other institutions, and female residents account for 70% of these costs.

The distribution of expenditures of RCFs offering level 2 care or higher by geographic region is as follows: Atlantic provinces 10%; Quebec 21%; Ontario 34%; Prairie provinces 21%; and British Columbia 14%. Map 5 illustrates the distribution of these expenditures by province/territory. Ontario ($2.8 billion), Quebec ($1.7 billion), and British Columbia ($1.2 billion) account for approximately 70% of these expenditures in Canada. The per capita cost, however, is fairly similar across provinces/territories, ranging from $182 in the Northwest Territories to $387 in Manitoba (with an average of $300).

1997-98 RCF Survey results

RCF survey data suggest that approximately 95% of expenditures are accounted for by facilities where the principal characteristic of the predominant group of residents is old age (Table 8).[2] According to the RCF survey, residential care facilities serving developmentally delayed residents account for a comparatively low 3% of expenditures.

Table 8: Expenditures of Residential Care Facilities Offering Level 2* Care or Higher by Principal Characteristic of Predominant Group of Residents in Canada, 1997-1998

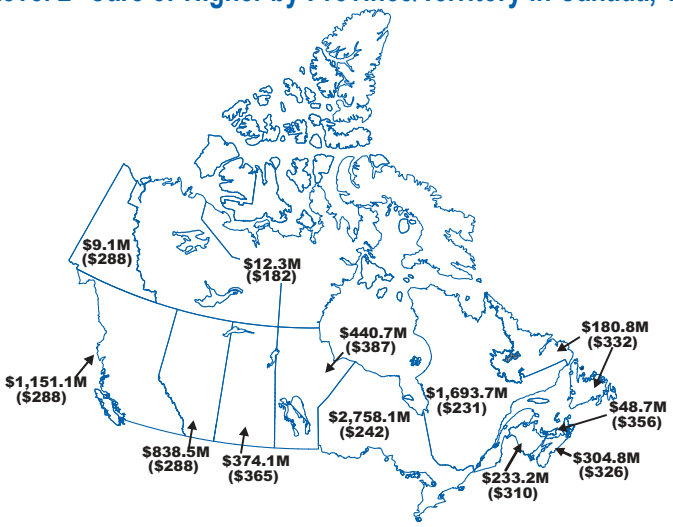
Principal Characteristic	1998 Cost ($1,000,000)	% of Total
Aged	7,618.0	94.7
Alcohol/Drug Addiction	7.4	0.1
Developmentally Delayed	238.0	3.0
Emotionally Disturbed Children	2.1	0.0
Physically Challenged	58.0	0.7
Psychiatrically Disabled	121.6	1.5
Total	8,045.1	100.0

Source: Custom Tabulations by National Health Expenditures Section, CIHI.
**Requires availability of personnel for care for a total of 1.5 to 2.5 hours in a 24-hour day with medical and professional nursing supervision and provision for meeting psychosocial needs.*
Note: Due to rounding some discrepancies may occur.

1996-97 NPHS results – institutional component

Data from the institutional component of the 1996-97 NPHS[3] show that 85% of the estimated population of just over 220,000 in long-term care facilities reported activity limitation due to various causes. The three major disease categories causing activity limitations are diseases of the nervous

Map 5 – Expenditures of Residential Care Facilities Offering Level 2* Care or Higher by Province/Territory in Canada, 1998



Key: *Total Cost (M denotes $1,000,000)*
(Cost per Capita)
**Requires availability of personnel for care for a total of 1.5 to 2.5 hours in a 24-hour day with medical and professional nursing supervision and provision for meeting psychosocial needs.*

system, mental disorders, and diseases of the circulatory system (Appendix 3, Tables 1 and 2).

More than 20% of the estimated population attributed their activity limitation to diseases of the nervous system, and 14.5% and 10.2% identified mental disorders and diseases of the circulatory system respectively (Appendix 3, Table 1). The rank order of identified diseases contributing to activity limitation remained consistent regardless of sex. For each of the three disease categories, however, the proportion of females affected was higher, ranging from 56.8% for mental disorders to 67.9% for diseases of the nervous system.[20] All three categories also show steep increases from the 65-74 age group to the 75-84 year old age group, most notably for nervous disorders (140% increase).

Alzheimer's disease is the leading subcategory of nervous system disorders (54%), affecting more females than males (Appendix 3, Table 2). Schizophrenia represents 13.1% of mental disorders contributing to activity limitation. Of the diseases of the circulatory system that contributed to activity limitations, almost 72% are cerebrovascular; stroke represented 84% of cerebrovascular diseases leading to activity limitations.

Considerations

Expenditures on long-term care facilities will likely be of greater interest as the Canadian population ages. It is expected that by 2031, one in four Canadians will be over the age of 65 years. Future projects dealing with the cost of other institutions in relation to disease categories and subcategories will require greater attention and more pertinent data.

References

1. Canadian Institute for Health Information (2001). *National Health Expenditure Trends (NHEX)*, 1975-2000.
2. Statistics Canada (1999). *Residential Care Facilities (RCF) Survey (1997-98)*. Custom tabulations from the Canadian Institute of Health Information (CIHI).
3. Statistics Canada (1998). *National Population Health Survey (1996-97)*. (Custom tabulations)
4. Statistics Canada. *Instructions and Definitions. Residential Care Facilities (RCF) Survey*, 1999-2000.

20 Keeping in mind that of the estimated population, the ratio of females to males was 2.1:1.

Burden of Illness by Cost Component

Additional Direct Health Expenditures

Methods

The 1998 total for additional direct health expenditures comes directly from the *National Health Expenditure Trends (NHEX), 1975-2000.*(1) The three major areas of expenditure for additional direct health costs are other professionals (e.g. dentists and physiotherapists), other health spending (e.g. public health and health research), and capital expenditures (e.g. construction and machinery) (Appendix 2 for more information regarding what is included in these categories of expenditure).[21]

Additional direct health expenditures could not be attributed to the cost components of hospitals, drugs, physicians, and other institutions, and, with the exception of a portion of health research expenditures, neither could they be allocated by diagnostic category or subcategory.

The Canadian Institutes of Health Research (CIHR) produces a detailed database[22] on Canadian research projects.(2) For 1997/98, this database reported that a total of $459 million, or 43% of the NHEX total, was spent on health research. The information in this database was used to apportion 73% of these expenditures to the relevant area of research, assigning projects to an appropriate diagnostic category based on project title.

Limitations

- Generally, the available data did not allow for allocation by diagnostic category or subcategory.
- Data from the CIHR allowed the distribution of some research dollars by disease category. This represents less than one-half of the health research expenditures reported by NHEX.
- Expenditures on "other professionals" have not been allocated by diagnostic category because of the lack of information regarding the distribution of these expenditures. For example, it is difficult to determine what proportion of dental service expenditures could be linked to digestive diseases.

Results

NHEX reports that additional direct health expenditures totalled $24.2 billion in Canada in 1998. Nine percent of these costs represent capital expenditures (Table 9). The remainder is divided between other health professionals (42.3%) and other health spending (48.7%).

Other health professionals

As shown in Table 9, almost 85% of other health professional expenditures are accounted for by dental services (62.0%) and vision care (22.6 %). Physiotherapists, chiropractors, and others represent approximately 15% of the balance for other professionals.[23]

Other health spending

Other health spending accounts for $11.8 billion in additional direct health expenditures. Table 9 shows that public health expenditures make up over 40% of these expenditures and include the cost of measures to prevent the spread of communicable disease, food and drug safety, health inspections, health promotion activities, community mental health programs, public health nursing and all health department infrastructure costs (Appendix 2). Prepayment administration, defined as expenditures related to the cost of providing health insurance programs by government or private

21 This report examines the impact of illness and injury from a societal perspective. Disability payments such as those made under the Canada Pension Plan are considered a cost to government but are not included in the calculations since from a social perspective they are transfers of purchasing power to the individual from society (i.e. the taxpayers) in compensation for loss of production. Including transfer payments in the cost of illness would result in double counting, counting first the individual's loss of production and then the redistribution of society's resources that attempts to compensate the individual for that loss. Transfer payments have been excluded to avoid double counting of indirect costs. The cost of administration for these transfer payments, however, is included as part of additional direct costs.

22 It does not include grants from U.S. organizations spent in Canada.

23 These expenditures are outside of the hospital sector, however, expenditures for "other professionals" working in a hospital environment are accounted for under the hospital section of this document.

health insurance firms, accounts for just over 13% of other health spending (Appendix 2).

Table 9: Additional Direct Health Expenditures Not Classified by Diagnostic Category in Canada, 1998

Area of Expenditure	1998 Cost ($1,000,000)	% of Additional Direct	% of Subtotal for Area
Other Health Professionals			
Chiropractors	202.0	0.8	2.0
Dental Services	6,350.2	26.2	62.0
Physiotherapists	251.5	1.0	2.5
Vision Care	2,310.6	9.6	22.6
All Other Health Professionals	1,125.3	4.7	11.0
Subtotal	**10,239.6**	**42.3**	**100.0**
Other Health Spending			
Ambulance	1,017.0	4.2	8.6
Health Research	1,069.7	4.4	9.1
Home Care	1,488.5	6.2	12.6
Prepayment Administration	1,570.6	6.5	13.3
Public Health	4,882.9	20.2	41.5
All Other Health Expenditures	1,744.8	7.2	14.8
Subtotal	**11,773.5**	**48.7**	**100.0**
Capital	2,186.2	9.0	100.0
Total	**24,199.3**		**100.0**

Source: Canadian Institute for Health Information, National Health Expenditures Database 1997-1998.

Note: Due to rounding some discrepancies may occur.

Home care services make up almost 13% or $1.5 billion of other health spending. The definition of home care currently in use by the NHEX is based on the Organization for Economic Cooperation and Development (OECD) definition. It stipulates that only the health professional component of home care be included. The remaining portion of home care, commonly referred to as "home support", is considered a social service expenditure rather than a health expenditure and is therefore not included (see Appendix 2). Ambulance expenditures account for almost 9% of the total for other health spending.

Health research expenditures make up just over 9% ($1.1 billion) of other health spending. This does not include research carried out by hospitals or drug companies. However, hospital research is included under hospital care expenditures, and because a portion of drug company research spending is recovered in the price of drugs and other health products that result from this spending, it is therefore partially captured under the drug expenditure component of this report (see Appendix 2).

Table 10
Health Research Expenditures by Selected Diagnostic Category in Canada, 1998

Diagnostic Category	1998 Cost ($1,000,000)	% of Total
Birth Defects	3.5	0.3
Blood Diseases	5.9	0.6
Cancer	80.4	7.5
Cardiovascular Diseases	61.2	5.7
Digestive Diseases	11.5	1.1
Endocrine and Related Diseases	33.8	3.2
Genitourinary Diseases	9.1	0.9
Ill-defined Conditions	3.1	0.3
Infectious and Parasitic Diseases	22.3	2.1
Injuries	7.3	0.7
Mental Disorders	20.6	1.9
Musculoskeletal Diseases	14.3	1.3
Nervous System and Sense Organ Diseases	35.7	3.3
Perinatal Conditions	5.2	0.5
Pregnancy	3.5	0.3
Respiratory Diseases	14.4	1.3
Skin and Related Diseases	0.5	0.1
Well-patient Care	3.1	0.73
Others (1)	89.9	8.4
Unattributable (2)	644.4	60.2
Total	**1,069.7**	**100.0**

(1) Includes data that are grouped due to small counts, e.g. basic health services, health care delivery, and population health research.

(2) Includes research dollars that could not be allocated by ICD-9 code. Specifically, this includes health research expenditures of $644.4 million. This represents the difference between the National Health Expenditures in Canada total for health research expenditures ($1.1 billion) and the health research expenditures information that comes from the Canadian Institutes of Health Research (CIHR), AHRIS Database Version 4 ($458.5 million).

Note: Due to rounding some discrepancies may occur.

Burden of Illness by Cost Component

Health research as reported by 1997-98 CIHR AHRIS database

The NHEX total for health research in Canada is $1.1 billion (Table 9); only 43% could be distributed by diagnostic category. This information was derived from the 1997/98 CIHR AHRIS database.[2] Table 10 shows how these research expenditures are distributed by diagnostic category. Nearly one-third ($335 million of $1.1 billion) are distributed by diagnostic category.

On the basis of this distribution of research expenditures, the top five diagnostic categories in rank order are cancer, cardiovascular disease, nervous system and sense organ diseases, endocrine and related diseases, and infectious and parasitic diseases.

Distribution by province/territory

The distribution of additional direct health expenditures by province/territory is illustrated in Map 6. Ontario ($9.4 billion), Quebec ($4.8 billion), and British Columbia ($3.8 billion) account for nearly three-quarters of the total additional direct health expenditures in Canada. The cost per capita ranges from a low of $557 in Nova Scotia to a high of $2,351 in the Northwest Territories.

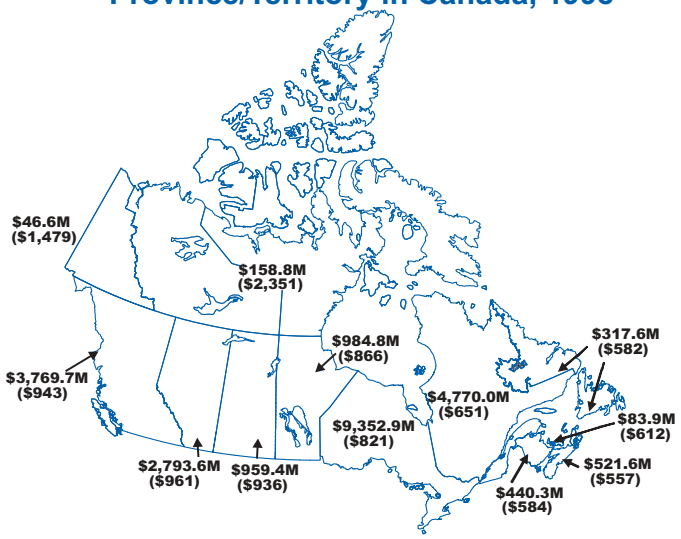
Considerations

- Further analysis of additional direct health expenditures should include consideration of trends and their possible linkages to health policy, particularly with respect to changes in the provision of health care services (e.g. sectors such as hospitals and home care services).
- Further study of the relatively low expenditure on professional psychologist services would aid decision-makers concerned with the delivery of mental health services. In addition to the personal and clinical significance of mental disorders, its monetary significance could be examined in greater detail.
- Future health research projects should include a national scan of organizations not included in the CIHR data.

References

1. Canadian Institute for Health Information (2000). *National Health Expenditure in Canada (NHEX)*, 1975-2000.
2. Canadian Institutes of Health Research. AHRIS: Automated Health Research Information System, Version 4.0 1997/98.

Map 6 – Additional Direct Health Expenditures by Province/Territory in Canada, 1998



Key: *Total Cost (M denotes $1,000,000)*
(Cost per Capita)

Indirect Costs

Mortality Costs

Methods

The human capital approach is used to estimate mortality costs in terms of the discounted present value of future production lost due to premature mortality. Future production is discounted because the future value of capital is less than its present worth.[1] Although the choice of an appropriate (if any) discount rate has been the subject of debate, a rate of 5% has been widely used in the literature.[2-4] This analysis was therefore conducted using a discount rate of 5%, with a sensitivity analysis performed, varying the discount rate from 0% to 7%.

Mortality-related production losses were estimated as the product of the number of deaths and the discounted present value of remaining potential lifetime production lost as a result of those deaths. Death counts were stratified by diagnostic category, sex, 5-year age group, and province/territory.[5] The discounted present value of remaining potential lifetime production was calculated for each 5-year age group and for sex (Appendix 4). This equation sums lost production in the year of death (1998) and all subsequent years that the individual would have been expected to live. The method accounts for age- and sex-specific rates of life expectancy,[6] average annual earnings,[7] workforce participation rates,[7] values of unpaid work, as well as labour productivity growth[8] and the discounting of future production.[1]

The average value of unpaid work in 1998 was calculated using the replacement cost generalist method. Calculations were made by age, sex, and province/territory. These average values were calculated using work force participation and time-use data from Statistics Canada's 1998 General Social Survey[9] together with an average wage rate. The wage rate was estimated from 1996 Census data,[10] projected to 1998 by means of an index of labour costs.[11]

The 1998 national average supplementary income rate[12] was added to the value of paid labour to account for wage supplements (CPP/QPP, worker's compensation, unemployment insurance funds). An annual labour productivity growth rate of 1.1% was chosen as this reflects Canadian historical rates over the last 10 years.[8] A sensitivity analysis was conducted, which varied labour productivity growth between the range of 0.0% and 1.3%.

The resulting calculation provides the discounted present value of lost production (earnings and value of housekeeping combined) by age, sex, diagnostic category, and province/territory.

Assumptions

- The 1997 survival pattern reflects 1998 survival and is therefore used to calculate 1998 life expectancy.[6]
- Average annual earnings in 1998 of all earners reflect future earnings.
- Mortality was evenly distributed throughout 1998, and the estimates of indirect costs incurred in 1998 due to premature mortality in 1998 are therefore calculated by dividing expected annual earnings in half.
- In the years following 1998, people would have worked and produced during their expected lifetime in accordance with the current patterns for their age group and sex.[1] No distinction is made between those in and out of the labour force at the time of death. The estimates of indirect costs incurred in post-1998 years due to premature mortality in 1998 are therefore calculated using total expected annual earnings for all years of expected life.
- There are no earnings between the ages of 0 and 14.

Burden of Illness by Cost Component

- No value of household work is accounted for between the ages of 0 and 14.
- The future earnings profile for an average individual follows the profile reported by Statistics Canada's 1997 Survey of Consumer Finances.[7]

Limitations

- Mortality costs are distributed across principal or main diagnostic categories only. Secondary or other diagnostic categories that may have contributed to mortality are not included in these results.
- Survival probabilities are averaged across 5-year time periods.
- Employment income and the value of unpaid work for children under 15 are not available and therefore not included in final estimates.
- Average earnings and the value of unpaid labour are estimated across 5-year age groups, up until the age of 85.
- Employment income and the value of unpaid work for adults aged 85 and over are not disaggregated because of sample size limitations.
- Production-adjusted contemporaneous age-earnings distributions are used as proxies for the age-earnings distribution for each age cohort.

Results

Using a 5% future discount rate, the discounted present value of future production lost due to premature mortality in 1998 is estimated to be $33.5 billion (Table 11), with a range of $32.1 billion to $33.8 billion based on labour productivity growth rates of 0.0% to 1.3%. A sensitivity analysis using discount rates from 0% to 7%, giving a range of $62.9 billion to $28.3 billion, is provided in Appendix 4.

Table 11
Mortality Costs by Diagnostic Category in Canada*, 1998

Diagnostic Category	1998 Cost ($1,000,000)	% of Mortality Costs
Birth Defects	357.8	*1.1*
Blood Diseases	93.1	*0.3*
Cancer	10,622.1	*31.7*
Cardiovascular Diseases	8,250.0	*24.6*
Digestive Diseases	1,134.3	*3.4*
Endocrine and Related Diseases	1,012.3	*3.0*
Genitourinary Diseases	319.7	*0.9*
Ill-defined Conditions	1,595.7	*4.8*
Infectious and Parasitic Diseases	755.2	*2.3*
Injuries	5,925.6	*17.7*
Mental Disorders	479.9	*1.4*
Musculoskeletal Diseases	125.7	*0.4*
Nervous System and Sense Organ Diseases	833.9	*2.5*
Perinatal Conditions	298.4	*0.9*
Pregnancy	12.3	*0.0*
Respiratory Diseases	1,646.8	*4.9*
Skin and Related Diseases	18.7	*0.1*
Total	**33,481.5**	***100.0***

** Present value of future production lost due to premature mortality based on 5% discount rate.*

Note: Due to rounding some discrepancies may occur.

Distribution by diagnostic category/ subcategory

The three diagnostic categories with the highest mortality costs are cancer, cardiovascular diseases, and injuries, which account for almost three-quarters of the total mortality costs (Table 11).

Burden of Illness by Cost Component

Table 12 shows that lung cancer accounts for more than one-quarter of mortality costs for cancer. The value of lost production due to premature mortality from cardiovascular diseases is primarily attributed to acute myocardial infarction (33.5%) and ischemic heart disease (25.2%).

Among injuries, the majority of mortality costs are accounted for by suicide (36.6%) and motor vehicle traffic accidents (26.3%).

Respiratory diseases ranked fourth in mortality costs in 1998 and account for nearly 5% of total mortality costs (Table 11). Table 12 shows that the majority of these costs are due to chronic obstructive pulmonary disease and allied conditions (46.8%) and by pneumonia and influenza combined (32.7%). Diabetes accounts for over 70% of the mortality costs attributed to endocrine and related diseases (Table 12).

