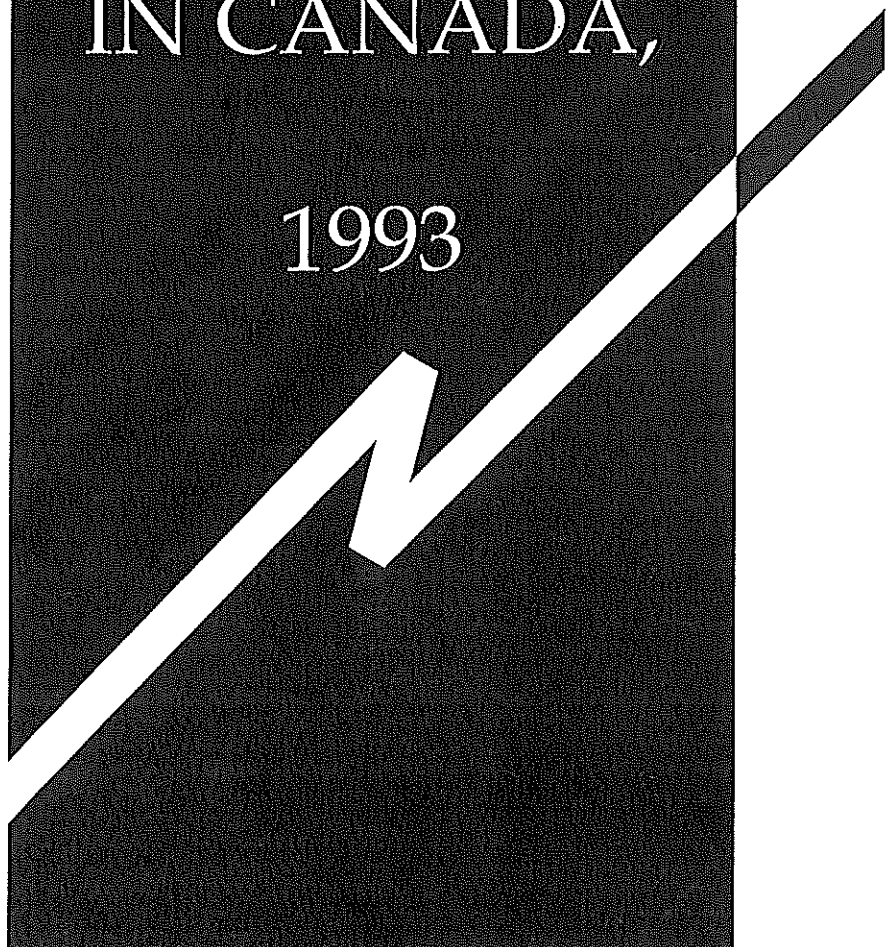




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ECONOMIC
BURDEN
OF ILLNESS
IN CANADA,
1993



Canada

**Our mission is to help the people of Canada
maintain and improve their health.**

Health Canada

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Economic Burden of Illness in Canada, 1993

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Executive Summary

Comprehensive and authoritative estimates of the cost of illness in Canada are vital to setting priorities for allocating limited health resources. However, many conceptual and methodological difficulties arise when attempting to quantify, in economic terms, the impact of illness and injury. The authors of this report have chosen the prevalence-based human capital approach to translate morbidity and premature mortality into direct and indirect costs to affected individuals and society.

The total cost of illness, disability and premature death in Canada for 1993 was an estimated \$156.9 billion based on a 6% discount rate. This is roughly equivalent to 22% of the Gross Domestic Product (GDP) or \$5,450 per capita. Direct costs accounted for \$71.7 billion; hospital care was the largest direct cost component (\$26.1 billion), while research expenditure was the smallest (\$752 million). Indirect costs totalled \$85.1 billion; almost half (45%, \$38.3 billion) of this amount was attributed to the loss of productivity resulting from long-term disability.

All costs except \$27.6 billion in direct costs were classifiable by diagnostic category. The diagnostic categories with the highest total costs were cardiovascular diseases (\$19.7 billion), musculoskeletal diseases (\$17.8 billion), injuries (\$14.3 billion) and cancer (\$13.1 billion). These four categories collectively represented half (50.2%) of the total cost of illness classifiable by diagnostic category.