Table 12
Mortality Costs by Selected Diagnostic Category/Subcategory in Canada*, 1998

Diagnostic Category/Subcategory	1998 Cost ($1,000,000)	% of Category Total	% of Total
Birth Defects			
Congenital CVD	168.3	47.0	0.5
All Other Dx Sub**	189.5	53.0	0.6%
Category Total	**357.8**	**100.0**	
Cancer			
Breast Cancer	1 062.8	10.0	3.2
Cervical Cancer	129.8	1.2	0.4
Colorectal Cancer	963.4	9.1	2.9
Lung Cancer	2,767.8	26.1	8.3
Prostate Cancer	305.3	2.9	0.9
All Other Dx Sub**	5,393.0	50.8	16.1
Category Total	**10,622.1**	**100.0**	
Cardiovascular Diseases			
Acute Myocardial Infarction (AMI)	2,764.3	33.5	8.3
Aortic Aneurysm	236.9	2.9	0.7
Ischemic Heart Disease (other than AMI)	2,081.5	25.2	6.2
Stroke (1)	1,255.4	15.2	3.7
All Other Dx Sub**	1,911.1	23.2	5.7
Category Total	**8,250.0**	**100.0**	
Endocrine and Related Diseases			
Diabetes	732.8	72.4	2.2
All Other Dx Sub**	279.5	27.6	0.8
Category Total	**1,012.3**	**100.0**	
Infectious and Parasitic Diseases			
HIV/AIDS	425.9	56.4	1.3
All Other Dx Sub**	329.3	43.6	1.0
Category Total	**755.2**	**100.0**	
Injuries			
Falls	211.2	3.6	0.6
MVTA	1,556.1	26.3	4.6
Self-Inflicted/Undetermined Poisoning (2)	639.5	10.8	1.9
Suicide	2,167.9	36.6	6.5
Unintentional Poisoning	446.0	7.5	1.3
All Other Dx Sub**	2,183.9	36.9	6.5
Category Total	**5,925.6**	100.0	
Nervous System and Sense Organ Diseases			
Alzheimer's (Disease)	131.9	15.8	0.4
All Other Dx Sub**	702.0	84.2	2.1
Category Total	**833.9**	**100.0**	
Respiratory Diseases			
COPD (other than asthma) (3)	770.7	46.8	2.3
Pneumonia/ Influenza	538.5	32.7	1.6
All Other Dx Sub**	337.6	20.5	1.0
Category Total	1,646.8	100.0	
All Other Dx Category	4,077.8		12.2
Total	**33,481.5**		100.0

** Present value of future production lost due to premature mortality based on a 5% discount rate.*

***All other diagnostic subcategories.*

(1) Stroke represents 99.6% of total cost for Cerebrovascular Disease (99.6% of $1.4 billion). The remaining $143.6 million (0.4%) represents Cerebrovascular Diseases other than Stroke.

(2) This group (E950-E952, E980-E982) overlaps with Suicide (E950-E959).

(3) Total cost for COPD is $840.3 million, which includes $69.6 million for asthma.

Note: Due to rounding some discrepancies may occur.

Burden of Illness by Cost Component

Distribution by sex

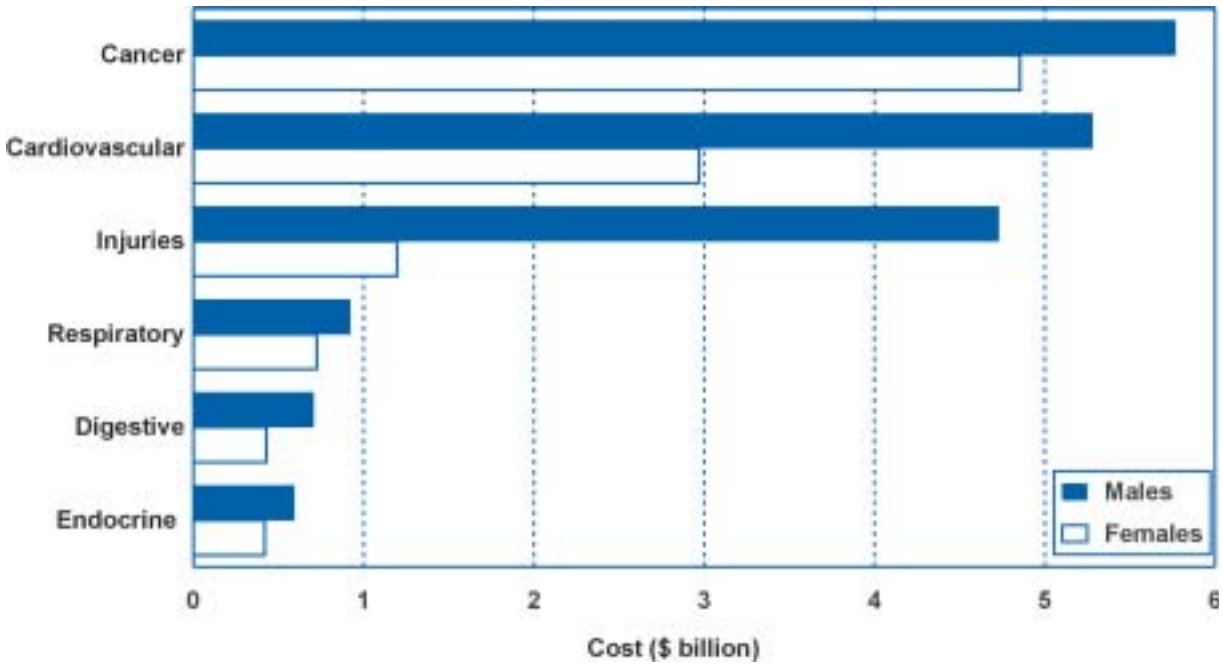
Males account for more than 60% of the total value of lost production due to premature mortality. Figure 10 shows that cancer is the top-ranking cause of lost production among both males and females. Cardiovascular diseases are second and injuries are third for both sexes.

Distribution by age group

Individuals who died between the age of 35 and 64 years account for about half of total mortality costs. The top ranking causes of lost production due to premature mortality in four broad age categories are perinatal conditions (ages 0-14 years), injury and poisoning (ages 15-34 years), neoplasms (ages 35-64 years), and respiratory diseases (ages 65+ years).

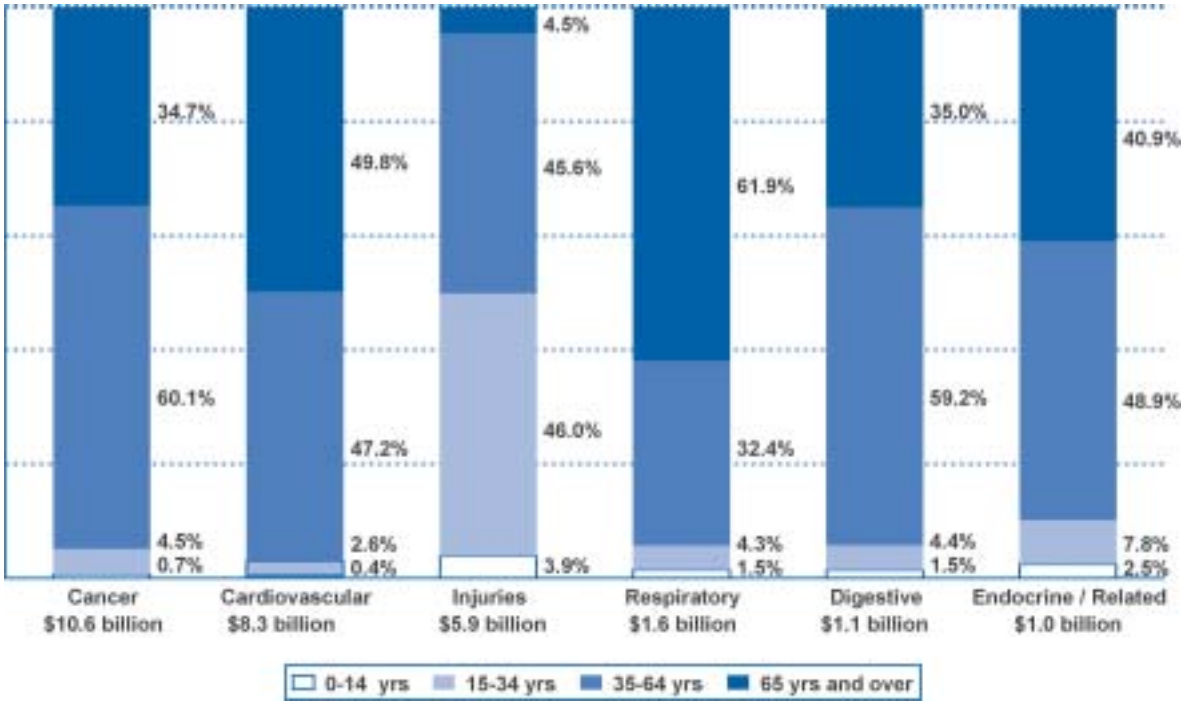
Figure 11 illustrates the mortality costs for the six largest diagnostic categories distributed by age. Seniors account for almost half of the mortality costs associated with cardiovascular diseases and more than half the mortality costs associated with respiratory diseases. Adults aged 35-64 years account for approximately 60% of the mortality costs associated with cancer and digestive diseases, and about half of the mortality costs associated with endocrine and related diseases. Adults aged 15-34 years and 34-65 years account for over 90% of the mortality costs associated with injuries.

Figure 10: Mortality Costs by Selected Diagnostic Category and Sex in Canada*, 1998



** Based on total mortality costs of $33.5 billion, (i.e. the present value of future production lost due to premature mortality using a 5% discount rate).*

Figure 11: Mortality Costs by Most Costly Diagnostic Categories and Age Group in Canada, 1998

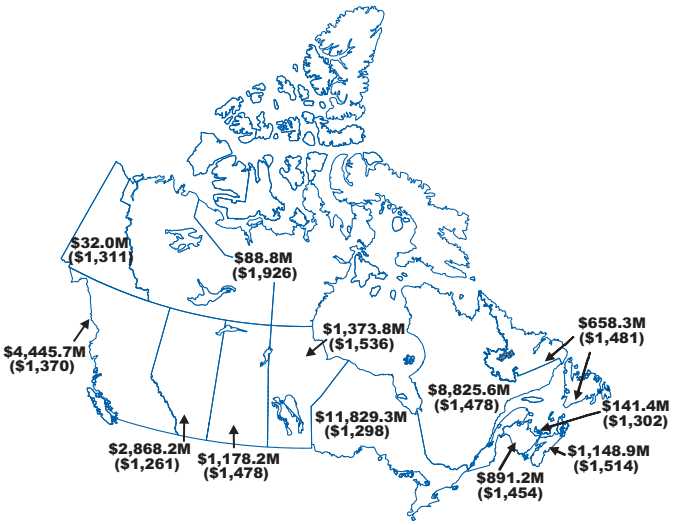


Note: Due to rounding some discrepancies may occur.

Distribution by province/territory

The distribution of total mortality costs by geographic region is as follows: Atlantic provinces 9%; Quebec 26%; Ontario 35%; Prairie provinces 16%; British Columbia 13%; and Northwest Territories and Yukon 1%. Map 7 illustrates the distribution of mortality costs by province/territory. Ontario ($11.8 billion), Quebec ($8.8 billion), and British Columbia ($4.4 billion) account for approximately 75% of total mortality costs for Canada. With the exception of the NWT, the per capita costs (for 1998 population over 15 years of age), however, are fairly similar (ranging from $1,261 in Alberta to $1,536 in Manitoba, with an average of $1,451).

Map 7 – Mortality Costs by Province/Territory in Canada, 1998



Key: *Total Cost (M denotes $1,000,000)*
(Cost per Capita based on 1998 population for ages 15+)

Burden of Illness by Cost Component

Considerations

The 1998 discounted present value of lost production due to premature mortality is $33.5 billion. Of the $33.5 billion in mortality costs, $13.5 billion represents paid labour and $20.1 billion represents our estimate of unpaid labour for those inside and outside the labour force (i.e. the imputed market value of household work). It is important to be aware of the fact that even though more refined data and methods for the calculation of mortality costs were used, these estimates are highly sensitive to the assumptions made in this chapter.

The apparent decrease in mortality costs from 1993 to 1998 could reflect changes in mortality rates and the distribution of the population, but the following differences in methods complicate comparisons between the two estimates.

As in 1993,[13] both loss of labour force and unpaid work resulting from premature mortality are estimated. For 1998, the calculation of remaining lifetime production has been refined to account for unpaid labour attributed to those who are in the labour force as well as those who are not.

The estimated value of lost production in 1998 is also affected by changes in the parameters used for estimation. The 1998 estimates use more recent survival probabilities, earnings, and unpaid labour valuations. In addition, a discount rate of 5% is used rather than the 6% used in EBIC 1993,[13] and this lower rate augments the estimate somewhat compared with 1993 methods. The 1998 estimates also use a higher supplementary income rate. In addition, supplementary income was not discounted in EBIC 1993, so that the net effect is a somewhat lower estimate than with the 1993 methods.

These mortality estimates include the discounted present value of future production losses as well as those occurring in the year of death. This represents a conventional approach to measuring lost production due to premature mortality. However, this approach has been challenged in recent years and should be given further consideration.[14]

The average annual labour productivity growth rate (LPGR) used is 1.1%. Based on the latest Statistics Canada historical estimates of annual labour productivity growth of a 1.1% per year average in the last 10 years,[7] this rate is conservative compared with the Conference Board of Canada's projected annual rate increase of 1.3% for the next 5 years.[15]

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Morbidity Costs Due to Long-term Disability

Methods

The value of production lost due to long-term disability in 1998 was calculated for both the household and institutionalized populations.

The household component of the 1996-97 National Population Health Survey (NPHS) provided the number of people who reported a long-term disability, by diagnostic category, age, sex, and province/territory.[1] Long-term disability is defined as the presence of a restriction of activity that has lasted or is expected to last at least 6 months. Weights for loss of production for different levels of disability were assigned to NPHS counts based on diagnosis-specific losses in autonomy, determined from data from the 1992-93 Quebec Health and Social Survey (QHSS)[2].[24] A weight of 0.8 was assigned to cases of long-term disability that were reported as very severe, 0.5 for somewhat severe, 0.3 for somewhat major, and 0.0 for minor (Appendix 5). These counts were further adjusted for diagnosis-specific average annual duration of disability, which was also obtained from the QHSS.[3]

The NPHS institutional component provides the number of people living in Canadian long-term health care facilities by age, sex, and cause of restriction of activities.[4,5] Loss of production weights were assigned according to restriction of activities as reported in the NPHS institutional component.[4] A weight of 0.8 was assigned to cases of long-term disability that were reported as very severe, and 0.3 for cases that were reported as minor (Appendix 5). Because the lost production weights are arbitrarily assigned, sensitivity analyses were performed to assess the impact of changes in disability weighting.

The adjusted household and institutional estimates of long-term disability were then multiplied by age- and sex-specific average values of paid and unpaid labour.[6,7] These age- and sex-specific values of labour were derived from average annual earnings,[6] the average supplementary income rate,[7] and a calculated estimate of the average value of unpaid work in 1998 (Methods section of the "Mortality Costs" chapter for more detail), all adjusted for the distribution of labour force and housekeeping participation rates.[6] The resulting products were then summed to yield the value of lost production due to long-term disability by age, sex, diagnosis, and province/territory.

Estimated long-term morbidity costs reflect only those losses occurring in 1998, and not in future years.

Assumptions

- Loss of production due to long-term disability is determined by the main health problem (ICD9-coded) causing restriction of activities as reported in the NPHS.
- Distribution of loss of autonomy and average annual duration of disability by diagnostic category obtained from the 1992-93 QHSS is representative of the Canadian household population in 1998.
- The estimated annual average length of stay in institutions from 1996-97 NPHS cross-sectional data is representative of the Canadian institutional population for 1998.
- People who are living with a disability and are in institutions are assumed to produce the same potential average annual economic output as those in the household population.
- Average annual earnings in 1998 of all earners provide a reasonable estimate of lost earnings.
- Labour force earnings have been adjusted for wage supplements. The 1998 supplementary income rate (14.05% ± 1.9% by province/territory) has been assumed to be the same for all age, sex, and geographic groups.

24 The QHSS defines long-term disability as the presence of a restriction of activity that is expected to last 100 days.

Limitations

- Morbidity costs due to long-term disability are based on principal diagnostic categories and do not permit an assessment of the impact of co-morbid conditions.
- Lost production weights have been arbitrarily assigned, and estimates are sensitive to changes in weights.
- Recent data for estimating disability-related production losses by principal diagnostic categories are not available.
- The value of production estimates for children less than 15 years of age is not available, and final estimates therefore do not include long-term morbidity costs for this age group.
- Average earnings and the value of unpaid labour are estimated across 5-year age groups, up until the age of 85 years.
- Employment income and the value of unpaid work for adults aged 85 years and over are not disaggregated because of sample size limitations.
- Applying the distribution of long-term disability by diagnostic category as reported in the QHSS to the NPHS distributions of long-term disability may introduce bias to the estimates. The 1992-93 QHSS data may not be representative of the 1998 Canadian population.
- Although the QHSS definition of long-term disability is slightly different from the NPHS (3 month vs. 6 months), the actual average duration of disability across all disease categories in the QHSS was quite high (approximately 11 months).
- The diagnostic categories "Complications of Pregnancy" and "Perinatal Conditions" are not given separately and are included in the "Others" category because low cell counts from the NPHS data do not permit reporting.
- Tabulations for the institutional component of the NPHS are not available by province/territory.
- The coding system used for musculoskeletal conditions in the NPHS does not permit sufficient differentiation of conditions that may be primarily due to injury and not an arthritic condition.
- While forgone time from the labour market is captured in the indirect costs of particular illnesses, the loss of schooling time is not considered in this study. Future income opportunities associated with the occurrence of illness that results in lost schooling time are also not considered.

Results

The estimated value of production lost due to long-term disability in 1998 is $32.2 billion. Of this total, $1.9 billion is attributed to the institutionalized population.

If mid-point estimates for lost production weights had been used, as in EBIC 1993,[8] estimated production losses due to long-term disability would be $37.6 billion; if the highest lost production weights for a given level of severity had been used, this total estimate would be $42.9 billion.

Distribution by diagnostic category/ subcategory

Musculoskeletal diseases are the leading cause of disability, accounting for about 39% of long-term disability costs ($12.6 billion), followed by diseases of the nervous system (12.9%, $4.2 billion), cardiovascular diseases (9.8%, $3.2 billion), mental disorders (7.0%, $2.2 billion), injuries (5.7%, $1.8 billion), and respiratory diseases (3.1%, $1.0 billion) (Table 13).

Burden of Illness by Cost Component

Table 13
Morbidity Costs due to Long-Term Disability by Diagnostic Category in Canada, 1998

Diagnostic Category	1998 Cost ($1,000,000)	% of Total
Birth Defects	172.4	0.5
Blood Diseases	103.2	0.3
Cancer	962.3	3.0
Cardiovascular Diseases	3,151.5	9.8
Digestive Diseases	487.5	1.5
Endocrine and Related Diseases	815.7	2.5
Genitourinary Diseases	166.3	0.5
Ill-defined Conditions	1,485.2	4.6
Infectious and Parasitic Diseases	268.8	0.8
Injuries	1,833.7	5.7
Mental Disorders	2,246.8	7.0
Musculoskeletal Diseases	12,597.0	39.1
Nervous System and Sense Organ Diseases	4,155.3	12.9
Respiratory Diseases	985.1	3.1
Skin and Related Diseases	122.2	0.4
Well-patient Care (1)	1,821.9	5.7
Others (2)	683.8	2.1
Unattributable (3)	120.0	0.4
Total	32,178.7	100.0

(1) Includes observations where the period of disability could not be attributed to a specific illness or injury, e.g., period of disability related to health service use (being visited in home in relation to recovery), or period of disability related to a factor that influences general health status (alcohol/drug abuse).

(2) Includes diagnostic categories with cell counts too small to report, including complications of pregnancy and perinatal conditions.

(3) Includes observations for which disability was not specified.

Note: Due to rounding some discrepancies may occur.

Of the musculoskeletal conditions, arthritis accounts for more than one-quarter of long-term disability costs. Hearing and sight disorders account for over 30% of nervous system related conditions. About 13% of cardiovascular-related long-term disability costs are attributed to stroke. Nineteen percent of costs associated with mental disorders are due to depressive disorder, 69% of respiratory-related costs are due to asthma, and 65% of endocrine disorder-related costs are due to diabetes (Table 14).

Table 14
Morbidity Costs due to Long-Term Disability by Selected Diagnostic Category/Subcategory in Canada*, 1998

Diagnostic Category/Subcategory	1998 Cost ($1,000,000)	% of Category Total	% of Total
Cardiovascular Diseases			
AMI	221.3	7.0	0.7
CereVD (other than Stroke)	71.8	2.3	0.2
IHD other than AMI	346.6	11.0	1.1
Stroke	415.7	13.2	1.3
All Other Dx Sub**	2,096.0	66.5	6.5
Category Total	**3,151.5**	**100.0**	
Endocrine and Related Diseases			
Diabetes	529.1	64.9	1.6
All Other Dx Sub**	286.6	35.1	0.9
Category Total	**815.7**	**100.0**	
Mental Disorders			
Depressive Disorder	425.2	18.9	1.3
All Other Dx Sub**	1,821.6	81.1	5.6
Category Total	**2,246.8**	**100.0**	
Musculoskeletal Diseases			
Arthritis	3,375.5	26.8	10.5
Back and Spine	4,722.8	37.5	14.7
Hips	173.8	1.4	0.5
Lower Limbs	1,411.0	11.2	4.4
Upper Limbs	857.2	6.8	2.7
All Other Dx Sub**	2,056.7	16.3	6.4
Category Total	**12,597.0**	**100.0**	
Nervous System and Sense Organ Diseases			
Alzheimer's (Disease) (1)	178.2	4.3	0.5
Hearing disorders	685.0	16.5	2.1
Sight disorders	633.2	15.2	2.0
All Other Dx Sub**	2,658.9	64.0	8.3
Category Total	**4,155.3**	**100.0**	

Burden of Illness by Cost Component

Diagnostic Category/Subcategory	1998 Cost ($1,000,000)	% of Category Total	% of Total
Respiratory Diseases			
Asthma	679.3	69.0	2.1
COPD (other than asthma)	160.8	16.3	0.5
All Other Dx Sub**	145.0	14.7	0.4
Category Total	985.1	100.0	
All Other Dx Category	7,468.6	23.2	
Others	120.0	0.4	
Unattributable	683.8	2.1	
Total	32,178.7		100.0

** Only those subcategories with sufficient cell counts (NPHS) could be estimated.*
*** All other diagnostic subcategories.*

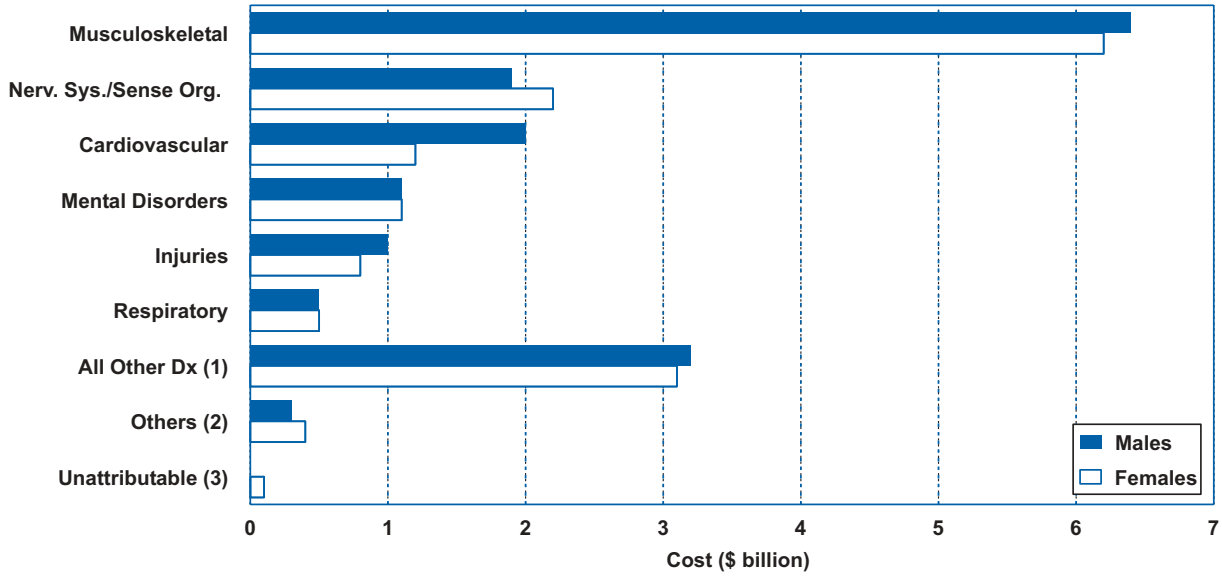
(1) Alzheimer's could not be estimated from the NPHS Household Survey; this estimate represents the institutionalized population only.

Note: Due to rounding some discrepancies may occur.

Distribution by sex

Figure 12 shows that musculoskeletal diseases, diseases of the nervous system, and cardiovascular diseases are the three leading causes of long-term disability for both men and women. Disability costs for musculoskeletal diseases, cardiovascular diseases, and injuries are higher for men, and those for diseases of the nervous system are higher for women. Disability costs for mental disorders and respiratory disease are approximately the same for men and women.

Figure 12: Morbidity Costs due to Long-term Disability by Diagnostic Category and Sex in Canada*, 1998



** Based on total long-term disability costs of $32.2 billion.*

(1) Refers to all other diagnostic categories.

(2) Refers to data for which coding was not provided, or data that are grouped due to small counts. For more details see Table 2, third footnote.

(3) Refers to data that could not be allocated by ICD-9 code. For more details see Table 2, fourth footnote.

Note: Due to rounding some discrepancies may occur.

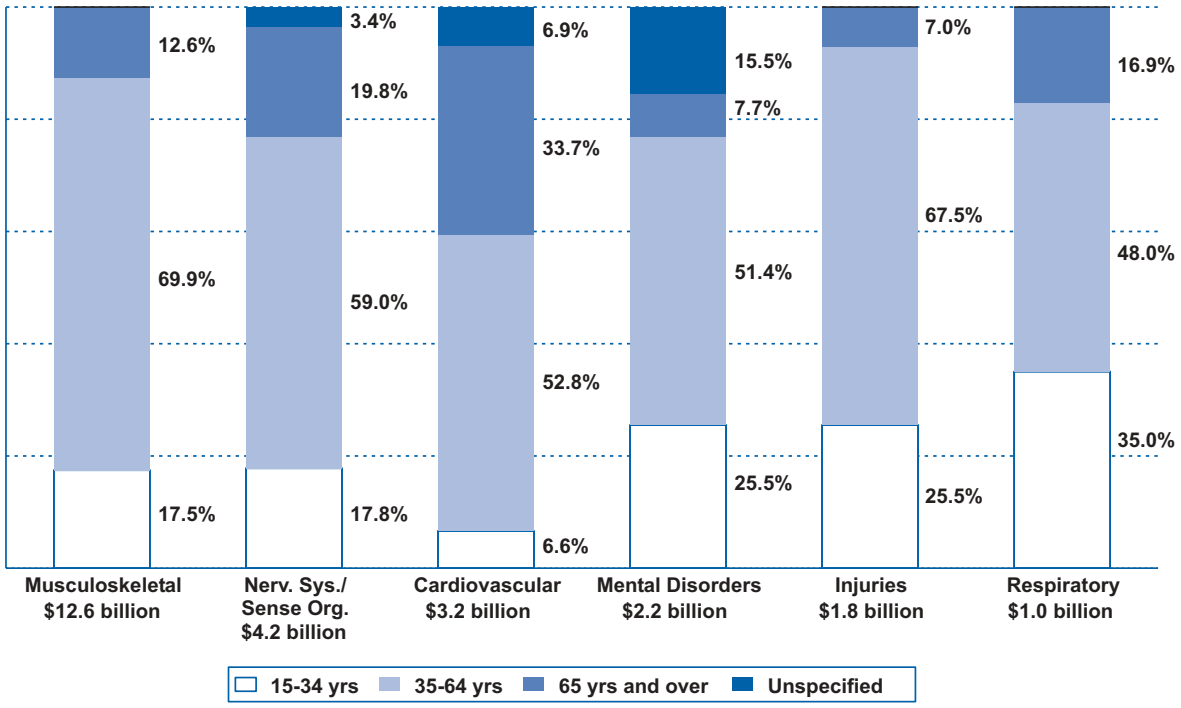
Burden of Illness by Cost Component

Distribution by age group

Almost two-thirds of long-term disability costs are attributed to the 35-64 age group. Musculoskeletal conditions ranked first as the main cause of long-term disability costs for all age groups combined. For the 35-64 age group, nervous system diseases, cardiovascular diseases, and injuries followed in ranking. In the 15-34 age group, nervous system-related conditions, mental disorders, and injuries followed in ranking. Finally, cardiovascular conditions, nervous system conditions, and injuries respectively followed musculoskeletal conditions as the leading causes of long-term disability costs for seniors.

Figure 13 illustrates the long-term disability costs for the six largest diagnostic categories distributed by age. Seniors account for over a third of the long-term disability costs for cardiovascular diseases. Adults aged 35-64 years account for over half the long-term disability costs in each of the five largest diagnostic categories (musculoskeletal diseases, nervous system diseases, cardiovascular diseases, mental disorders, and injuries), and almost half of the long-term disability costs associated with respiratory diseases. Adults aged 15-35 years account for more than a quarter of the long-term disability costs for mental disorders, injuries, and respiratory diseases.

Figure 13: Morbidity Costs due to Long-term Disability by Most Costly Diagnostic Category and Age Group in Canada, 1998

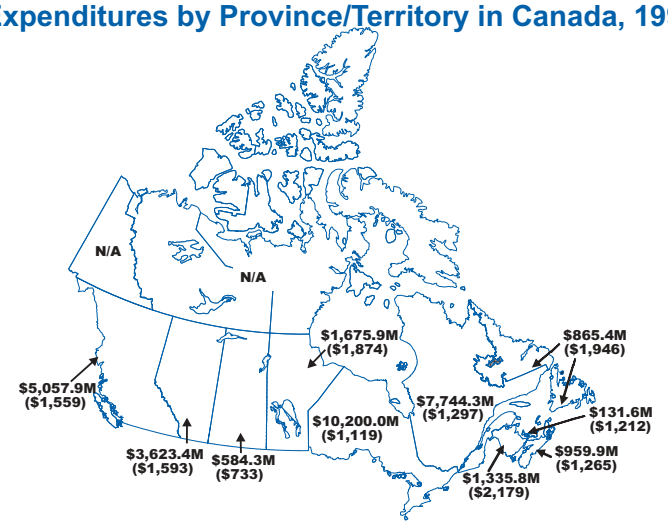


Note: Due to rounding some discrepancies may occur.

Distribution by province/territory

The distribution of long-term disability costs by region (for household population only) is as follows: Atlantic provinces 10%; Quebec 24%; Ontario 32%; Prairie provinces 18%; British Columbia 16%. Map 8 illustrates the distribution of long-term disability costs by province (data not available for the territories). Ontario ($10.2 billion), Quebec ($7.7 billion), and British Columbia ($5.1 billion) account for approximately 70% of total morbidity costs due to long-term disability. With the exception of Saskatchewan, Newfoundland and New Brunswick, per capita costs (based on 1998 population over 15 years of age), are fairly similar, ranging from $1,119 in Ontario to $1,874 in Manitoba (with an average of $1,417).

Map 8 – Morbidity Costs Due to Long-Term Disability Expenditures by Province/Territory in Canada, 1998



Key: Total Cost (M denotes $1,000,000)
(Cost per Capita – based on 1998 population for ages 15+)

Considerations

Differences between estimates reported in EBIC 1993[8] and EBIC 1998 are affected by the reported prevalence of activity limitation in the NPHS, which varies between versions and cycles.

Compared with EBIC 1993[8], the 1998 long-term disability estimates also differ as a result of the following factors:

- lost production weights used;
- earnings estimates;
- distinction between those in and out of the workforce is made in estimating unpaid labour; and
- lost production weights calculated and assigned by diagnostic category rather than by age.

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Morbidity Costs Due to Short-term Disability

Methods

The value of production lost due to short-term disability in 1998 was calculated for the household population of the 1996-97 National Population Health Survey (NPHS).[1]

For the purposes of this report, short-term disability is defined as the presence of a restriction of activity that has lasted or is expected to last less than 6 months. The NPHS captures short-term disability in terms of the "number of days spent in bed" and "days cut down on things" over the previous 2-week period. The distribution of short-term disability was imputed over the year based on the disability reported in the NPHS 2-week period[25].

The NPHS distribution of days of reported reduced activity over the previous 2-week period was available by age group, sex, and province/territory. Weights were assigned to the two levels of activity reduction to account for respective losses in production (Appendix 5). A weight of 0.8 was assigned to the proportion of potential daily production lost for days reported as spent in bed. A weight of 0.5 was assigned to the proportion of potential daily production that was lost for days of reported reduced activity. A sensitivity analysis on the final cost estimates was conducted using weights of 0.8 to 1.0 for production loss due to days spent in bed.

The distribution of the number of days spent in bed and days cut down by primary diagnostic category was obtained from the 1992-93 Quebec Health and Social Survey (QHSS)[2] and applied to the distributions obtained from the NPHS. The QHSS distributions were applied to the NPHS data according to age and sex.

To estimate the value of lost production due to short-term disability by diagnostic category, province/territory, age, and sex, the resulting distributions of disability-adjusted days of reduced activity were then multiplied by age- and sex-specific estimates of average daily paid labour (adjusted for wage supplements), and average daily value of unpaid labour.[3,4]

Age and sex-specific average values of paid and unpaid labour were derived from average annual earnings,[3] the average supplementary income rate,[4] and a calculated estimate of the average value of unpaid work in 1998 (Methods section of "Mortality Cost" chapter for more details), all adjusted for the distribution of labour force and housekeeping participation rates.[3]

Assumptions

- The QHSS distribution of days lost due to short-term disability by diagnostic category reflects that of the Canadian population. Quebec represents 24.2% of the Canadian population.
- The 2-week short-term disability captured in NPHS is representative of any 2-week period in the year.
- Average annual earnings in 1998 of all earners provide a reasonable estimate of lost earnings.
- Labour force earnings have been adjusted for wage supplements. The 1998 supplementary income rate (14.05% ± 1.9% by province/territory) has been assumed to be the same for various age, sex, and geographic groups.

Limitations

- Morbidity costs due to short-term disability are based on primary diagnosis and do not permit an assessment of the impact of co-morbid conditions.
- The value of production estimates are not available for children (less than 15 years of age). A large proportion of reported short-term disability occurs in children under 15 years of age; however, no losses of production can be accounted for in this age group because of the lack of value of labour estimates.

25 Disability lasting between 2 weeks and 6 months is not captured because this information was not available at the time of the study.

Burden of Illness by Cost Component

- Average earnings and the value of unpaid labour are estimated across 5-year age groups, up until the age of 85 years.
- Employment income and the value of unpaid work for adults aged 85 years and over are not disaggregated because of sample size limitations.
- Applying the distribution of short-term disability by diagnostic category as reported in the QHSS to the NPHS distributions of short-term disability may introduce bias to the estimates. The 1992-93 QHSS data may not be representative of the 1998 Canadian population.
- Disability lasting between 2 weeks and 6 months is not captured because this information was not available at the time of the study. This may result in an underestimate of morbidity costs due to short-term disability.
- Provincial/territorial trends in short-term disability costs cannot be explored, as all distributions by diagnostic category are assumed to follow that of Quebec.
- The impact of short-term disability may be underestimated because all individuals reporting long-term disability in the NPHS and the QHSS are excluded from the analysis.
- Weights for losses in production have been arbitrarily assigned, and estimates are sensitive to changes in weights.
- Although forgone time from the labour market is captured in the indirect costs of particular illnesses, the loss of schooling time is not considered in this study. Future income opportunities associated with the occurrence of illness that results in lost schooling time are also not considered.
- The costs associated with reduced production during work hours due to a health problem (or "presenteeism") are not captured.

Results

The total production lost due to short-term disability is estimated to be $9.8 billion in 1998. The sensitivity analysis, which varied the lost production weights for days spent in bed, yields estimates of $10.3 billion using a weight of 0.9, and $10.7 billion using a weight of 1.0.

Distribution by diagnostic category and subcategory

Table 15 shows that the three leading causes of disability are respiratory diseases ($2.4 billion, 24.8%), injuries ($1.8 billion, 17.9%), and musculo- skeletal diseases ($1.0 billion, 10.3%). Together, these three diagnostic categories account for more than half of total short-term disability costs in 1998.

Table 15
Morbidity Costs due to Short-Term Disability by Diagnostic Category in Canada*, 1998

Diagnostic Category	1998 Cost ($1,000,000)	% of Total
Blood Diseases	48.8	0.5
Cancer	173.6	1.8
Cardiovascular Diseases	253.3	2.6
Digestive Diseases	692.4	7.0
Endocrine and Related Diseases	51.7	0.5
Genitourinary Diseases	430.5	4.4
Ill-defined Conditions	836.1	8.5
Infectious and Parasitic Diseases	188.3	1.9
Injuries	1,753.0	17.9
Mental Disorders	463.9	4.7
Musculoskeletal Diseases	1,010.2	10.3
Nervous System and Sense Organ Diseases	489.0	5.0
Perinatal Conditions	0	0.0
Pregnancy	378.5	3.9
Respiratory Diseases	2,437.8	24.8
Skin and Related Diseases	47.4	0.5
Well-patient Care	553.0	5.6
Unattributable (1)	11.9	0.1
Total	**9,819.4**	**100.0**

* *Annual value of lost productivity.*

(1) Includes observations for which disability was not specified.

Note: Due to rounding some discrepancies may occur.

Burden of Illness by Cost Component

Table 16 shows that over 70% of short-term disability costs related to respiratory diseases are for pneumonia and influenza combined ($1.8 billion). Depressive disorders account for about one-quarter of mental disorders ($0.12 billion), and arthritis accounts for approximately 10% of musculoskeletal diseases ($0.11 billion).

Table 16: Morbidity Costs due to Short-Term Disability by Selected Diagnostic Category/Subcategory in Canada*, 1998

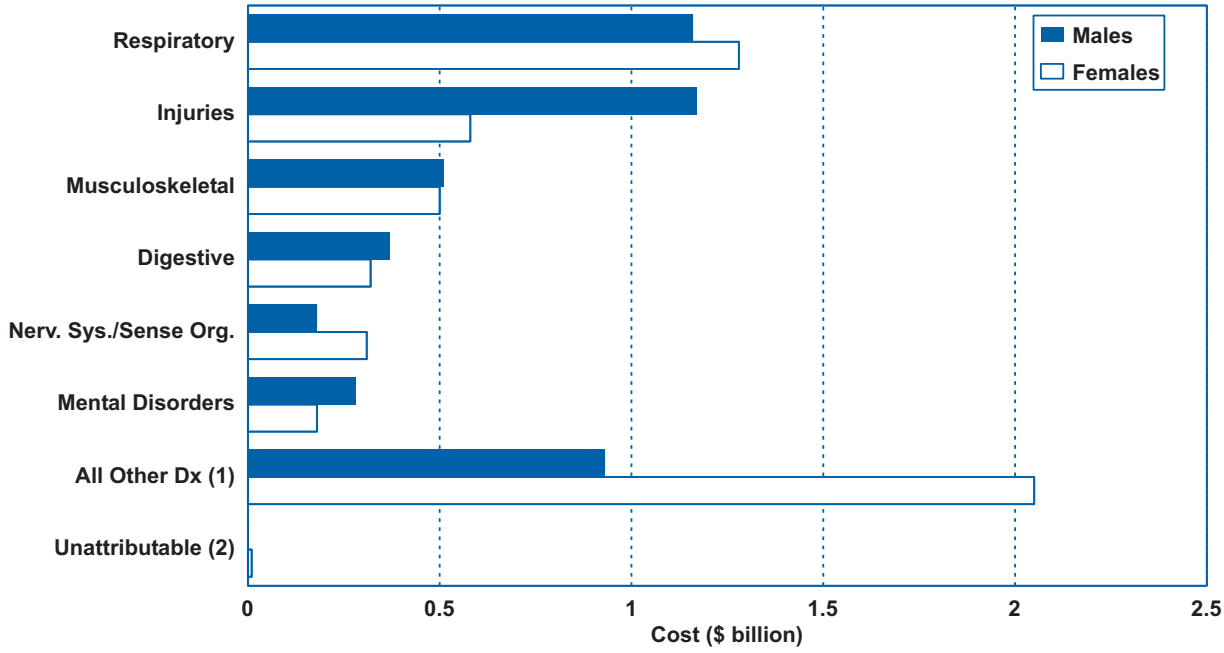
Diagnostic Category/Subcategory	1998 Cost ($1,000,000)	% of Category Total	% of Total
Mental Disorders			
Depressive Disorder	118.0	25.4	1.2
All Other Dx Sub	345.9	74.6	3.5
Category Total	463.9	100.0	
Musculoskeletal Diseases			
Arthritis	105.3	10.4	1.1
All Other Dx Sub	904.9	89.6	9.2
Category Total	1,010.2	100.0	
Respiratory Diseases			
Acute Respiratory Infections	243.2	10.0	2.5
COPD	271.7	11.1	2.8
Pneumonia/Influenza	1,763.3	72.3	18.0
All Other Dx Sub	159.6	6.5	1.6
Category Total	2,437.8	100.0	
All Other Dx Category	5,895.6	60.0	
Others	0.0	0.0	
Unattributable	11.9	0.1	
Total	9,819.4		100.0

** Only those subcategories with sufficient cell counts (NPHS) could be estimated.*
Note: Due to rounding some discrepancies may occur.

Distribution by sex

For the top six causes of short-term disability, costs are higher for females with respiratory and nervous system diseases. Short-term disability costs related to injuries for males are double the costs for females (Figure 14).

Figure 14: Morbidity Costs due to Short-term Disability by Diagnostic Category and Sex in Canada*, 1998



** Based on total short-term disability costs of $9.8 billion.*

(1) Refers to all other diagnostic categories.

(2) Refers to data that could not be allocated by ICD-9 code. For more details see Table 2, fourth footnote.

Burden of Illness by Cost Component

Distribution by age group

As illustrated in Figure 15, in each of the top six major diagnostic categories, at least half of the total short-term disability costs are in the 35-64 age group.