A portion of the costs of illness could be categorized by age and sex. The age group 65 and over accounted for almost one third (29.2%, \$37.6 billion) of the costs classifiable by age group. The costs of illness that could be classified by sex were almost evenly distributed between males (\$65.9 billion) and females (\$62.7 billion). However, the distribution by age group and sex varied considerably by cost component.

This report provides a conservative estimate of the main direct and indirect costs of illness in Canada for 1993. Cost estimates have been refined extensively from the original report, *Economic Burden of Illness in Canada, 1986*. Recognizing implicit limitations and assumptions, both theoretical and practical, the report recommends continued refinement of cost-of-illness estimates as well as research, health promotion and disease prevention focused on illnesses with the greatest "health burden."

Recommendations

Health information systems and future analyses of the economic burden of illness should do the following.

1. Improve data sources and refine methods for direct and indirect cost components to provide more comprehensive information for specific diseases (several specific suggestions in the discussion address the present data limitations).
2. Organize all health-related cost data according to the most recent version of the World Health Organization's International Classification of Diseases in order to effectively and accurately determine the distribution of health resources by diagnostic category.
3. Refine methods to establish the costs of illness attributable to various risk factors (e.g. tobacco smoking, alcohol consumption).
4. Refine cost-of-illness methods to consider the multidimensional nature of disease (i.e. the costs associated with secondary causes of illness and disability).

In using these estimates, decision makers are encouraged to remember these points.

1. Consider the overall "health burden" (i.e. incidence, prevalence, number of deaths, years of life lost, use of health care resources, quality of life implications, economic impact, etc.) of illness when making decisions.
2. Strengthen research, health promotion and disease prevention programs, especially those that target illnesses with the greatest "health burden" (i.e. cardiovascular diseases, musculoskeletal diseases, injuries, cancer, mental disorders, respiratory diseases) in order to minimize the burden of illness in Canada.

Introduction

In 1991, the *Economic Burden of Illness in Canada, 1986*¹ was published by the Laboratory Centre for Disease Control (LCDC) in response to numerous requests for estimates of the cost of illness to Canadian society. The overwhelming response to the original report and continued requests for detailed information indicated the need for an up-to-date revision that would provide even finer detail than the original report.

The goal of this new document is to systematically estimate the 1993 economic impact of illness in Canada. This report provides a comprehensive overview of the distribution of the principal direct and indirect costs of illness using the human capital approach. The prevalence-based methodology determines "opportunity costs" to individuals and society that result from illness or injury, translating morbidity and premature mortality into direct and indirect costs.

Direct costs are the value of goods and services for which payment was made and resources used that could have been allocated to other uses in the absence of disease. Direct costs of health services include drugs and appliances, medical care provided by physicians and other health professionals, care in hospitals and other health care institutions, health science research, capital, administration, and various other health care expenditures. Indirect costs to society due to morbidity and premature mortality are measured by the present value of lost productivity due to long-term and short-term disability and premature death.

The *Economic Burden of Illness in Canada, 1993* begins with a background on conceptual issues, a discussion of methodology used in this report and a summary of direct and indirect costs by cost component, diagnostic category, age and sex. The subsequent pages provide detailed information by cost component: sources, specific methodologies, assumptions, limitations and key results. An inclusive reference list (organized by report section) and appendices are provided at the end of the document.

As in the past, complete systematic national information about the cost of illness is not readily available. Since publication of the original report in 1991, we have acquired better data sources, refined our methods and included a sensitivity analysis of our indirect costs. Disability payments, which were included in the 1991 publication as direct costs, are excluded from this report because their inclusion led to double counting of costs. Improvements to this and other methodology make comparison of estimates between the two time periods unadvisable; differences may represent these improvements rather than actual changes in the distribution and costs of illness between the two years of data.

Detailed, reliable data about health care costs are of increasing importance in developing effective health strategies and allocating limited health resources as Canadian health care costs continue to rise, the population ages and resource allocations tighten. Cost-of-illness studies are a valuable resource to health planners, policy makers, researchers and other stakeholders (i.e. private sector, volunteer organizations, professional associations). In conjunction with other health indicators, this information helps explain the overall scope and magnitude of illness and provides substantive information on which to base such difficult decisions as setting program priorities and effectively allocating limited health resources.

Background

Illness and injury can influence many aspects of a person's life. The complex nature of illness and injury poses a tremendous challenge for cost-of-illness studies, which seek to quantify, in economic terms, the impact of illness and injury on individuals and society.

Before initiating a cost-of-illness study, one must first determine what to consider as costs, what methods to use and what sources of data are available. The study must incorporate an approach to time and a point of view that suit both the available data and the purpose of the analysis.

Definition and Measurement of Costs

Direct costs reflect the value of goods and services for which payment was made and resources used that could have been used for other purposes in the absence of illness.¹ These costs, which are less open to dispute than indirect costs, include the cost of care provided by physicians and other health professionals, care in hospitals and other health care institutions, drugs and appliances, health science research, capital, administration and other health care expenditures. Direct costs also include out-of-pocket expenses to patient and family (e.g. transportation to health providers, moving expenses, additional household help, adaptive equipment or clothing, special diets).

Direct costs initially appear straightforward to calculate using existing secondary data sources. Although total national health expenditures are readily available, detailed systematic information about specific diagnostic categories is not easily found, and even ad hoc data are scarce. Reliable data about out-of-pocket costs to patient and family are even harder to obtain.

Indirect costs represent the value society places on "health" and "life." Indirect costs are more controversial than direct costs since a quantitative valuation, in economic terms, of health and life

inevitably places a value on the relative worth of individuals in society. However, to ignore these costs would underestimate the value society places on health and life. There are two main approaches to calculating indirect costs: the human capital and the willingness-to-pay approach.^{2,3}

The human capital approach considers the value of lost productivity as a result of disability and premature death, using lost earnings as a surrogate for the impact that premature death and disability have on individuals and society. By contrast, the willingness-to-pay approach considers the amount people are willing to pay to keep people alive and healthy; typically willingness-to-pay values are higher than those based on foregone earnings.⁴⁻⁸

The main criticism of the human capital approach is that it fails to recognize pain and suffering and the psychosocial consequences of illness. It assumes a single measure, present-value dollars, to be an adequate standard for judging the overall impact of illness and injury that affects all aspects of people's lives. Moreover, earnings do not always accurately reflect one's ability to produce, and some groups are thus undervalued: women, the young and the elderly.^{1,4,5,6}

The willingness-to-pay approach is favoured by many economists on the grounds that the human capital approach does not account for consumer behaviour in purchasing goods and services.⁹ The decision of whether or not a health program should proceed is ultimately driven by the willingness of the program's beneficiaries to incur costs in order to receive the benefits of the program. Preserving the life of an elderly person with no future economic productivity, for example, may be a decision for which a family or society is willing to pay.^{10,11}

The willingness-to-pay approach can be criticized because it is extremely difficult to place a value on small

reductions in the probability of death.^{1,4-6} It can also be criticized because it values individual lives based on income distribution, the rich being more able to pay than the poor.

We have chosen to use the human capital approach to estimate indirect costs of illness. It is used most often in cost-benefit and cost-effectiveness analyses because of the availability of reliable statistics, the relative simplicity of calculations and the consistency of results, permitting comparison between diagnostic categories or with other cost-of-illness studies using this approach.^{2,3,12}

None the less, indirect costs are less reliable indicators than estimates of direct costs that can be calculated directly from usage data. Any estimate of foregone earnings must be based on assumptions about the earnings people with an illness could have had but for their illness. These assumptions are variable and have a substantial effect on the resulting estimation of costs.⁶ Blindly using indirect costs as a guide to setting priorities may lead to resources being directed toward the most productive groups (i.e. wealthy, middle-aged, male) rather than the more vulnerable groups (i.e. poor, elderly, young, female). Such policies would worsen inequalities in health, contrary to social objectives.^{10,11}