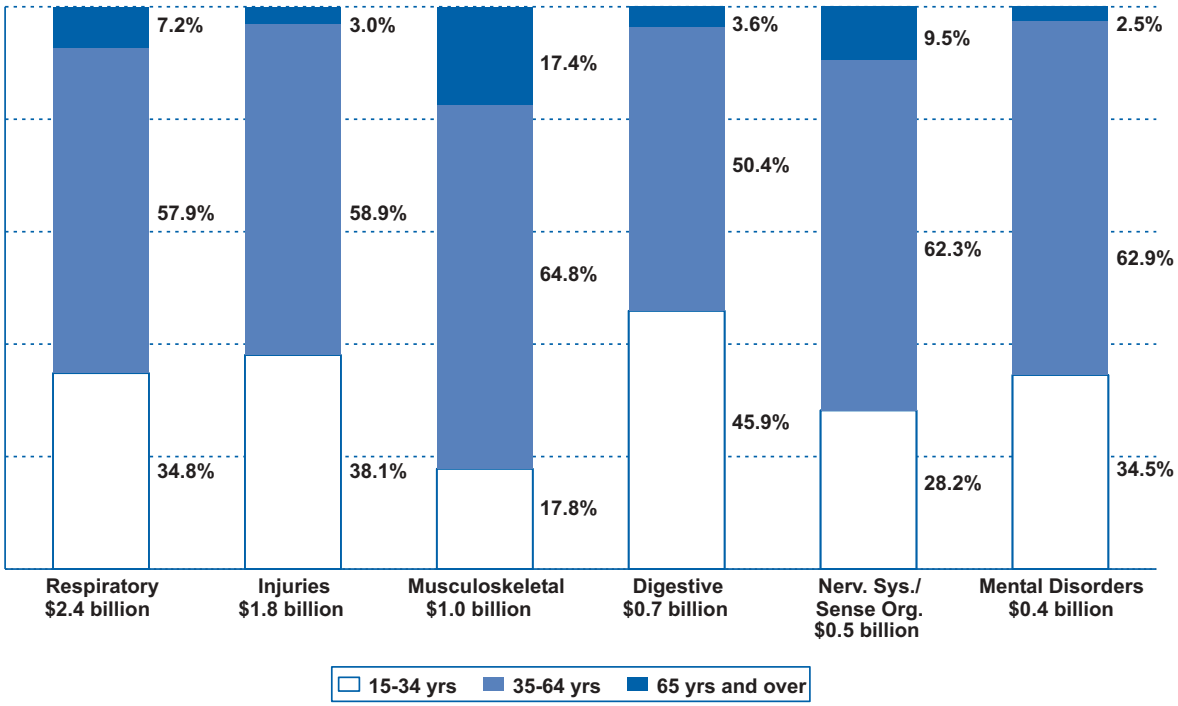
Distribution by province/territory

Map 9 illustrates the distribution of short-term disability costs by province (data for territories not available). Ontario ($4.1 billion), Quebec ($1.7 billion), and British Columbia ($1.6 billion) account for about three-quarters of total short-term disability costs in Canada. Per capita costs (based on 1998 population over 15 years of age), however, are fairly similar, ranging from a low of $212 in Saskatchewan to a high of $541 in Manitoba (with an average of $395).

Map 9 – Morbidity Costs due to Short-Term Disability Expenditures by Province/Territory in Canada, 1998

Key: *Total Cost (M denotes $1,000,000)*
(Cost per Capita – based on 1998 population for ages 15+)

Figure 15: Morbidity Costs due to Short-term Disability by Most Costly Diagnostic Category and Age Group in Canada, 1998



Note: Due to rounding some discrepancies may occur.

Considerations

EBIC 1993[5] estimated the value of lost production due to short-term disability to be $17.5 billion. A comparison of the two analyses suggests that the main reasons for the differences in estimates are the respective analytic approaches used, and a possible double counting of some "cut-down days" in the former analysis.

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Discussion

The *Economic Burden of Illness in Canada, 1998* (EBIC 1998) provides an overview of the methods and results of a national cost-of-illness analysis that estimates the burden of illness and injury for Canadian society.

With the exception of mortality costs, a prevalence-based approach is used to estimate all direct and indirect costs that accrue to existing (or prevalent) cases of illness, injury, or disability in 1998. For mortality costs, an incidence-based human capital approach was used. This approch is most commonly used in cost-of-illness studies. These approaches made the best use of the survey and administrative data that are available for calculating core direct and indirect costs, and in turn, for distributing these costs across primary diagnostic categories. While these diagnostic categories are clearly defined and mutually exclusive (according to ICD-9 chapters), subcategories were grouped to reflect diseases that are of interest to Health Canada program areas or non-government agencies. This creates some difficulties in presenting data in logical, mutually exclusive groups and needs to be taken into consideration when interpreting the results.

Building on the experience gained from the two previous versions (EBIC 1993 and EBIC 1986), specific innovations in EBIC 1998 include the following: the addition of many diagnostic subcategories; additional information by age, sex, and province/territory/region; more complete, standardized, and validated health care utilization data for the direct costs; and more refined data and methods for the calculation of indirect costs (for examples see Considerations sections in indirect cost chapters). Although more refined methods have been used to estimate indirect costs, it is important to recognize that these estimates are based on a certain number of assumptions that affect the resulting estimates. In order to capture the effects of these assumptions, some sensitivity analyses were used to illustrate the possible range of indirect cost estimates.

Economic burden of illness over time

In this cost-of-illness study, the total cost of illness in Canada in 1998 is estimated to be $159.4 billion: $84.0 billion in direct costs and $75.5 billion in indirect costs. Based on the results of EBIC 1986, 1993, and 1998, the burden of illness in Canada (in 1998 constant dollars) appears to have increased by $32 billion (23.8%) between 1986 and 1993, and decreased by $7.9 billion (4.7%) between 1993 and 1998. The decrease in total cost between 1993 and 1998 is due primarily to changes in the way long- and short-term disability costs were calculated (Table 17 and Figure 16).

Direct costs in constant dollars increased by approximately $6.7 billion (9.6%) between 1986 an 1993, and by $7.4 billion (9.7%) between 1993 and 1998. Indirect costs increased significantly between 1986 and 1993 ($25.5 billion, 39.0%), and decreased by $15.3 billion (16.9%) between 1993 and 1998. This increase in direct and decrease in indirect costs between 1993 and 1998 is primarily explained by an increase in direct health expenditures, particularly for prescription drugs and physician care, and a decrease in indirect costs due to changes in the way long- and short-term disability costs were calculated.

These comparative analyses must be interpreted with caution because of the changes and improvements in the data and methods from one version of EBIC to another, in particular for drug costs and morbidity costs due to long- and short-term disability (further details can be found in the respective chapters of this document). It is important to note, however, that even with these changes, the relative cost of illness and injury remained stable over time. At the national level, four diagnostic categories consistently represent the most significant burden of illness and injury. These categories are cardiovascular diseases, cancer, musculoskeletal diseases, and injuries. Cardiovascular diseases consistently represent the number one burden of illness in all three versions of EBIC. Respiratory diseases ranked in the top five in both 1993 and 1998 versions of EBIC.

Table 17
Economic Burden of Illness for Selected Diagnostic Categories by Cost Component in Canada, 1986, 1993, 1998* (in 1998 $1,000,000)**

Diagnostic Category	Costs 1986**			Costs 1993**			Costs 1998**		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Birth Defects	260.0	493.6	**753.6**	325.7	356.4	**682.1**	175.8	530.2	**706.0**
Blood Diseases	262.8	272.5	**535.3**	292.4	184.6	**477.0**	213.4	245.1	**458.5**
Cancer	2,779.9	9,936.7	**12,716.4**	3,436.9	10,502.8	**13,939.7**	2,462.4	11,758.0	**14,220.4**
Cardiovascular Diseases	7,243.2	16,181.5	**23,424.7**	7,845.5	13,193.7	**21,039.2**	6,818.1	11,654.8	**18,472.9**
Digestive Diseases	3,000.8	2,144.2	**5,145.0**	3,548.4	3,116.1	**6,664.4**	3,540.0	2,314.2	**5,854.2**
Endocrine and Related Diseases	1,136.1	1,507.3	**2,643.4**	1,422.7	2,225.2	**3,647.9**	1,584.6	1,879.7	**3,464.3**
Genitourinary Diseases	2,048.2	321.2	**2,369.4**	2,398.1	838.3	**3,236.4**	2,597.3	916.5	**3,513.8**
Ill-defined Conditions (1)	1,902.2	7,425.4	**9,327.6**	1,974.3	2,685.0	**4,659.3**	1,760.3	3,917.0	**5,677.3**
Infectious and Parasitic Diseases	610.4	216.9	**827.3**	839.2	1,980.7	**2,819.9**	909.0	1,212.3	**121.3**
Injuries	6,428.4	8,884.1	**15,312.5**	3,330.1	11,971.3	**15,301.4**	3,224.8	9,512.3	**12,737.1**
Mental Disorders	3,709.9	1,823.0	**5,532.9**	5,388.9	2,973.4	**8,362.2**	4,680.8	3,190.7	**7,871.5**
Musculoskeletal Diseases	2,526.6	8,935.5	**11,462.1**	$2 624.1	16,352.3	**18,976.4**	2,648.4	13,732.8	**16,381.2**
Nervous System/Sense Organ Diseases	2,993.8	2,052.4	**5,046.2**	$2 402.0	7,810.3	**10,212.3**	2,822.5	5,478.2	**8,300.7**
Perinatal Conditions	190.5	407.4	**597.9**	$588.1	354.0	**942.1**	305.8	298.4	**604.2**
Pregnancy	2,388.9	4.2	**2,393.1**	2,159.9	736.3	**2,896.2**	1,297.1	390.8	**1,687.9**
Respiratory Diseases	3,388.7	4,541.5	**7,930.2**	4,040.4	8,954.0	**12,944.5**	3,461.4	5,069.7	**8,531.1**
Skin and Related Diseases	1,015.1	169.6	**1,184.7**	951.4	130.5	**1,081.9**	1,474.3	188.3	**1,662.6**
Well-patient Care	2,326.3	0.0	**2,326.3**	2,924.0	0.0	**2,924.0**	2,623.3	2,374.9	**4,998.2**
Sub-Total	**44,211.6**	**65,317.0**	**109,528.6**	**46,492.1**	**84,364.9**	**130,857.0**	**42,599.3**	**74,663.9**	**117,263.2**
Others (2)	426.9	N/A	**426.9**	585.5	6,443.7	**7,029.2**	3,221.5	683.8	**3,905.3**
Unattributable (3)	25,152.4	N/A	**25,152.4**	29,443.6	N/A	**29,443.6**	38,134.1	131.9	**38,266.0**
Total	**69,790.9**	**65,317.0**	**135,107.9**	**76,521.2**	**90,808.6**	**167,329.8**	**83,954.9**	**75,479.6**	**159,434.5**

**Comparisons of results from different years should be used with caution since different methodologies were used to calculate these results.*

***1986 and 1993 dollars are adjusted for inflation (converted to 1998 dollars) using the 1986 Consumer Price Index (CPI) (78.1), the 1993 CPI (101.8), and the 1998 CPI (108.6), as provided by Statistics Canada.*

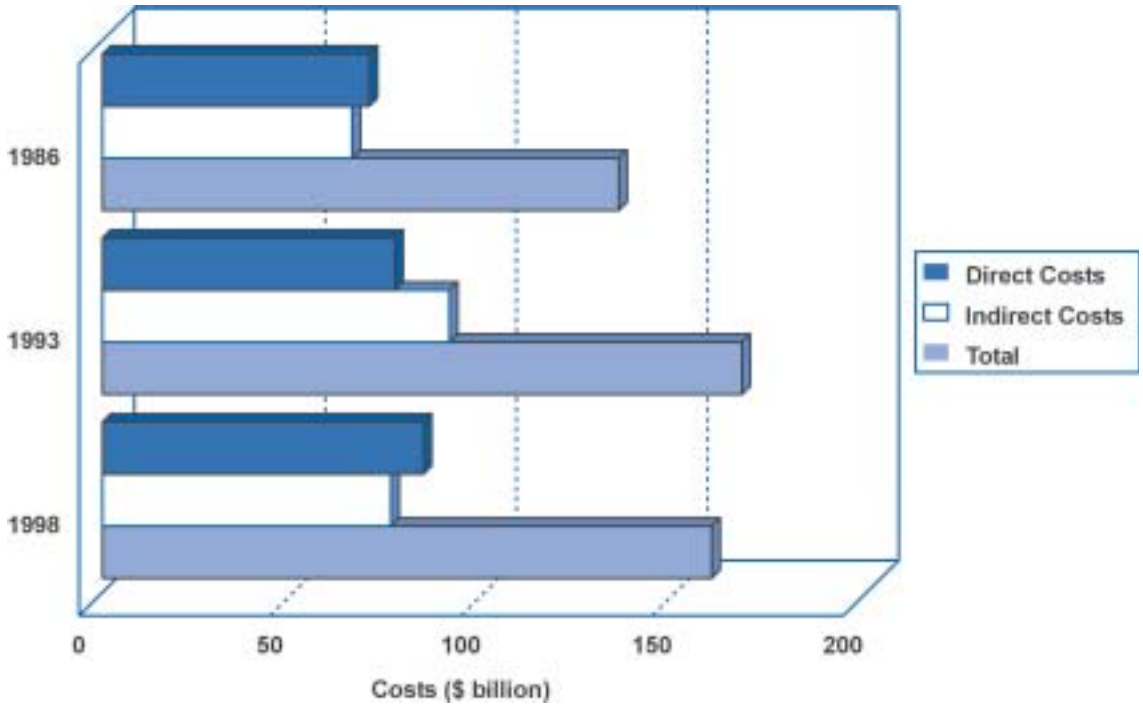
(1) Includes "Others" under 1986 Indirect Costs, i.e. health problems that were too small to be categorized as specific independent health problems.

(2) Includes data for which coding is not provided (for diagnostic categories), or data that are grouped due to small counts.

(3) Includes data that could not be allocated by ICD-9 code .

Note: Due to rounding some discrepancies may occur.

Figure 16: Economic Burden of Illness in Canada for 1986, 1993 and 1998 (in 1998 $)*



** 1986 and 1993 dollars are adjusted for inflation using the Consumer Price Index (CPI) for 1986 (78.1), 1993 (101.8), and 1998 (108.6), as provided by Statistics Canada.*

Economic burden of illness across provinces/territories

EBIC 1986 and EBIC 1993 did not provide any cost of illness data by province/territory. Therefore, no temporal comparison can be made using provincial/territorial burden of illness data. The 1998 results show that the provinces of Ontario, Quebec, and British Colombia together represent almost 75% of the burden of illness in Canada (Map 1). Per capita direct costs, however, are fairly similar, ranging from $2,548 in New Brunswick to $3,262 in the Yukon. The one exception is the Northwest Territories, where per capita direct costs are more than twice the average of the rest of the provinces/territories ($5,244). This difference appears to be explained by higher per capita hospital care expenditures in the Northwest Territories.

Health policy and EBIC results

The estimates in this report are based on comprehensive, standardized, and validated data that appropriately and effectively allow for the comparison of costs of illnesses and health conditions in Canada. The methods used allow the determination of the "opportunity cost"[26] to society of illness or injury by translating illness, injury, and premature death into direct and indirect costs. In others words, these estimates represent an approximation of what society could gain if the illnesses and injuries that give rise to these costs in Canada could be eliminated.

Used wisely and in the context of broader indicators of health,[1,3] they can contribute to a more rigorous analysis of the relative burden of major illnesses and injury in Canada and the impact of different

26 For the purpose of this report, opportunity cost is the value of opportunities forgone because of an intervention, action, or health outcome (i.e. the direct and indirect costs of illness and injury).

health-related interventions. Good information on these parameters provides the necessary evidence for priority setting, program planning, policy development, and effective allocation of health resources.[4,7]

It is important to note that these estimates address the *economic* burden of illness and should ideally be used in conjunction with other health indicators. For example, indicators such as incidence and prevalence of disease, death rates, and morbidity rates (or surrogates such as hospitalization, physician claims, drug utilization) are routinely available for some, but not all, illnesses. In addition, broader indicators, such as health-adjusted life expectancy (HALE) and disability-adjusted life years (DALY), incorporate additional dimensions of quality of life, length of life, and patients' preferences into a single measure. A wider range of indicators, including daily functioning and other dimensions of health-related quality of life, would extend the assessment of illness and injury to other dimensions of the burden of illness.

Opportunities for future work

To further EBIC's usefulness as a health policy tool for decision-making and to ensure a broader and more accurate picture of the cost of illness and injury in Canada, options for dealing with current data and methodology limitations and challenges need to be explored. First, further initiatives need to be developed to work in partnership with the provinces/territories to improve access to, and understanding of, health care utilization data by disease (in particular the number of cases) in order to account more accurately for costs by different disease categories and subcategories. These data would allow for cost-per-case information and provincial/territorial comparisons over time, which is not possible at the moment. In addition, more complete data on provincial/territorial and federal health program spending are needed for a better understanding of how health spending is distributed between population/public health programs and health care services.

Second, the costs of illness and injury should ideally include costs related to 1) chronic complications of the condition; 2) unrelated conditions for which the afflicted are more likely to use health services; and 3) co-morbidity effects of the condition that raise the cost of medical care.[8,9] EBIC 1998 allocates costs to only one diagnosis, thus underestimating the possibility that certain illnesses or conditions may contribute to other illnesses or conditions (e.g. the relation between diabetes, hypertension, and coronary heart disease). Further studies that use attributable fractions to allocate costs to contributing or secondary diagnoses, with adjustments to avoid double counting (i.e. the cost of diabetes embedded within cardiovascular diseases), could provide a more realistic estimate of the impact of disease.

Third, the costs that are outlined in EBIC 1998 are limited to the major direct and indirect costs. There has been no attempt to include all out-of-pocket costs, the value of lost production and leisure time for caregivers, or the value of lost production at work, much less the psychosocial costs to patients or caregivers. Methods for measuring these costs need to be given additional consideration and incorporated into future versions of EBIC.

Fourth, the inevitable time lag in reporting data hampers the usefulness of this report. Reporting at 5-year intervals creates a major gap in information availability. An interactive web-based application is being released as part of EBIC 98, and is expected to accommodate more frequent reporting.

Finally, although cost-of-illness studies of major risk factors (i.e. smoking, obesity, and physical inactivity) have been published, they have yet to be integrated into a rigorous and comprehensive framework like the one used in EBIC. A comprehensive analysis based on the portion of disease attributable to various risk factors would be a useful follow-up to this report.

Discussion

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Appendix 1
Classification of Diseases

Diagnostic Category - Terms Used in Report - (ICD-9 Code)	Subcategory - Terms Used in Report - (ICD-9 Code)*†
Infectious and Parasitic Diseases (001-139)	HIV/AIDS (042-044) Sexually Transmitted Diseases (054.1, 076-078, 090-099,132.2, 133.0, 616.0, 616.1)
Cancer (Neoplasms) (140-239)	Colorectal Cancer (152, 154) Lung Cancer (162, 163) Breast Cancer (Female) (174) Cervical Cancer (Cervix Uteri) (180) Prostate Cancer (185)
Endocrine and Related Diseases (240-279)	Diabetes (Mellitus) (250)
Blood Diseases (280-289)	
Mental Disorders (290-319)	Schizophrenia (Schizophrenic Psychoses) (295) Anxiety States (300.0) Depressive Disorder (not classified elsewhere) (311)**
Nervous System and Sense Organ Diseases (320-389)	Alzheimer's (Disease) (331.0) Parkinson's Disease (332) Glaucoma (365) Disorders of Conjunctiva (372) Ear Infections (Suppurative and Unspecified Otitis Media) (382)
Cardiovascular Diseases (390-459)	(Essential) Hypertension (401) Ischemic Heart Disease (410-414)‡ Acute Myocardial Infarction (410)‡ Cerebral Infarction (434.9) Cerebrovascular Disease (430-438)‡ Stroke (430-432, 434, 436)‡§ Aortic Aneurysm (441)
Respiratory Diseases (460-519)	Acute Respiratory Infections (460-466) Pneumonia & Influenza (480-487) COPD (Allied Conditions) (490-496)‡ Asthma (493)‡
Digestive Diseases (520-579)	
Genitourinary Diseases (580-629)	
Pregnancy (630-676)	
Skin and Related Diseases (680-709)	

Diagnostic Category - Terms Used in Report - (ICD-9 Code)	Subcategory - Terms Used in Report - (ICD-9 Code)*†
Musculoskeletal Diseases (710-739)	Arthritis (714-716, 721) Osteoporosis (733.0)
Birth Defects (740-759)	Congenital CVD (745-747)
Perinatal Conditions (760-779)	Slow Growth & Fetal Malnutrition (and Disorders Related to Short Gestation and Unspecified Low Birth Weight) (764-765)
Ill-defined Conditions (780-799)	
Injuries (800-999)	Poisoning (960-989) Motor Vehicle Traffic Accidents (E810-E819) Unintentional (Accidental) Poisoning (E850-E869) (Accidental) Falls (E880-E886, E888) Suicide and Self-inflicted Injury (E950-E959)‡ Poisoning, Self-Inflicted and Undetermined¶ (E950-E952, E980-E982)‡
Well-patient care (V01-V82)	

**Tables and charts in this document use the lay terms as indicated. For reference, additional information from ICD-9 is provided in brackets.*

† Some coding differences exist across provinces/territories, e.g. injury coding in Quebec is different from that listed here.

***Depressive disorder (not elsewhere classified) does NOT include neurotic depression (caused by life events), adjustment or brief depressive reactions, acute reaction to major stress, affective psychoses, manic-depression, etc.*

‡Some subcategories overlap. To facilitate finer breakdown, subcategories in tables and figures are presented as mutually exclusive, i.e. the total cost for COPD would be the sum of costs for "asthma" plus "COPD (other than asthma)", unless otherwise indicated.

§Stroke includes the following: subarachnoid, intracerebral, other and unspecified intracranial hemorrhage, occlusion of cerebral arteries and acute but ill-defined cerebrovascular disease.

¶As to whether accidentally or purposely inflicted.

Appendix 2
Conventions and Definitions

Conventions

The following conventions are used in this document:

- All direct and indirect costs are referred to as "costs." "Direct Costs" and "Expenditures" are used interchangeably in the text.
- All costs are in 1998 Canadian dollars unless otherwise indicated.
- Where possible, total direct and indirect costs are distributed by diagnostic category following the International Classification of Disease, Ninth Revision (ICD-9) chapters. Lay terms are used for each diagnostic category, as indicated in Appendix 1.
- Where possible, costs are distributed by the most common diagnostic subcategories (up to a maximum of 20) within each cost component. A list of the corresponding diagnostic subcategories can be found in Appendix 1.
- To avoid misinterpretation of overlapping subcategories, costs for overlapping subcategories are provided as follows:
  1. COPD excluding asthma: includes chronic bronchitis, emphysema and other chronic obstructive pulmonary disease, but not asthma.
  2. IHD other than AMI: includes angina pectoris, chronic ischemic heart disease and other ischemic heart disease, but not acute myocardial infarction.
- Percentages may not add to 100% because of rounding.
- "Others" refers generally to groups of data for which coding was not provided (for diagnostic category), and/or data that are grouped because of small counts.
- "Unattributable" refers to data that could not be allocated by ICD-9 code (diagnostic category). This includes some hospital care expenditures, including health science research undertaken through Acute Care Hospitals (inpatient); non-prescription drug expenditures; non fee-for-service physician care expenditures (which are assumed to be alternative payment plan payments); expenditures for care in other institutions; additional direct health expenditures (excluding a portion of health research); and a portion of the value of time lost to long and short-term disability when the type of disability was unknown or unspecified.
- "Unspecified" refers to data that were not allocated by sex and age.
- Age groups refer to the following: children (0-14 years), adults aged 15-34 years; adults aged 35-64 years; and seniors (65 years and over).