Time Frame: Prevalence versus Incidence Approach

Two recognized approaches to establishing a time frame are used in cost-of-illness studies: prevalence and incidence.^{1,4} Prevalence-based studies examine costs incurred during a given time period, usually one year, regardless of the time of disease onset.¹ By contrast, incidence-based studies represent all the future costs associated with all cases with onset of illness in the base year.¹ When practice patterns and technology do not change over time, both methods yield the same results. However, if changes in

practice patterns and technology are anticipated, incidence-based costs will reflect these changes.¹¹

The prevalence approach is better suited to answering policy questions about cost control. For example, policy makers may wish to set targets on total expenditures for a diagnostic category and measure the extent to which the goal was met. The incidence approach, on the other hand, is better suited to decision making about treatment or research strategies as it more realistically reflects the impact of reduced incidence or improved outcomes in the context of future costs.¹³

The incidence approach requires collection of primary data based on knowledge of the likely course of a disease and its duration, i.e. survival rates since onset, type and cost of medical care for the duration of the illness and impact of the illness on employment income and unpaid work.⁸ These data can only be predicted; estimates based on incidence are even more dependent on assumptions than prevalence-based estimates.⁶

We use the prevalence approach in this study for two reasons. First, national economic and health data are readily available from various data sources. Second, results are easier to understand, are more directly related to other data and have a higher confidence level than estimates based on incidence.⁶

We use 1993 as the base year for our cost calculations. Although the premature mortality took place in 1993, some of the productivity loss will be incurred in future years and cannot strictly be allocated to 1993. On the other hand, premature mortality that took place before 1993 and caused productivity loss in 1993 is not considered in this model. A more complex lifetime productivity loss model would take into account all of these factors. However, the results of a more complex model are unlikely to differ significantly from those of the simpler model.

Perspective of Analysis: Society versus Government

The context in which data will be applied must also be considered in cost-of-illness analysis. Specifically, the impact of lost productivity imposed by injury or illness is viewed quite differently by governments than by society itself.

Disability payments such as Canada Pension Plan (CPP), Quebec Pension Plan (QPP) and workers' compensation, which attempt to compensate for the loss of earnings due to illness or injury, are transfers of funds from society to the individual. From the government's perspective, this shift in funds is a net (direct) cost: if illness did not occur, transfer payments could be used for other purposes.¹⁴⁻¹⁷ The indirect costs of illness and injury (i.e. lost productivity) are thus excluded when viewed from the governmental perspective.

However, from the perspective of society, the cost of illness and injury is not the disability payment itself, but the loss of productivity (i.e. earnings) it seeks to compensate: the transfer payment only shifts the burden of the disability from the individual to society. Including transfer payments in the cost of illness would result in double counting, counting first the individual's loss of productivity and then the redistribution of society's resources that attempts to compensate the individual for that loss.^{4,6}

We have chosen the societal perspective for the measurement of our costs, including all costs incurred by individuals, by employers, collectively through governments or through shared arrangements between any of these parties. However, we have excluded transfer payments to avoid double counting of indirect costs.

Discussion

Methods for estimating the cost of illness have been refined extensively from our original report, *Economic Burden of Illness in Canada, 1986*. This section provides an overview of how methods have been improved and what limitations remain. Further details about each specific cost component can be found in the section entitled "Expenditures by Cost Component" (p. 17 ff). We also provide a more general context for our methods, comparing our results with other sources of information, in Appendix 7.

Drug Expenditures

Our total drug expenditure (\$9.9 billion) now includes estimates of prescription drugs, non-prescription drugs and personal health supplies bought in retail stores and prescription drugs purchased for hospital use. Although costs of personal health supplies and most non-prescription drugs are still not available by diagnostic category, we are able to categorize more than 90% of all prescription drugs sold in pharmacies by diagnostic category, age and sex. We also estimate hospital drug expenditures by diagnostic category, age and sex.

We have compared our total hospital drug expenditure with estimates provided by Statistics Canada.¹ After adjusting Statistics Canada's estimates for underreporting, our estimates were almost identical to theirs. Thus, we are confident that we have represented the majority of hospital drug expenditures.