Definitions and Data Sources

Tables, figures, and maps presented in this report provide a breakdown, where possible, of the burden of illness in Canada by type of cost, cost component, principal/main diagnostic category or subcategory, sex, and age group. The definition and principal sources of data for each type of cost and cost component are provided below. In addition, a Venn diagram is included (p. 73) to show the main differences between what is included in the direct and indirect cost totals for this version of EBIC and EBIC 1993.

Type of cost – Within this report the burden of illness is estimated in terms of two types of costs, direct and indirect.

Direct costs – Direct costs refer to health care expenditures for which the primary objective is to improve and prevent the deterioration of health status. In this report, total direct costs are presented

in terms of five major cost components, and total expenditures for each of these components come from the Canadian Institute for Health Information's (CIHI) National Health Expenditure Trends (NHEX), 1975–2000.

The five direct cost components used in this report and in NHEX include Hospital Care Expenditures, Drug Expenditures, Physician Care Expenditures, Expenditures for Care in Other Institutions, and Additional Direct Health Expenditures.

NHEX totals include both public and private health expenditures. Public sector health expenditures are made up of four main areas of expenditure: federal government direct health expenditures (e.g. health care services for First Nations populations living on reserve); provincial and territorial government health expenditures (supported by federal transfers to the provinces/territories and provincial/territorial government funds); municipal government health expenditures (supported by federal and provincial transfers and municipal government funds); and workers' compensation board health expenditures.

Private sector health expenditures are made up of three major areas of expenditure: health insurance plan expenditures (commercial and non-profit); individual out-of-pocket expenditures; and revenue of health care institutions from patient and non-patient services.

For more details on data sources and methods, refer to CIHI's National Health Expenditure Trends (NHEX), 1975–2000.

Indirect costs – Indirect costs refer to the dollar value of production lost due to illness, injury, disability, or premature death. In this report, the indirect costs of illness in Canada relate only to losses in production due to time lost from paid work or unpaid household work brought about by periods of morbidity or premature mortality. The total indirect costs are presented in terms of three major cost components: Mortality Costs, Morbidity Costs due to Long-term Disability, and Morbidity Costs due to Short-term Disability. There is an important distinction between morbidity and mortality costs, in that morbidity costs are driven by production losses associated with partial or permanent disability as opposed to death.

These costs have been estimated according to the human capital approach (i.e. by estimating the value of production that is lost due to illness, disability, and premature death). The major concern with the human capital approach is that it excludes intangibles, only counts earnings and imputed earnings, and undervalues some groups relative to others because earnings may not accurately reflect one's ability to produce.[27] The longer the illness keeps people from doing these major activities, the greater will be the loss of production. Specifically, indirect costs are estimated by calculating lost earnings in terms of age- and sex-specific wage rates and the imputed market value of household work.

Opportunity cost – The methods used in this report allow us to determine the "opportunity costs" to society of illness or injury, by translating illness, injury, and premature death into direct and indirect costs. For the purpose of this report, opportunity cost is the value of opportunities forgone because of an intervention, action, or health outcome.

Cost Components – Cost components refer here to the class of care, type of service, product being used, or the value of life/activity days lost. As noted above, this report includes five direct cost components and three indirect cost components: Hospital Care Expenditures, Drug Expenditures, Physician Care Expenditures, Expenditures for Care in Other Institutions, Additional Direct Health Expenditures, Mortality Costs, Morbidity Costs due to Long-term Disability, and Morbidity Cost due to Short-term Disability.

Definitions and data sources for each cost component are provided below. Direct cost component definitions are taken directly from NHEX, with supplementary information coming from "National Health Expenditures in Canada 1975-1994", as published by Health Canada in 1996. Indirect cost component definitions highlight generally how cost component totals were estimated – more details regarding these estimates

27 Drummond MF, O'Brien BJ, Stoddart GL, Torrance GW (1997). *Methods for Economic Evaluation of Health Care Programmes*. 2nd ed. Oxford University Press.

are provided in the methods section of these component chapters.

Hospital Care Expenditures

The NHEX total for national hospital care expenditures in 1998 includes the costs of operating and maintaining acute care hospitals, acute emergency room/other outpatient hospitals,[28] chronic/rehabilitation hospitals,[29] and psychiatric hospitals.[30] This includes gross salaries and wages covering all hospital staff remuneration, employee benefits, supplies, and expenses.

Examples of hospital care expenditures include wages and salaries for nurses, technicians, medical students, and some physicians on hospital payroll; laboratory, radiological, and other diagnostic procedures; drugs, biological and related preparations when administered in the hospital; operation and maintenance of operating rooms and case rooms, and of anaesthetic, radiotherapy and physiotherapy facilities (including the necessary medical and surgical equipment and supplies); and accommodation and meals at the standard or public ward level and preferred accommodation if medically required.

Drug Expenditures

The NHEX total for national drug expenditures in 1998 includes expenditures for prescribed drugs and non-prescribed products (over-the-counter drugs and personal health supplies) that were purchased in retail stores. It excludes drugs prescribed in hospitals and in other institutions. These are included in Hospital Care Expenditures and Expenditures for Care in Other Institutions. The NHEX cost estimates for prescribed drugs are derived from figures obtained from federal, provincial, and territorial governments, workers' compensation boards, private insurers, and Statistics Canada's Survey of Family Expenditures.

Prescribed drugs refer exclusively to expenditures for substances considered to be drugs under the *Food and Drug Act* that are sold for human use as the result of a prescription from a health professional through retail outlets on the specific order of an authorized practitioner.

Over-the-counter drugs are substances considered to be drugs under the *Food and Drug Act* that are sold for human use without a prescription. The following categories of products that are considered to be drugs or devices under the Act are excluded and are considered to be personal health supplies: hygienic, diagnostic devices, sundries, and bandages.

Personal health supplies are medical devices or sundries that are used primarily to promote or maintain health or normal human function and that are not included in the health expenditure definition of a drug.

Physician Care Expenditures

The NHEX total for national physician care expenditures in 1998 includes expenditures for professional health services provided by physicians. The largest component is professional fees, primarily those paid by provincial/territorial medical care insurance plans through fee-for-service (FFS) claims by licensed medical practitioners. Salaries and other forms of contractual professional incomes paid through alternative payment plans (APP), fee payments by workers' compensation boards, direct payments by federal agencies, and private sector payments for physicians' services not covered by provincial/territorial plans are also included in this total.

The remuneration of physicians on payrolls of hospitals, public health agencies and the like are excluded here but counted within the category concerned (physicians on hospital payrolls are included in hospital expenditures). Payments to physicians for administrative services are not considered physician service expenditures for the purpose of national health expenditures.

28 **Acute care hospitals** include non-teaching general hospitals with or without long-term care units, pediatric hospitals, teaching general hospitals (excluding pediatric), nursing stations, outposts, and others (cancer hospitals, cardiology hospitals or institutes, maternity hospitals, neurological institutes, orthopedic hospitals, etc.).

29 **Chronic/rehabilitation hospitals** include extended care hospitals (including chronic) and rehabilitation hospitals (including convalescent).

30 **Psychiatric hospitals** include short -term care (including alcohol/drug recovery); and long-term care.

Expenditures for Care in Other Institutions

The NHEX total for national expenditures for care in other institutions in 1998 includes the costs of operating and maintaining public and private residential care facilities that are approved, funded, or licensed by provincial or territorial departments of health or social services. These costs include gross salaries and wages covering all employee remuneration, as well as employee benefits, supplies, and expenses. Drugs prescribed in these institutions are also included as expenditures under this category.

These facilities are generally populated by people who are chronically ill or disabled and who reside there more of less permanently, in contrast, for example, to a hospital where patients are accommodated on the basis of medical need and are provided with continuing care and supportive diagnostic and therapeutic services. Other institutions include homes for the aged (including nursing homes), homes for the physically and mentally handicapped, and for developmentally delayed and psychiatrically disabled people.

Residential care facilities also include facilities for clients with alcohol and drug problems and for emotionally disturbed children (non-health expenditures in these facilities are excluded where possible).

These estimates do not include non-health expenditures in these facilities, or facilities solely of a custodial or domiciliary nature (i.e. level 1 care or less[31]).

Additional Direct Health Expenditures

The NHEX total for additional direct health expenditures in 1998 includes expenditures on other professionals; other health spending (e.g. public health and health research expenditures); and capital expenditures.

Other professionals

Expenditures on other professionals include "expenditures for the services of privately practicing dentists, denturists, chiropractors, massage therapists, orthopedists, optometrists, osteopaths, podiatrists, psychologists, naturopaths, private duty nurses and physiotherapists" (CIHI, NHEX Trends, 1975-2000, 2000, pg. 53).

Other health spending

Public health expenditures include "expenditures for items such as measures to prevent the spread of communicable disease, food and drug safety, health inspections, health promotion activities, community mental health programs, public health nursing and all costs for the infrastructure to operate health departments" (CIHI, NHEX Trends, 1975-2000, 2000, pg. 54).

Prepayment administration represents "expenditures related to the cost of providing health insurance programs by either government or private health insurance firms" (CIHI, NHEX Trends, 1975-2000, 2000, pg. 54).

Home care expenditures include "only the health professional component of home care". The "portion that is commonly referred to as home support is considered to be a social service expenditure rather than a health expenditure" (CIHI, NHEX Trends, 1975-2000, 2000, pg. 55). When home care is provided by a hospital, it is included in Hospital Care Expenditures.

Health research expenditures include "expenditures for research activities designed to further knowledge of the determinants of health, health status or methods of providing health care, evaluation of health care delivery or of public health programs. The category does not include research carried out by hospitals or drug companies in the course of product development"(CIHI, NHEX Trends, 1975-2000, 2000, pg. 54).

31 There are three types or levels of care in residential facilities. **Self-sufficient** requires only minor supervision. **Level 1 Care** requires less than 90 minutes, in a 24-hour day, of supervision and/or assistance with activities of daily living and provision of support in meeting psycho-social needs. **Level 2 Care** requires availability of personnel for care for a total of 1.5 to 2.5 hours in a 24-hour day with medical and professional nursing supervision and provision for meeting psychosocial need: a level of care that is required by a person with a relatively stabilized [physical or mental] chronic disease or functional disability who, having reached the apparent limit of recovery, is not likely to change in the near future, and who has relatively little need for the diagnostic and therapeutic services of a hospital.

All other expenditures (or "Others") include "expenditures for items such as medical transportation (ambulances), hearing aids, other appliances, training of health workers, voluntary health associations, and occupational health to promote and enhance health and safety at the workplace" (CIHI, NHEX Trends, 1975-2000, 2000, pg. 54).

Capital expenditures

Capital expenditures include "expenditures on construction, machinery and equipment of hospitals, clinics, first-aid stations, and residential care facilities" (CIHI, NHEX Trends, 1975-2000, 2000, pg. 54).

Mortality Costs

Mortality costs are associated with untimely or premature deaths caused by various categories of illness and injury. For the purpose of this study, these losses were calculated using an incidence-based human capital approach, i.e. by calculating the discounted present value of future production lost due to premature mortality.

The total for national mortality costs in 1998 was estimated as the product of the number of deaths and the discounted present value of remaining lifetime production lost as a result of those deaths. The discounted present value of remaining lifetime production was calculated for each 5-year age group and sex using the formula presented in Appendix 4. More details regarding the calculation of mortality costs are provided in the Methods section of that chapter.

Morbidity Costs

Morbidity costs (short- or long-term) are incurred when the illness or injury results in some form of disability and, as a result, time is lost from major activities like paid work and unpaid household work. This can be experienced either while being hospitalized for treatment and rehabilitation and/or while living in the community.

Morbidity Costs due to Long-term Disability

The total for national morbidity costs due to long-term disability in 1998 was estimated as the product of adjusted household and institutional estimates of long-term disability (taken from the 1996-97 National Population Health Survey, [NPHS]) and age- and sex-specific estimates of average daily paid labour (adjusted for wage supplements), and average daily value of unpaid labour. The estimates of long-term disability by diagnostic category were adjusted for severity and duration using both the 1992-93 Quebec Health and Social Survey (QHSS) and the institutional component of 1996-97 NPHS. More details regarding the calculation of morbidity costs due to long-term disability are provided in the Methods section of that chapter.

Morbidity Costs Due to Short-term Disability

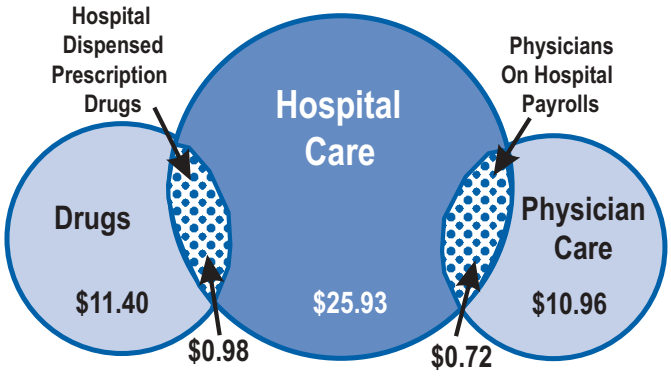
The total for national morbidity costs due to short-term disability in 1998 was estimated as the product of adjusted household estimates of short-term disability (taken from the 1996-97 NPHS) and age- and sex-specific estimates of average daily paid labour (adjusted for wage supplements), and average daily value of unpaid labour. These estimates of short-term disability were distributed across diagnostic categories and adjusted for severity and duration using the 1992-93 QHSS. More details regarding the calculation of morbidity costs due to short-term disability are provided in the Methods section of that chapter.

Venn Diagram 1

The following Venn diagram presents the distribution of hospital care, drugs and physician care expenditures in Canada, in 1998. It shows that hospital-based drug and physician care expenditures represent 3.6% and 2.6% of total hospital care expenditures, respectively.

Diagram 1

Distribution of Hospital Care, Drugs and Physician Care Expenditures in Canada, 1998 (in $ billions)



Appendix 3

Estimated Population in Long-term Care Facilities by Causes of Activity Limitation (in terms of Diagnostic Categories and Subcategories), Age, and Sex

Table 1: Estimated population in long-term care facilities by diagnostic category, age, and sex

		Diagnostic Categories							
Age	Population	Mental Disorders	Nervous System	Circulatory System	Symptoms, Signs, etc.	Other	Don't Know	Total with Activity Limitation	N/A
Both Sexes									
Total	**222,967**	**32,270**	**47,146**	**22,745**	**13,925**	**59,988**	**14,006**	**189,450**	**33,517**
<35	11,633	3,850	~	~	~	~	~	3,850	3,168
35-54	15,240	6,239	3,256	~	~	~	~	9,495	~
55-64	10,556	~	~	~	~	~	~	~	~
65-74	28,122	4,456	6,680	3,760	~	6,568	~	21,464	4,461
75-84	64,409	7,335	16,028	7,846	~	18,302	3,888	53,399	9,330
85+	92,609	8,590	17,609	9,781	7,385	28,913	6,613	78,891	13,718
Males									
Total	**72,254**	**13,953**	**15,152**	**7,584**	**4,074**	**15,819**	**3,588**	**60,169**	**12,087**
<35	7,805	~	~	~	~	~	~	~	2,205
35-54	8,400	3,801	~	~	~	~	~	3,801	~
55-64	5,612	~	~	~	~	~	~	~	~
65-74	13,639	~	3,038	~	~	~	~	3,038	~
75-84	19,151	~	4,573	~	~	5,880	~	10,453	~
85+	17,555	~	3,501	~	~	4,450	~	7,951	3,466
Females									
Total	**150,713**	**18,317**	**31,995**	**15,161**	**9,222**	**44,169**	**10,418**	**129,282**	**21,430**
<35	3,828	~	~	~	~	~	~	~	~
35-54	6,840	~	~	~	~	~	~	~	~
55-64	4,944	~	~	~	~	~	~	~	~
65-74	14,483	~	3,642	~	~	4,050	~	7,692	~
75-84	45,258	5,129	11,455	5,086	~	12,422	~	34,122	6,902
85+	75,054	6,687	14,109	7,561	5,592	24,463	6,031	64,803	10,252

~ Sample size too small for analysis

Source: NPHS 1996-97. Institutions sample survey. Custom tabulations by Statistics Canada, National Population Health Survey (NPHS) – Institutional Component, 1996-97.

Table 2: Estimated population in long-term care facilities by selected diagnostic subcategory, age, and sex

		Selected Diagnostic Subcategories			
Age	Population	Schizophrenia	Alzheimer	Cerebrovascular Disease (including Stroke)	Stroke
Both Sexes					
Total	**222,967**	**4,217**	**25,463**	**16,327**	**13,717**
<35	11,633	~	~	~	~
35-54	15,241	~	~	~	~
55-64	10,555	~	~	~	~
65-74	28,122	~	3,309	~	~
75-84	64,409	~	11,472	5,514	4,699
85+	92,609	~	10,362	6,291	4,922
Age Unknown	~	~	~	~	~
Males					
Total	**72,254**	**~**	**6,079**	**5,910**	**4,793**
<35	7,805	~	~	~	~
35-54	8,400	~	~	~	~
55-64	5,612	~	~	~	~
65-74	13,639	~	~	~	~
75-84	19,151	~	~	~	~
85+	17,555	~	~	~	~
Age Unknown	~	~	~	~	~
Females					
Total	**150,713**	**~**	**19,384**	**8,924**	**8,924**
<35	3,828	~	~	~	~
35-54	6,840	~	~	~	~
55-64	4,944	~	~	~	~
65-74	14,483	~	~	~	~
75-84	45,258	~	8,584	~	~
85+	75,054	~	8,307	3,656	3,656
Age Unknown	~	~	~	~	~

~ Sample size too small for analysis

Source: NPHS 1996-97. Institutions sample survey. Custom tabulations by Statistics Canada.

Appendix 4

Mortality Costs: Discounted Present Value of Lost Future Production

The discounted present value of lost future production is calculated by 5-year age group and by sex. The resulting value is the expected current and future production of an individual of a given age and sex had they continued to live. It is the sum of the estimated value of paid labour for all persons in the workforce ($Y_{ns}W_{ns}P^{n}_{as}$)and the estimated value of unpaid labour for all persons in the workforce ($H_{nsw}W_{ns}P^{n}_{as}$) and the estimated value of unpaid labour of all persons not in the workforce ($H_{nsh}K_{ns}P^{n}_{as}$), all adjusted for changes in labour productivity (g) and discounted (i) to provide the present value. The algebraic formula for the discounted present value of lost future production is as follows:

$$V = \sum_{n=a}^{85+} (Y_{ns}W_{ns}P^{n}_{as} + H_{nsw}W_{ns}P^{n}_{as}) + (H_{nsh}K_{ns}P^{n}_{as}) \quad \frac{(1+g)^{na}}{(1+i)^{na}}$$

where

a = midyear age for the given cohort of persons

s = sex

n = age

Y_{ns} = annual mean earnings for all persons of a given sex with earnings in an age group where the midpoint age is n

H_{nsw} = annual mean imputed value of housekeeping services for all persons in the workforce of a given sex in an age group where the midpoint age is n

H_{nsh} = annual mean imputed value of housekeeping services for persons not in the workforce of a given sex in an age group where the midpoint age is n

W_{ns} = average workforce participation rate of a given sex in the age group where the midpoint age is n

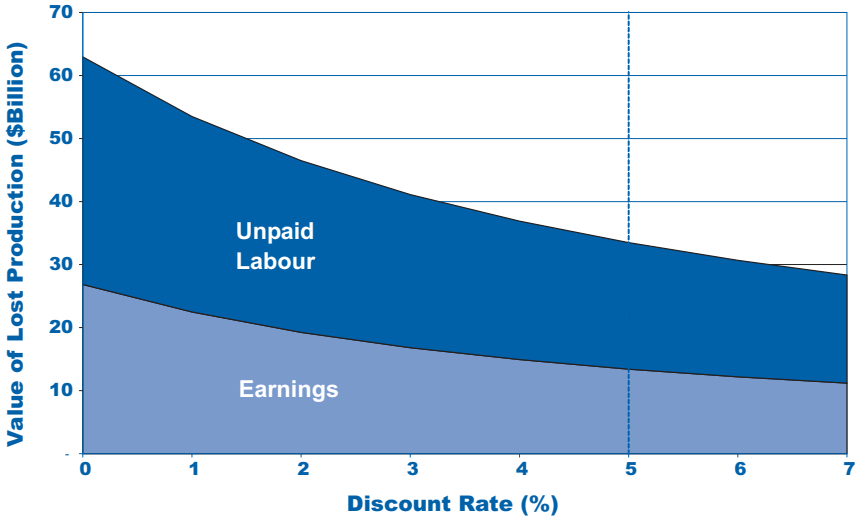
K_{ns} = average housekeeping participation rate of a given sex in the age group where the midpoint age is n

P^{n}_{as} = the approximate probability that an individual of age a and sex s survives to age n

g = rate of increase of labour productivity

i = discount rate

Sensitivity Analysis: Value of Lost Production due to Premature Mortality, Canada, 1998



Appendix 5
Morbidity Costs: Lost Production Weights

There is a relation between disability and production; however, the presence of disability does not necessarily imply complete loss of production, and loss of health may not be linearly related to loss of earnings/production (Appendix 6 in EBIC 1993).

Different sets of definitions were used to assign the weights for each of the following three groups: long-term disability in the household population, long-term disability in the institutionalized population, and short-term disability in the household population. These weights have been estimated, as there are no known weights for this purpose.

The following definitions and respective weightings for lost production associated with severity of disability are used to classify disability in this document. Where ranges are given for lost production weights, the analysis conducted for this report used the lowest level of disability weight.

1. Long-term disability (household)

EBIC Classification	QHSS Definition	EBIC lost production weight
Very Severe	Dependence for personal care (e.g. eating, washing, dressing, moving about inside the house)	0.8-1.0
Somewhat Severe	Dependence for instrumental activities (e.g. managing personal affairs, housework, going outside the home)	0.5
Somewhat Major	Disabled in performance of a main activity (e.g. working, keeping house)	0.3
Minor	Other activity limitations	0.0-0.2

Source: 1992-93 Quebec Health and Social Survey, Loss of Functional Autonomy Scale

2. Long-term disability (institution)

EBIC Classification	NPHS Definition	EBIC lost production weight
Very Severe	Restriction of activities (85% of institutionalized in 1998)	0.8–1.0
Minor	No restriction of activities (15% of institutionalized in 1998)	0.3

Source: 1996-97 NPHS Institutional Survey, restriction of activities caused by specified condition

3. Short-term disability (household)

EBIC Classification	NPHS Definition	EBIC lost production weight
	Days in bed	0.8–1.0
	Days cut down on things	0.5

Source: 1996-97 NPHS Household Survey

Appendix 6
Additional Figures

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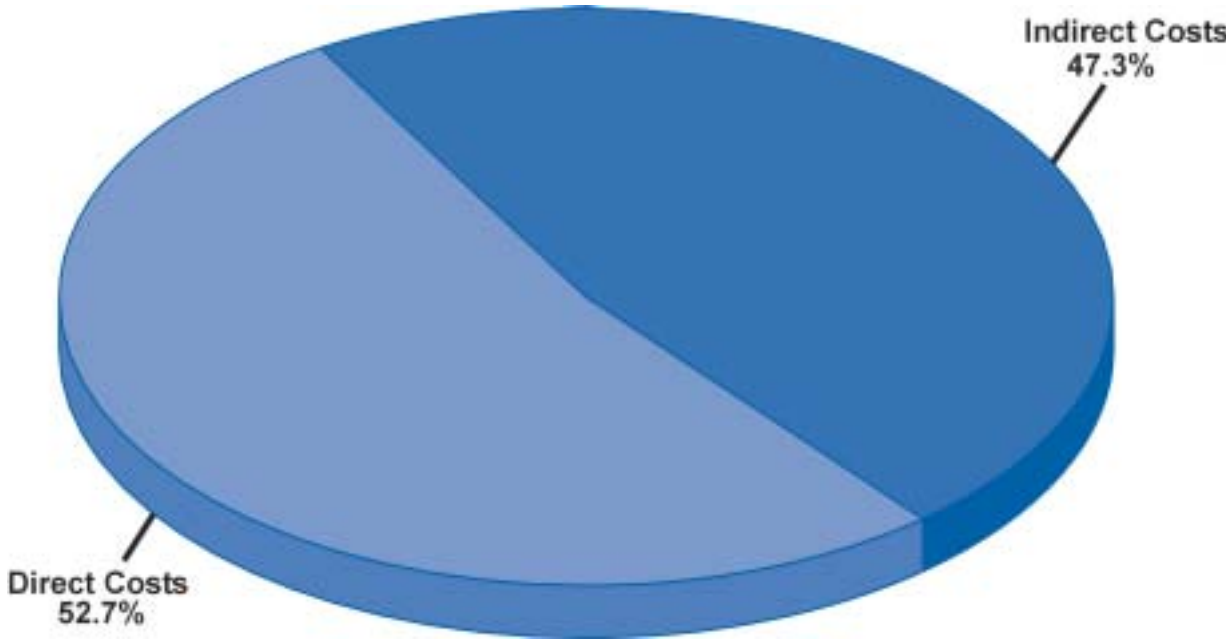
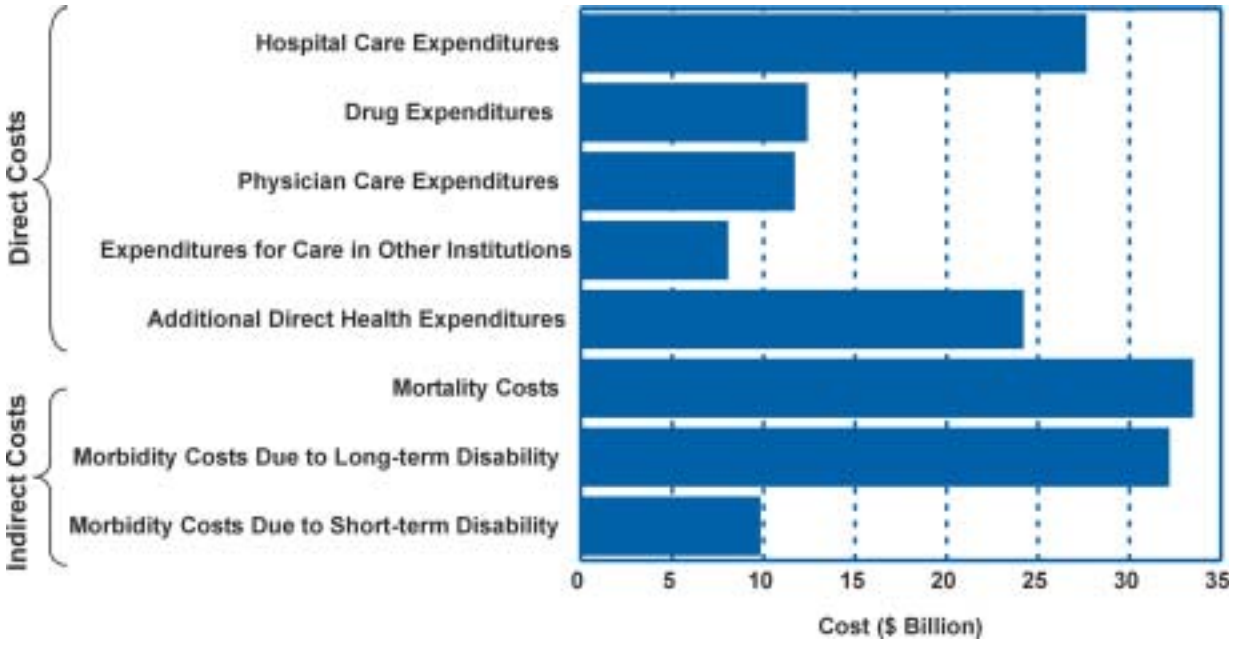
Economic Burden of Illness in Canada*, 1998



** Based on total cost of illness of $159.4 billion.*
Note: Due to rounding some discrepancies may occur.

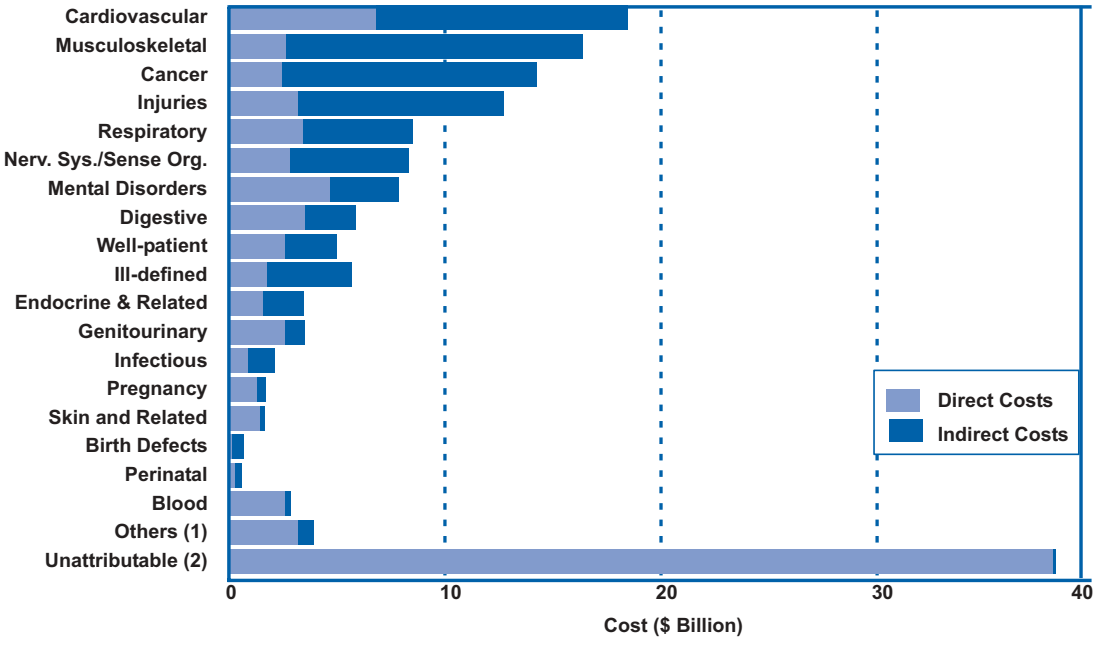
Appendices

Burden of Illness by Cost Component in Canada*, 1998



* *Based on total cost of illness of $159.4 billion.*

Direct and Indirect costs by Diagnostic Category in Canada*, 1998

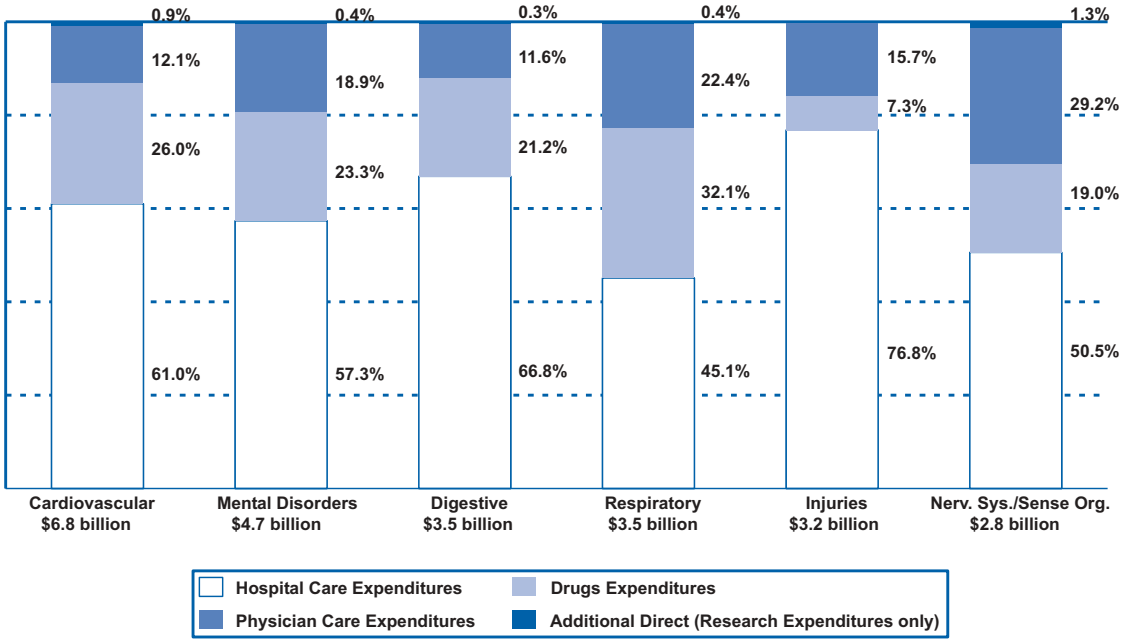


* Based on total cost of illness of $159.4 billion.

(1) Refers to data for which coding is not provided (for diagnostic categories), or data that are grouped because of small counts. For further detail see Table 2, third footnote.

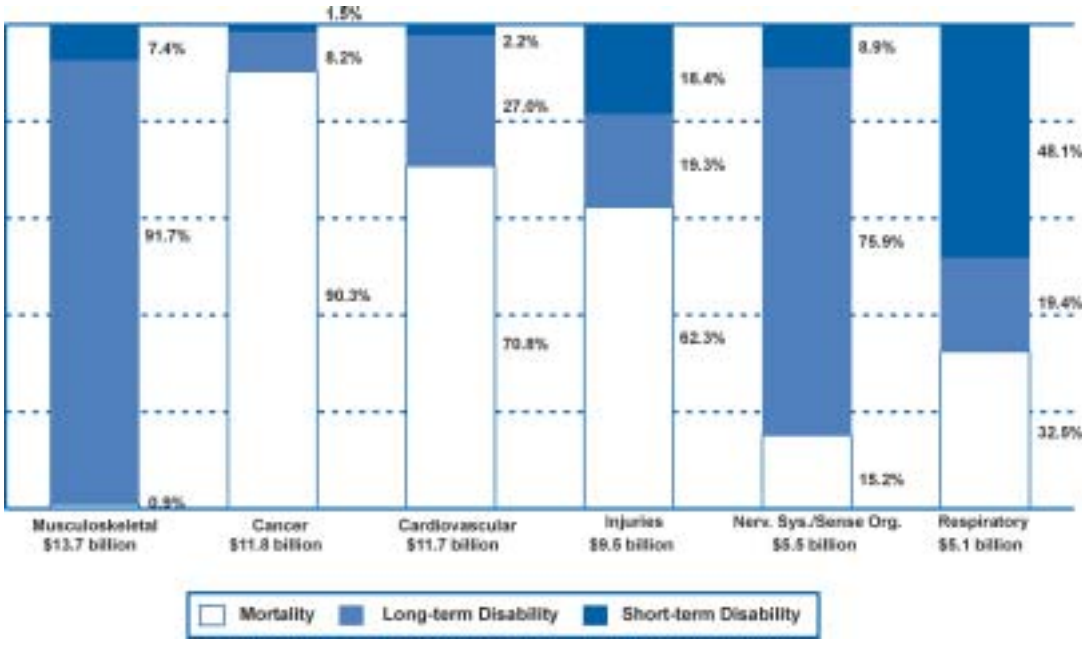
(2) Refers to data that could not be coded by ICD-9 code. For further details see Table 2, fourth footnote.

Diagnostic Categories with Highest Direct Costs in Canada, 1998



Note: Expenditures for care in other institutions are not included as they were not allocated by diagnostic category. Cost components that represent less then 0.3% of diagnostic categories are not shown here.
Due to rounding some discrepancies may occur.

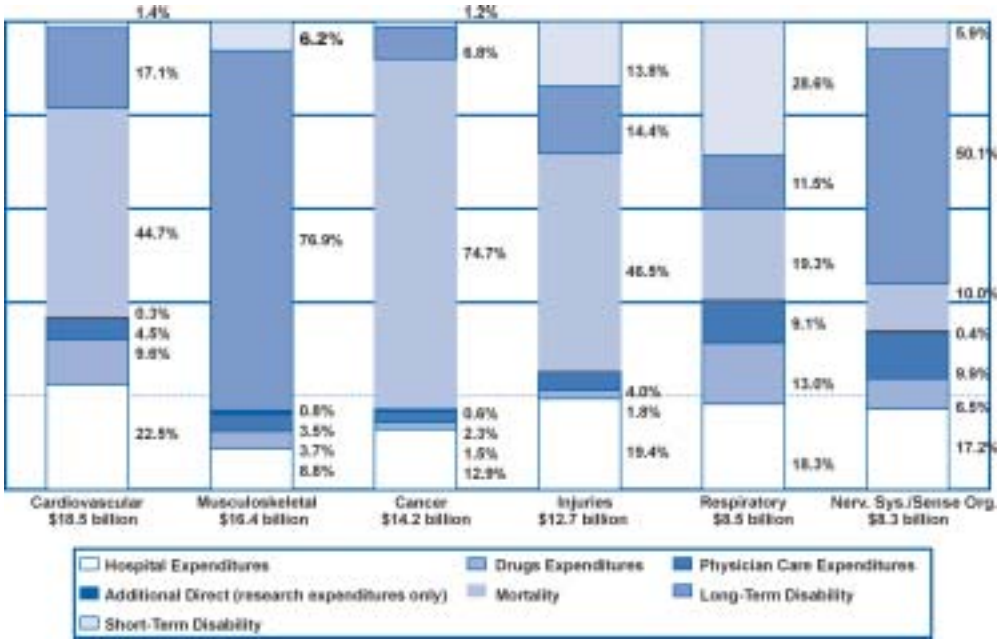
Diagnostic Categories with Highest Indirect Costs in Canada, 1998



Note: Due to rounding some discrepancies may occur.

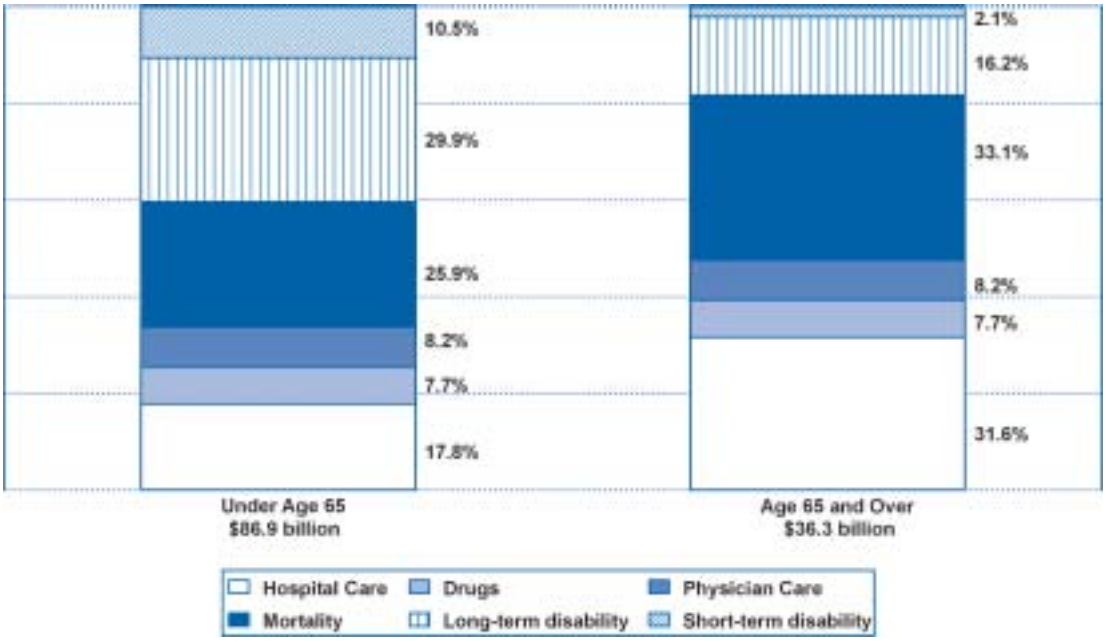
Appendices

Diagnostic Categories with Highest Costs by Cost Component in Canada, 1998



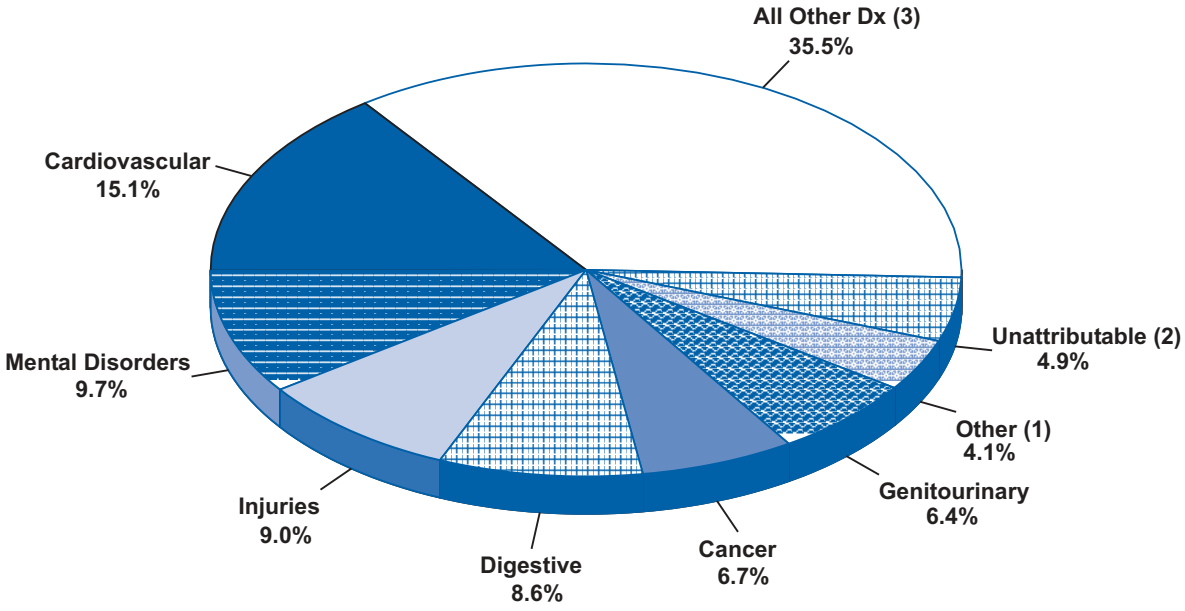
Note: Expenditures for care in other institutions are not included as they were not allocated by diagnostic category. Cost components that represent less then 0.3% of diagnostic categories are not shown here.
Due to rounding some discrepancies may occur.