Cost estimates for some diagnostic categories (e.g. cancer) may be underestimated since the data sources we used to categorize drugs by diagnostic category excluded the activities of specialized health centres or clinics outside of a hospital. As much as 15% of the cancer drug market could be missing.² However, the cost of drugs for these patients is represented in the total drug expenditure.

Our cost estimates exclude drugs prescribed in other institutions that are included in the component called "Expenditures for Care in Other Institutions."

Physician Care Expenditures

To categorize the national physician care expenditure by diagnostic category, age and sex, we have compared the distribution of medical service costs in seven provinces by diagnostic category and sex.

At the time of this comparison, most provinces could only provide 1991/92 data. We assumed that the distribution by diagnostic category for each province remained fairly constant between 1991/92 and 1993/94. The National Physician Database (NPDB)³ provides a distribution of fee-for-service physician expenditures for all provinces except Quebec. Although the NPDB could not provide data to verify the distribution by diagnostic category, it verified that the distribution by sex remained fairly constant between 1990/91 and 1992/93.

The seven provincial distributions are comparable for all diagnostic categories except ill-defined conditions and well-patient care (see Appendix 3). Provincial officials have suggested that disparities in these two categories can be attributed to the use of a limited set of diagnostic codes and over-classification of many diagnoses to these categories that capture poorly-defined diagnoses.⁴ As in our 1986 cost-of-illness estimates, we apply Manitoba's 1993/94 distribution of physician expenditures by diagnostic category, age and sex to the total national physician expenditure; Manitoba's data have been validated, whereas officials in other provinces lacked confidence in the accuracy of their diagnostic coding.

Unfortunately, we were unable to obtain physician care expenditures by diagnostic category from Ontario, Quebec, New Brunswick and the territories. These regions represent 67.5%

of the total national physician care expenditure;⁵ distribution of physician care costs by diagnostic category in these areas has an important impact on the overall distribution of physician care costs in Canada. We assume physician care cost distributions for the missing provinces and territories to be similar to those of the other seven provinces.

Although we were unable to verify that the distribution of physician expenditure by diagnostic category for Ontario, Quebec and New Brunswick was similar to that of the other provinces, the NPDB did confirm that the sex distribution for Ontario and New Brunswick was similar to that of the other provinces for 1990/91 and 1992/93.³

Hospital Care Expenditures

The national hospital expenditure by diagnostic category, age and sex is estimated separately for acute care, long-term care and psychiatric hospitals to account for the impact of differences in patient composition, duration of stay and intensity of care on costs within these types of hospitals.

Acute care hospitals represent 86.6% of the total hospital expenditure.¹ We were able to account for the duration of stay and intensity of care for the inpatient "acute care" portion of the acute care hospitals using total Resource Intensity Weights (RIWs). General and other short-stay hospitals (i.e. acute care hospitals) also include long-term care bed, outpatient and emergency ward costs that are not considered in the calculation of total RIWs. These costs are assumed to have diagnostic category and age/sex distributions similar to those for acute care.

In the current report, we estimate the average cost of hospitalization per patient day for extended care and rehabilitation hospitals to represent patients in long-term care hospitals. Although we are unable to identify the intensity of care in these hospitals, we know that long-term

care hospitals make up only 6.9% of the total hospital expenditure,¹ and the intensity of care among patients in these hospitals is likely to be more homogeneous than for acute care patients.

The total psychiatric hospital expenditure is assigned to mental disorders.

Expenditures for Care in Other Institutions

We use the term "other institutions" to refer to residential care facilities providing Type II care or higher (see definitions in Appendix 2). Although we are unable to estimate costs by diagnostic category, age and sex, we have grouped these institutions by principal characteristic of the predominant group of residents. The majority of the expenditure for care in other institutions is for homes for the aged. However, attributing costs to the category "aged" obscures the fact that, for a very high proportion of residents of these institutions, it is a health problem (e.g. cognitive impairment, musculoskeletal diseases), and not age alone, that requires professional health care. Approximately 12% of the expenditure for care in other institutions was spent on treating mental disorders.

Health Science Research Expenditures

Our health science research expenditure represents the vast majority of health science research conducted in Canada (\$752 million). We have categorized approximately 70% of this expenditure. Research categories have been expanded to include basic research (e.g. metabolism, immunology) and other non-disease areas of health science research (e.g. medical history, equipment grants), providing a more accurate estimate of the distribution of research by diagnostic category. In our previous publication, basic research was assigned to endocrine and related disorders and to blood diseases, overestimating the cost of research in these diagnostic categories.

The total research expenditure includes a combination of 1992/93, 1993, and 1993/94 grants (see Health Science Research Expenditures); however, the majority of grants were for 1993/94. We assumed the type and value of research to

be similar for the two years and reported all grants and awards as if for 1993/94.

Additional Direct Health Expenditures

Unfortunately, we are unable to categorize care by other professionals, capital and some other expenditures by diagnostic category. Many of these costs are either system costs that should not be attributed to specific diagnostic groups (i.e. public health, prepayment administration) or areas that could be allocated at aggregate levels (i.e. dentistry and denturists, \$4.7 billion, to digestive diseases; eye care and hearing aids, \$1.4 billion, to nervous system and sense organ diseases).

We did not include these additional disease costs in our Summary of Results because information about them is not detailed enough to justify allocating the total figure to a diagnostic category. For example, a large portion of dentistry might be considered well-patient care. To allocate the total cost to a diagnostic category could misrepresent the proportion of total costs for that diagnostic category; for instance, digestive diseases would rank seventh overall largely because of dental costs.

Nevertheless, it is important to focus more attention on these additional health expenditures since they represent a considerable portion of the total direct costs.

Mortality Costs

Our calculation of mortality costs (i.e. the present value of lost productivity due to premature mortality) now considers the loss of labour force and unpaid work resulting from premature mortality.

In our 1986 estimates, we calculated productivity loss using the average annual income of individuals. Income overestimated productivity losses because it included many sources of revenue (e.g. interest from stocks and bonds, pensions and benefits) in addition to earnings from employment. Loss of productivity would not affect these additional income sources: only employment income would be affected.

We add the replacement value of unpaid work⁶ to earnings from

employment because employment income alone underestimates the loss resulting from illness, especially for the women, children and elderly persons who are not in the work force.^{7,8} Although we have reduced disparities between some groups (i.e. men and women, middle-aged and elderly), mortality costs for children are still underestimated since earnings from employment and the value of unpaid work for children under age 15 are not available. Attention to measuring the value of lost productivity for this age group is necessary in subsequent work.

The arithmetic sum of lifetime earnings and unpaid work overestimates the present value of an individual since the future value of capital is less than its present worth (i.e. capital can be invested and increases in value over time).⁹ We express the value of future earnings from employment and the value of unpaid work in terms of equivalent present-day dollars. This is accomplished by discounting by an assumed rate of return on investments for the time period (i.e. 6% discount rate). Because investment rates are difficult to predict, we provide a sensitivity analysis comparing our estimates at a 6% discount rate to a range of estimates using discount rates between 2% and 10%.¹⁰

Morbidity Costs Due to Long-term and Short-term Disability

Our calculations of lost productivity due to long-term and short-term disability are significantly higher than our 1986 estimates. This reflects the use of the 1994 National Population Health Survey (NPHS), which provides a more recent prevalence of disability than the 1978/79 Canada Health Survey used previously. The NPHS also provides information about long-term disability among the institutionalized population; only psychiatric hospitals were included in the cost of long-term disability in the 1986 estimates.

However, surveys that provide estimates of the number of "self-reported" people affected by illnesses are hard to validate, and it is even more difficult to determine the degree of disability involved. For example, survey data tend to underestimate the extent of disability

due to mental illness and its severity. This could result in a significant underestimation of the indirect costs for some diagnostic categories.

The NPHS uses V-codes developed by Statistics Canada to code musculoskeletal diseases, which include injuries. Although we have attempted to solve this problem, long-term disability costs for injuries may be underestimated.

NPHS data on short-term disability are not available by diagnostic category; the distribution of the Quebec Health and Social Survey is used to classify this NPHS data by diagnostic category.