Burden of Illness by Age Group and Cost Component in Canada, 1998



Note: Expenditures for care in other institutions and addiitonal direct expenditures are not included as they are not available by age and sex.
Due to rounding some discrepancies may occur.

Hospital Care Expenditures by Diagnostic Category in Canada*, 1998



**Based on total hospital care expenditures of $27.6 billion.*

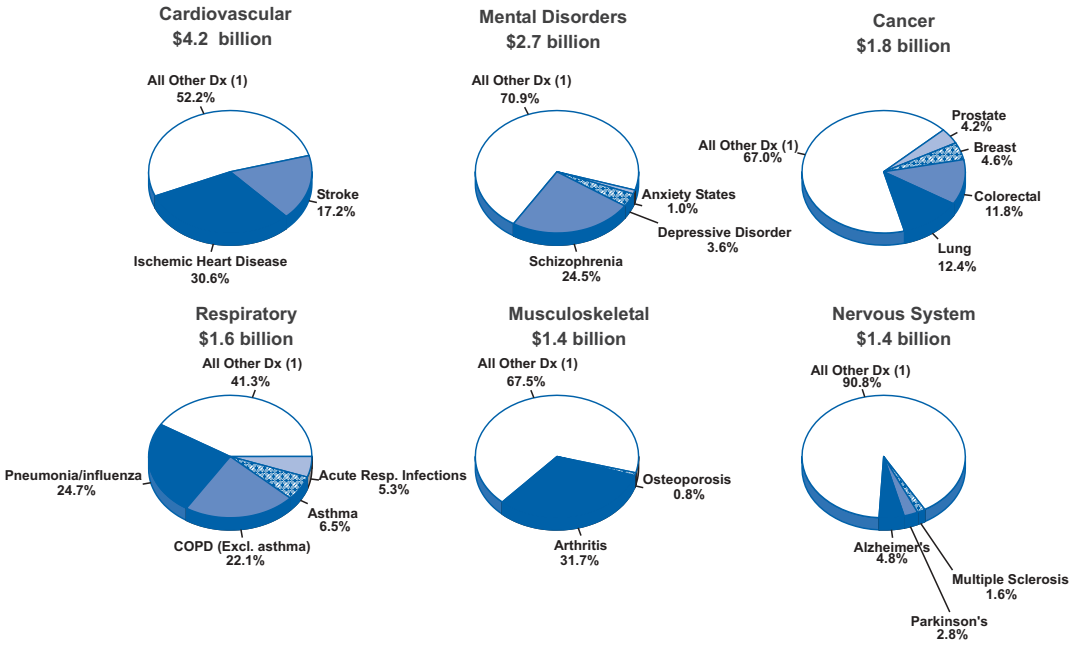
(1) Refers to data for which coding was not provided (for diagnostic categories), or data that are grouped because of small counts. For further details see Table 2, third footnote.

(2) Refers to data that could not be allocated by ICD-9 code (diagnostic category). It includes $1.4 billion in health research expenditures.

(3) Refers to all other diagnostic categories.

Note: Due to rounding some discrepancies may occur.

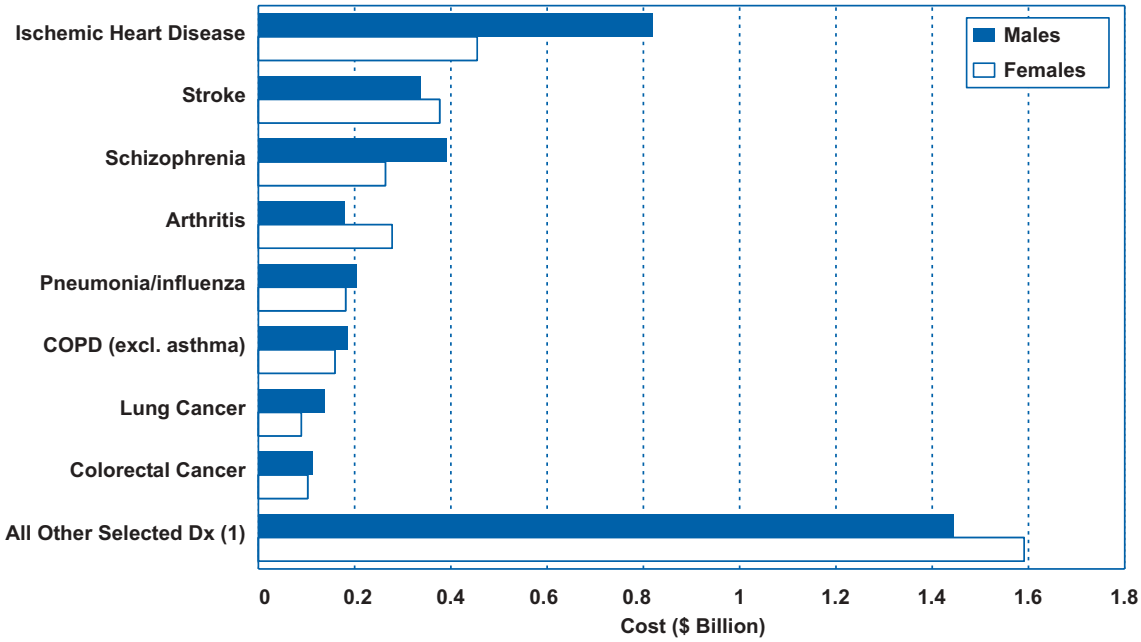
Hospital Care Expenditures by Selected Diagnostic Subcategory for Most Costly Diagnostic Categories in Canada, 1998



(1) Refers to all other diagnostic categories.
Note: Due to rounding some discrepancies may occur.

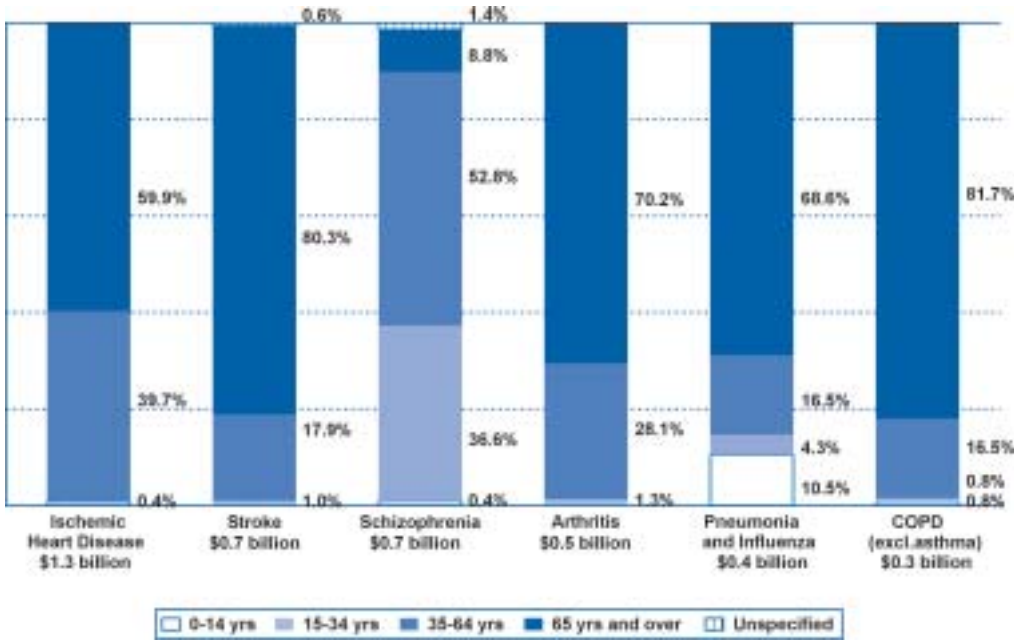
Appendices

Hospital Care Expenditures by Diagnostic Subcategory and Sex in Canada*, 1998



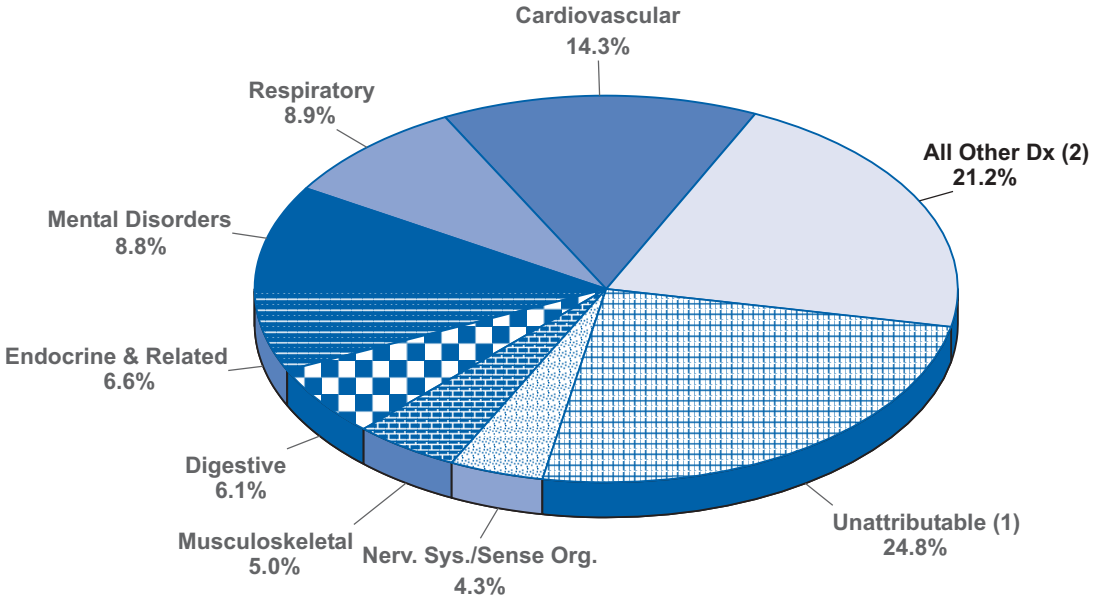
** Based on the $7.3 billion in hospital care expenditures that were allocated by selected diagnostic subcategory and sex.*
(1) Refers to all other selected diagnostic categories.

Hospital Care Expenditures by Most Costly Diagnostic Subcategories and Age Group in Canada, 1998



Note: Age groups that represent less then 0.3% of diagnostic subcategories are not shown here.
Due to rounding some discrepancies may occur.

Drug Expenditures by Diagnostic Category in Canada*, 1998



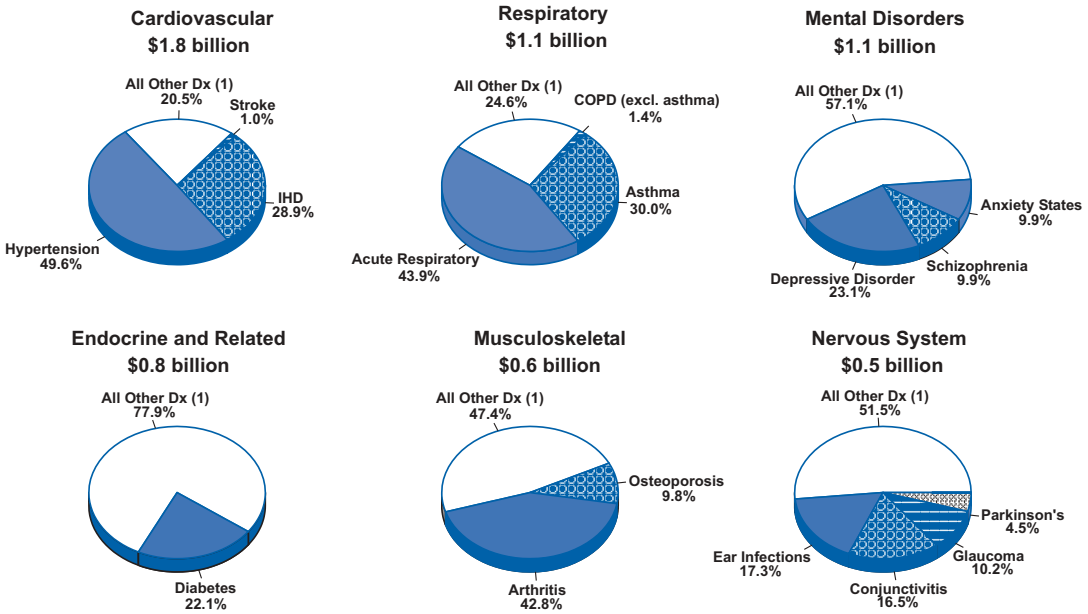
* *Based on total drug expenditures of $12.4 billion.*

(1) Refers to data that could not be allocated by ICD-9 code (diagnostic category). It includes $3.0 billion in non-prescription drug expenditures (over-the-counter drugs (OTC) and personal health supplies)

(2) Refers to all other diagnostic categories.

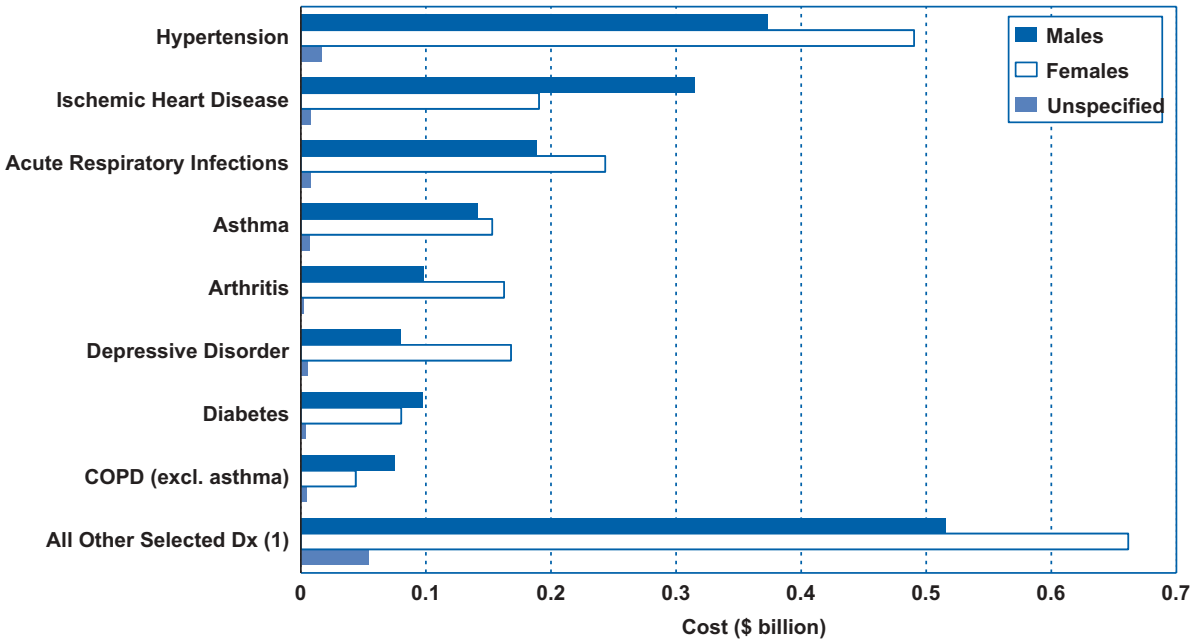
Note: Due to rounding some discrepancies may occur.

Prescription Drug Expenditures by Diagnostic Subcategory for Most Costly Diagnostic Categories in Canada, 1998



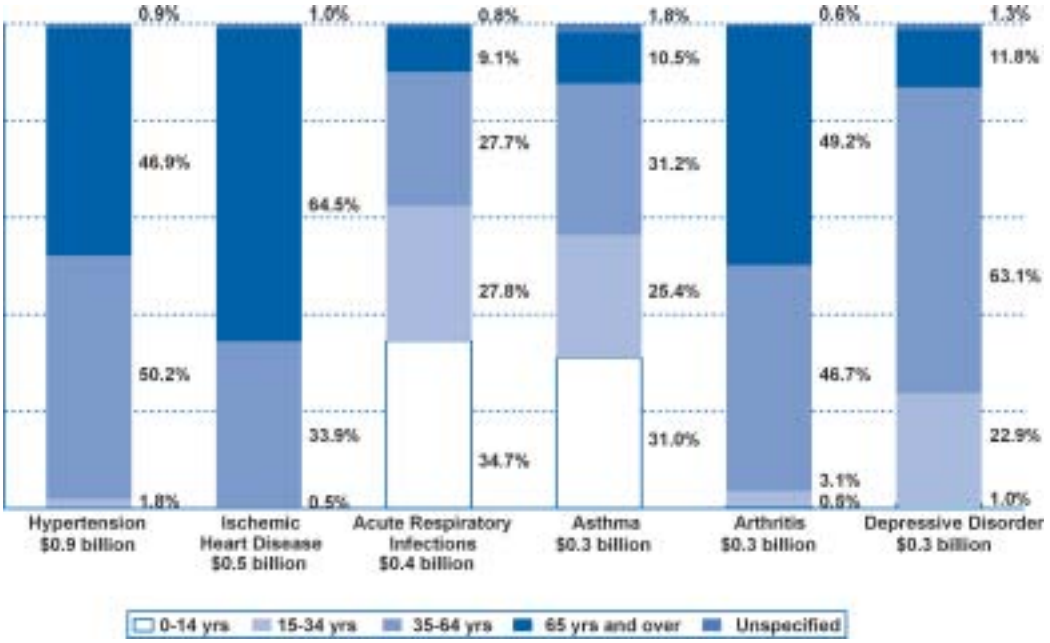
Note: Digestive disease subcategories are not included because data were not available.
(1) Refers to all other diagnostic categories.
Due to rounding some discrepancies may occur.

Prescription Drug Expenditures by Selected Diagnostic Subcategories and Sex in Canada*, 1998



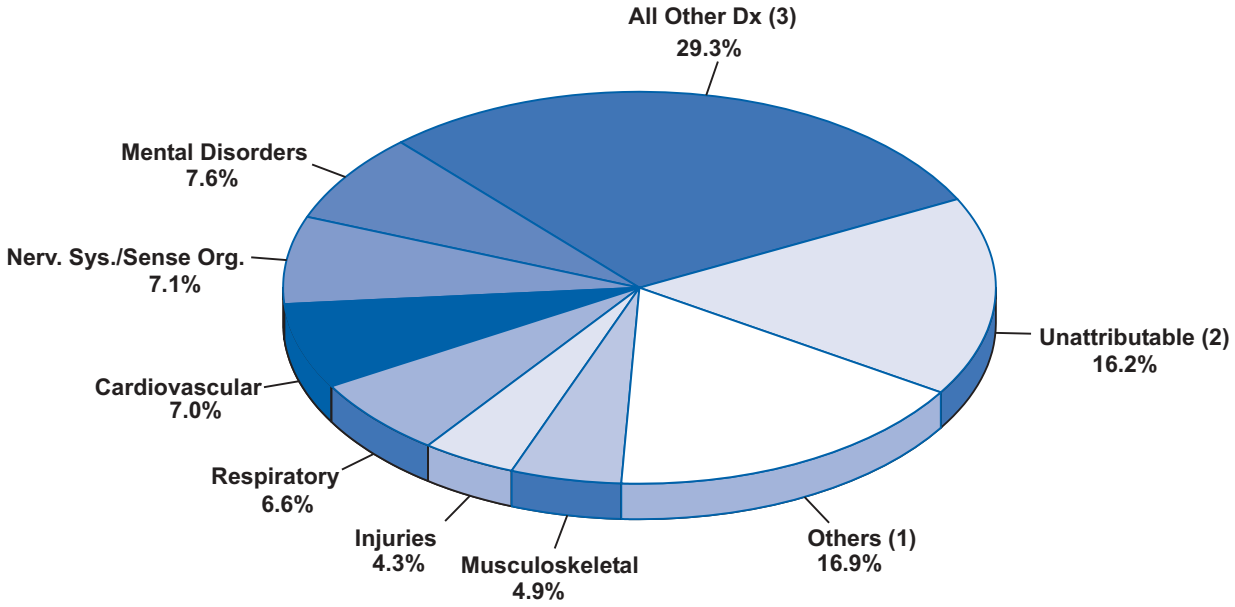
** Based on the $4.2 billion in prescription drug expenditures that are allocated by selected diagnostic subcategory and sex.*
(1) Refers to all other selected diagnostic categories.

Prescription Drug Expenditures by Selected Diagnostic Subcategories and Age Group in Canada, 1998



Note: Age groups that represent less then 0.3% of diagnostic subcategories are not shown here.
Due to rounding some discrepancies may occur.

Physician Care Expenditures by Diagnostic Category in Canada*, 1998



** Based on total physician care expenditures of $11.7 billion.*

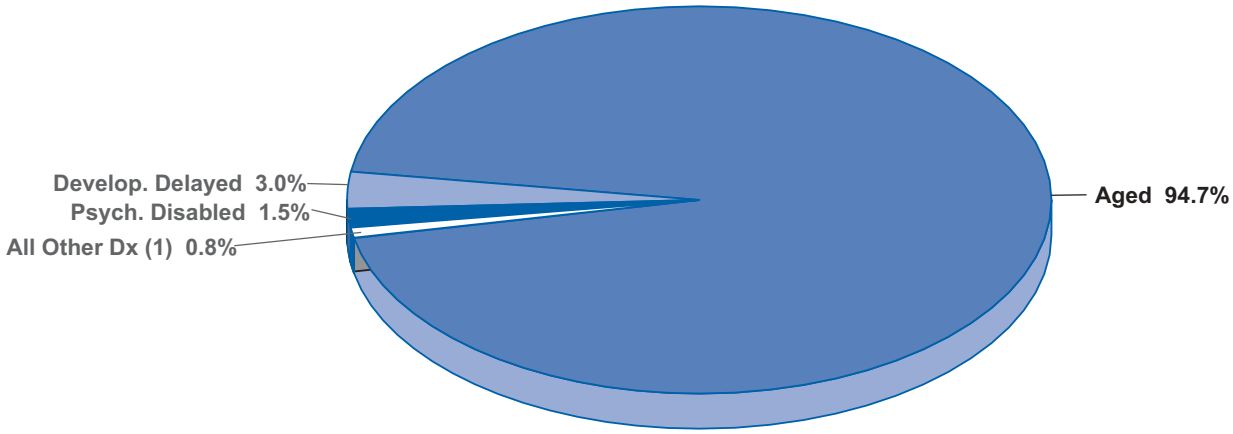
(1) Refers to data for which coding was not provided (for diagnostic categories), or data that are grouped because of small counts, specifically, $2.0 billion in provincial/territorial fee-for-service (FFS) physician care expenditures.

(2) Refers to data that could not be allocated by ICD-9 code (diagnostic category). Specifically, this includes $1.9 billion in physician care expenditures this represents the difference between total NHEX expenditures ($11.7 billion) and provinical/territorial FFS expenditures ($9.8 billion), which is assumed to be alternative payment plan (APP) expenditures ($1.9 billion).

(3) Refers to all other diagnostic categories.

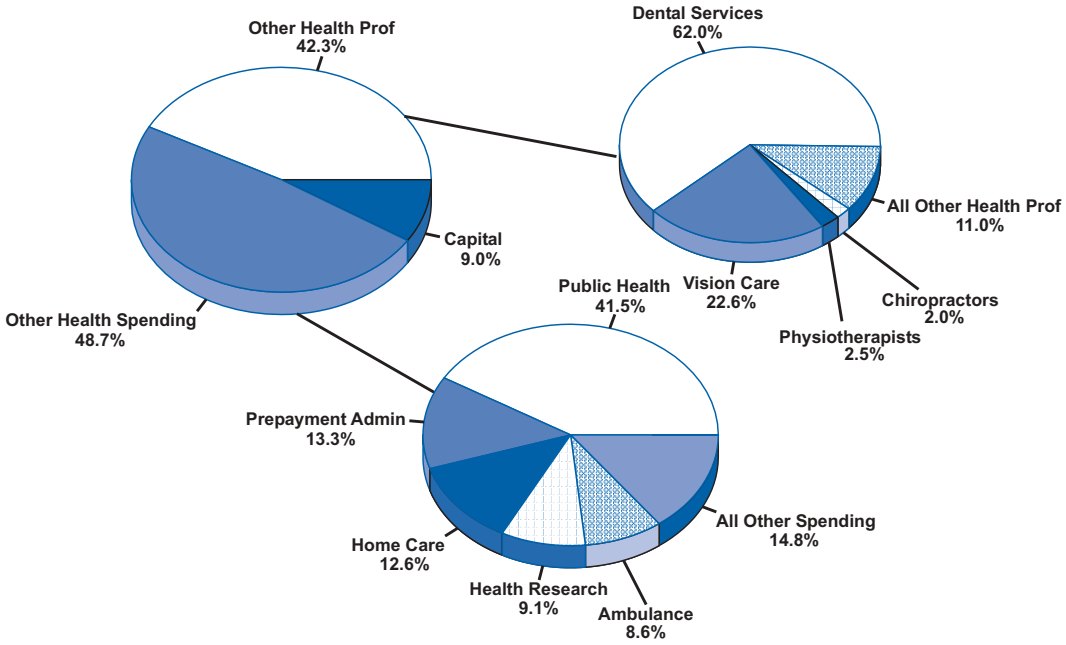
Note: Due to rounding some discrepancies may occur.

Expenditures of Residential Care Facilities by Principal Characteristic of Predominant Group of Residents in Canada*, 1997-1998



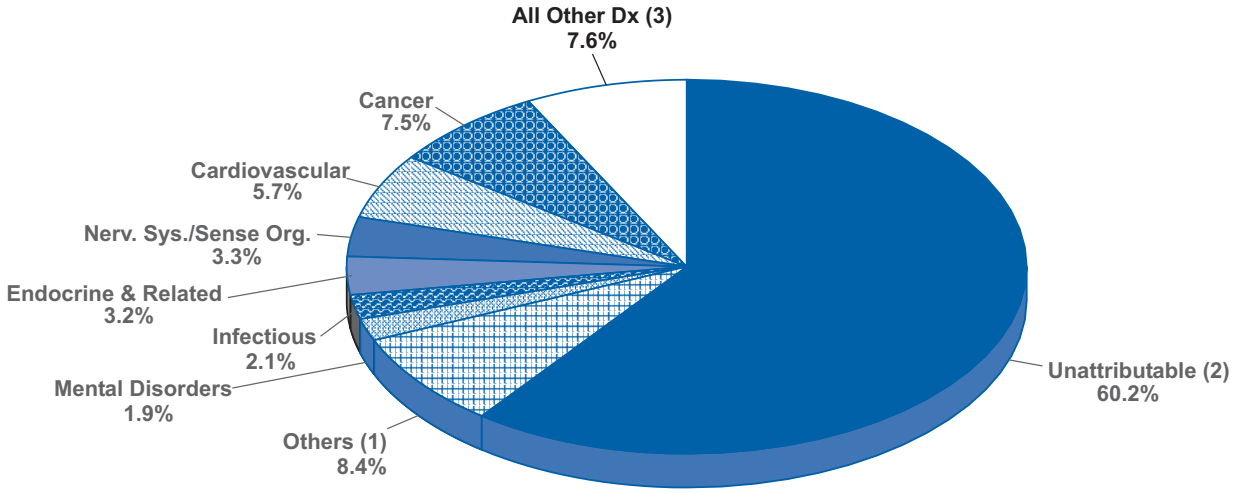
** Based on expenditures for care in other institutions of $8.0 billion.*
(1) Refers to all other diagnostic categories.
Note: Due to rounding some discrepancies may occur.

Additional Direct Health Expenditures in Canada*, 1998



** Based on total additional direct health expenditures of $24.2 billion.*
Note: Due to rounding some discrepancies may occur.

Health Research Expenditures by Diagnostic Category in Canada, 1998



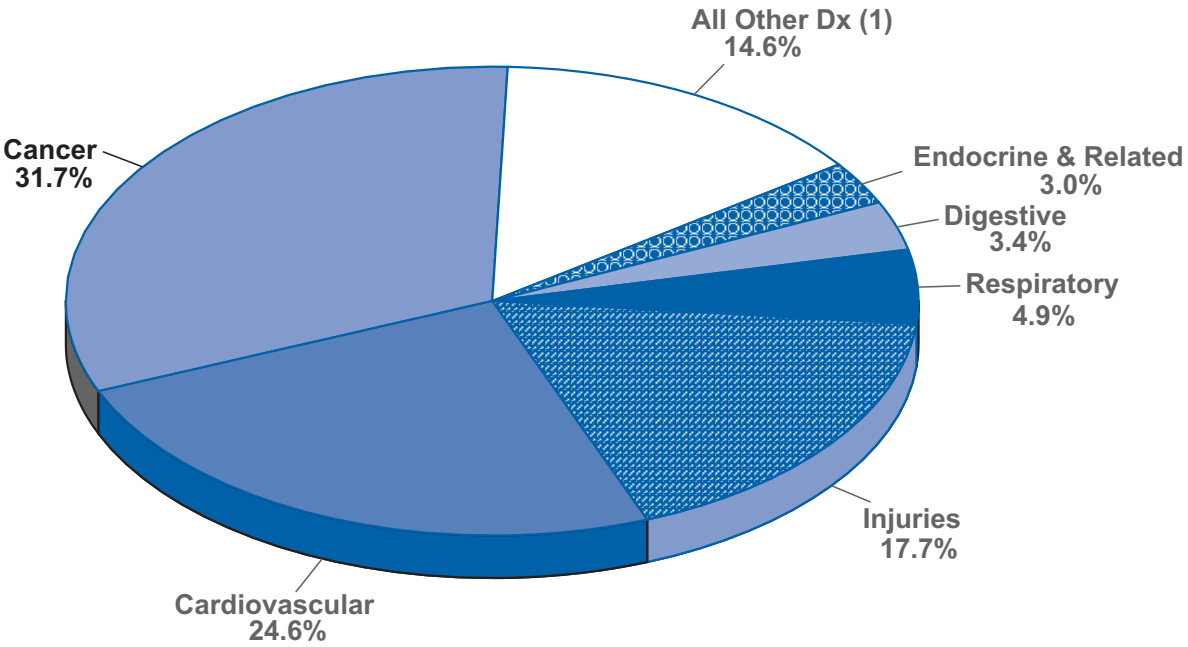
(1) Refers to data for which coding was not provided (for diagnostic categories), or data that are grouped because of small counts. For further details see Table 2, third footnote.

(2) Refers to data that could not be allocated by ICD-9 code (diagnostic category). Specifically, this includes health research expenditures of $644.4 million. This represents the difference between the National Health Expenditures in Canada total for health research expenditures ($1.1 billion) and the health research expenditures information that comes from the Canadian Institutes of Health Research (CIHR), AHRIS Database Version 4 ($458.5 million).

(3) Refers to all other diagnostic categories.

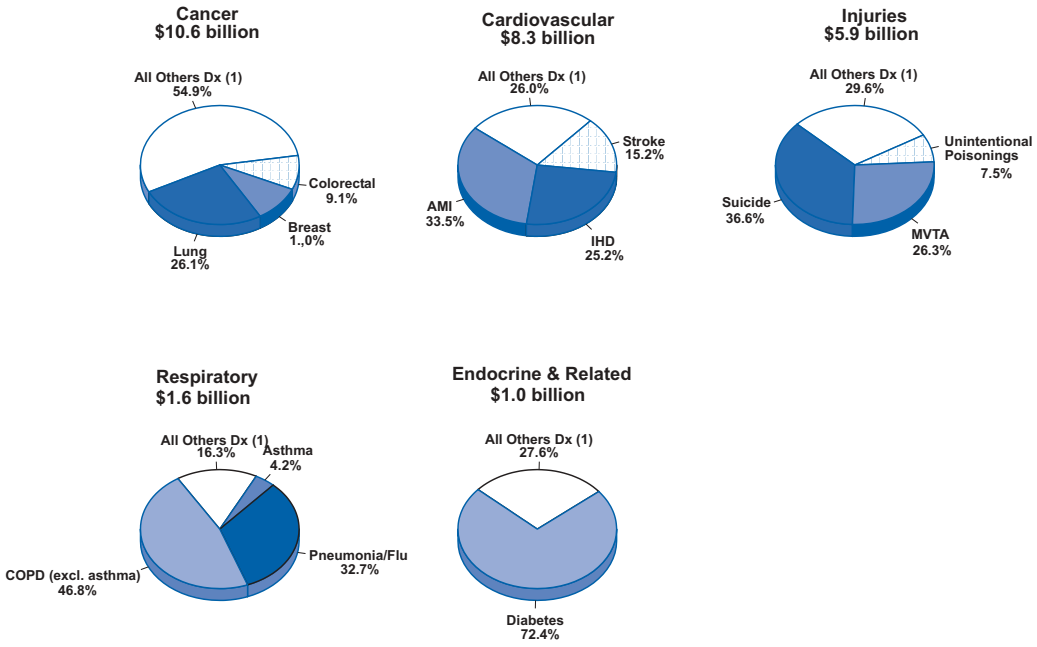
Note: Due to rounding some discrepancies may occur.

Mortality Costs by Diagnostic Category in Canada*, 1998



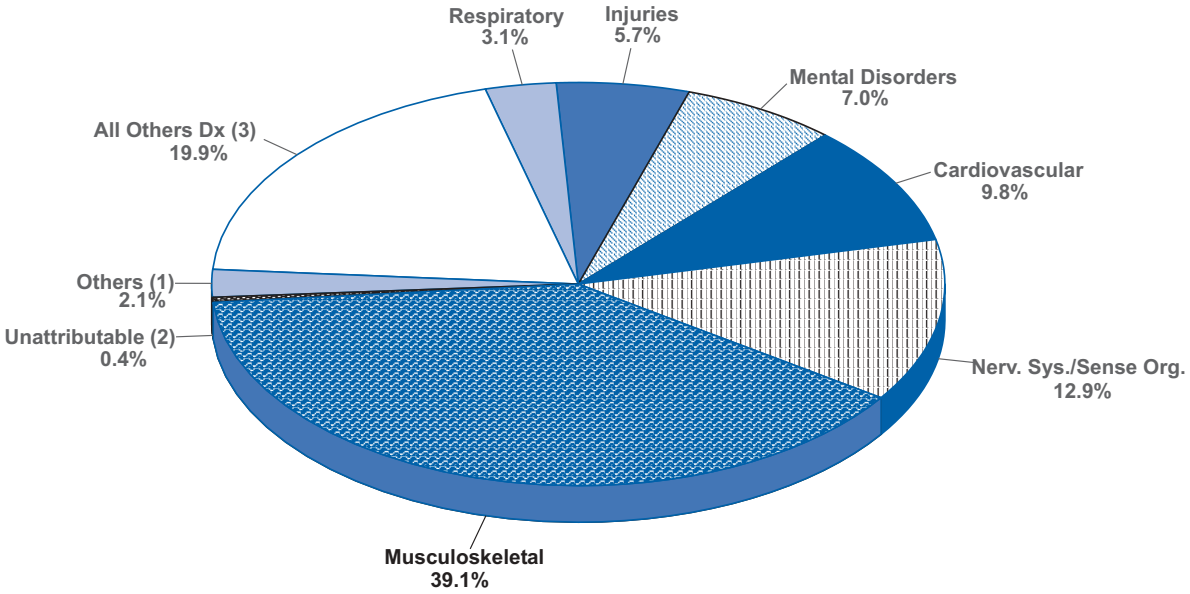
** Based on total mortality costs of $33.5 billion, i.e., the present value of future productivity lost due to premature mortality using a 5% discount rate.*
(1) Refers to all other diagnostic categories.
Note: Due to rounding some discrepancies may occur.

Mortality Costs by Diagnostic Subcategory for Most Costly Diagnostic Categories in Canada, 1998



(1) Refers to all other diagnostic categories.
Note: Due to rounding some discrepancies may occur.

Morbidity Costs due to Long-Term Disability by Diagnostic Category in Canada*, 1998



* *Based on total long-term disability costs of $32.2 billion.*

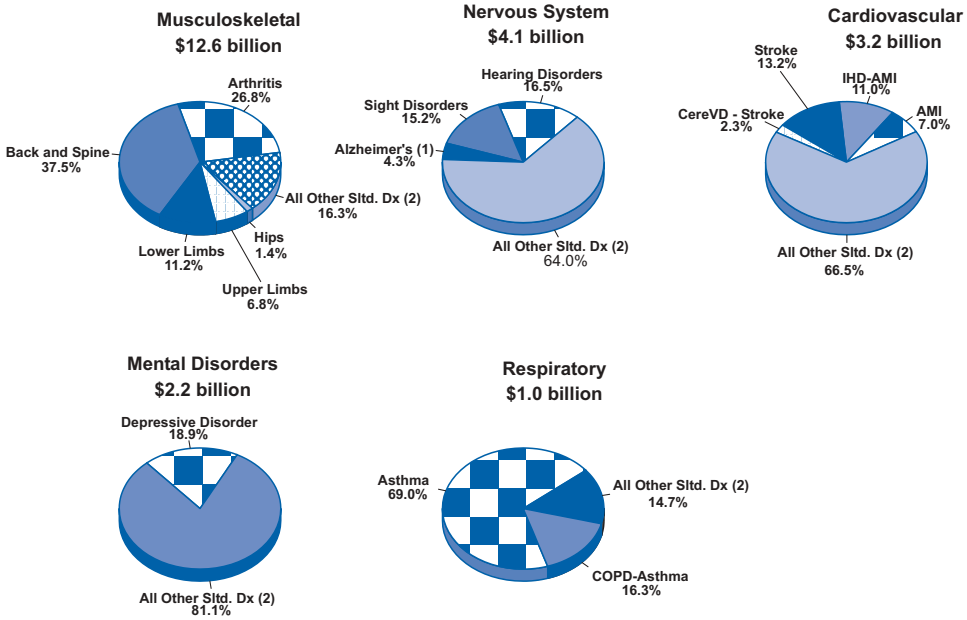
(1) Refers to data for which coding was not provided, or data that are grouped because of small counts. For more details see Table 2, third footnote.

(2) Refers to data that could not be allocated by ICD-9 (diagnostic cateogory). For more details see Table 2, fourth footnote.

(3) Refers to all other diagnostic categories.s

Note: Due to rounding some discrepancies may occur.

Morbidity Costs Due to Long-Term Disability by Selected Diagnostic Subcategories for Most Costly Diagnostic Categories in Canada, 1998

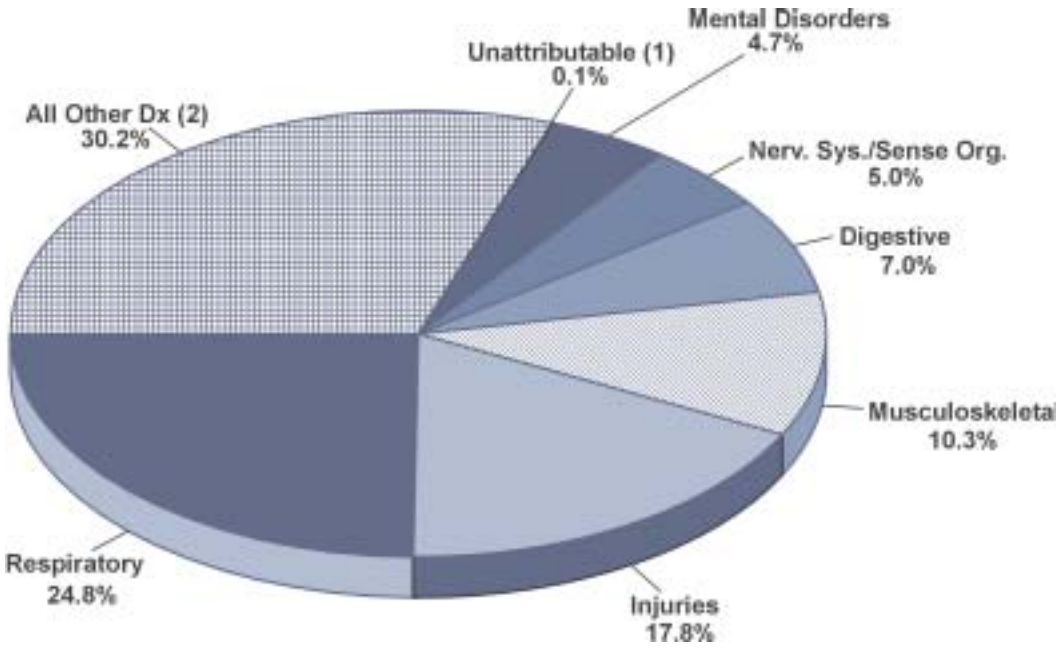


(1) Alzheimer's (Disease) could not be estimated from the NPHS household survey, and this estimate represents the institutionalized population only.

(2) Refers to all other selected diagnostic categories.

Note: Due to rounding some discrepancies may occur.

Morbidity Costs Due to Short-Term Disability by Diagnostic Category in Canada*, 1998



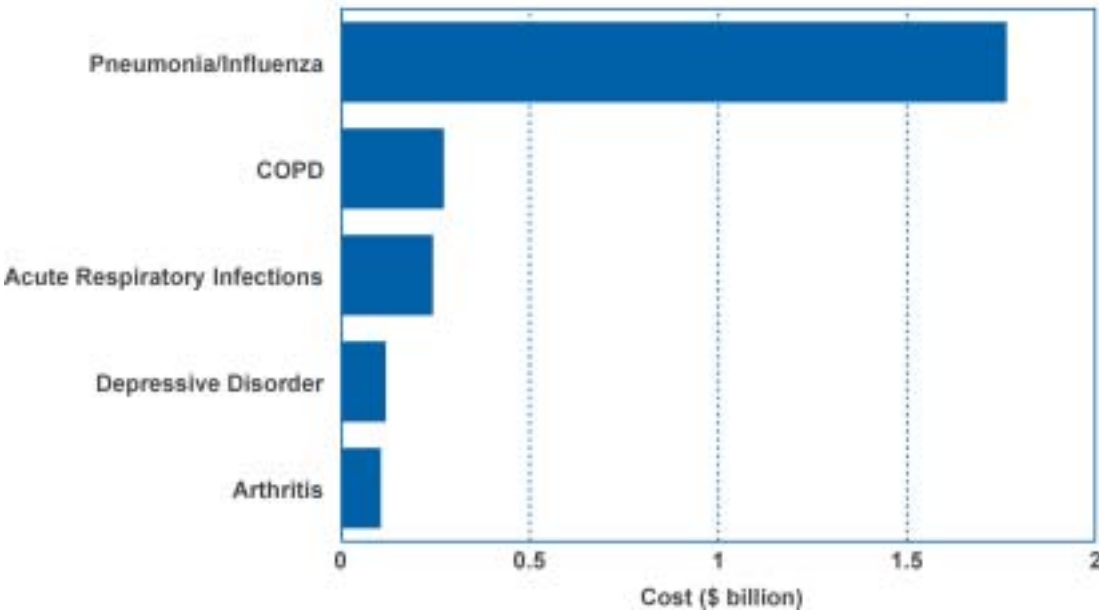
** Based on total short-term disability costs of $9.8 billion.*

(1) Refers to data that could not be allocated by ICD-9 code (diagnostic category). For more details see Table 2, fourth footnote.

(2) Refers to all other diagnostic categories.

Note: Due to rounding some discrepancies may occur.

Morbidity Costs Due to Short-Term Disability by Selected Diagnostic Subcategory in Canada*, 1998



** Based on total short-term disability costs of $9.8 billion.*