As in estimating premature mortality, we use earnings (adjusted for wage supplements) and the replacement value of unpaid work to measure lost productivity. We have developed different weights to adjust for "loss of productivity" at different levels of disability. This is an improvement from our first report, where the use of "loss of health" indexes may not reflect "loss of productivity."¹¹⁻¹⁴ We now provide a sensitivity analysis, comparing morbidity costs by using a range of weights for future productivity losses at different levels of disability.

Transfer Payments

In our 1986 estimates, we considered pensions and benefits as direct costs and included them in the total cost of illness to society. This led to double counting of costs by almost \$7 million since we counted both the individual's lost productivity and reallocation of resources used to compensate the loss. In this report, we exclude transfer payments from our total cost estimate. The cost of administration for these transfer payments is a legitimate cost;¹⁵⁻²⁰ unfortunately, we are unable to obtain this information at present.

Other Costs

Inevitably there are other costs we have not included in our cost-of-illness estimates. Direct costs should include, among other considerations, patient out-of-pocket expenses (i.e. transportation costs to health providers; the cost of relocating or altering property to adapt to a patient's

needs; special diets, clothing or equipment for rehabilitation or comfort; and education and counselling of patients and caregivers),⁷ social services (i.e. community programs/services, corrections/legal system costs) and service provider training. Indirect costs of illness might well include foregone employment opportunities for family members and the cost of reduced working hours or leisure time used in providing for a sick or disabled family member.¹⁴ Although we have been unable to account for such costs, they should be considered in subsequent work.

Comorbidity

We have attributed direct and indirect costs to a single diagnostic category even though they may represent individuals with multiple diseases or conditions.²¹ Costs have been apportioned to the primary cause of illness based on the following list.

- Drugs: The written prescription to treat a particular diagnosis
- Physicians: Treatment of an illness or disability billed as a result of a physician visit
- Hospitals: Acute care: the cost of procedures to treat conditions diagnosed and the duration of hospital stay

Psychiatric and long-term care: primary cause of hospitalization
- Research: The main disease area investigated in a research project
- Mortality: The underlying cause of death
- Morbidity: Self-reported main cause of short-term and long-term disability or institutionalization

Cost estimates may thus present a one-dimensional picture of illness that fails to address the costs of secondary causes.

Health care databases (i.e. mortality, hospitalization) generally do not provide information about multiple contributing or associated secondary causes. Suicide,

for example, is coded as an injury even though physical or mental illness may be a contributing factor.

Similarly, our morbidity costs do not reflect short-term limitations for people with long-term disabilities. Although this avoids overestimation from double counting, our cost values may underestimate certain diagnostic categories that are often secondary causes of illness. For example, diabetes, arthritis and mental disorders are often secondary causes of illness, whereas cancer is more likely to be recorded as a primary cause of illness or death.

Summary of Results

The total cost of illness in Canada in 1993 was estimated at \$156.9 billion: \$71.7 billion (45.7%) in direct costs and \$85.1 billion (54.3%) in indirect costs, using a 6% discount rate to value lost productivity due to premature mortality in 1993 (see Table 1 and Figure 1). Total costs would range from \$149.9 billion, using a 10% discount rate, to \$171.3 billion, using a 2% discount rate. The following pages illustrate the distinct nature of each diagnostic category and the relative impact of each cost component on the total cost of these illnesses.

TABLE 1		
TOTAL COST OF ILLNESS, CANADA, 1993		
COST COMPONENT	\$ MILLIONS	% OF TOTAL
Direct Costs		
Hospital Care	\$26,096	16.6%
Other Institutions	\$7,008	4.5%
Physician Care	\$10,363	6.6%
Other Professionals	\$6,056	3.9%
Drugs	\$9,884	6.3%
Research (1993/94)	\$752	0.5%
Capital	\$2,291	1.5%
Other Health Expenditures	\$9,294	5.9%
Subtotal	\$71,743	45.7%
Indirect Costs		
Mortality	\$29,296	18.7%
Long-term Disability	\$38,277	24.4%
Short-term Disability	\$17,549	11.2%
Subtotal	\$85,123	54.3%
TOTAL COST OF ILLNESS	\$156,866	100.0%

FIGURE 1
Total Cost of Illness

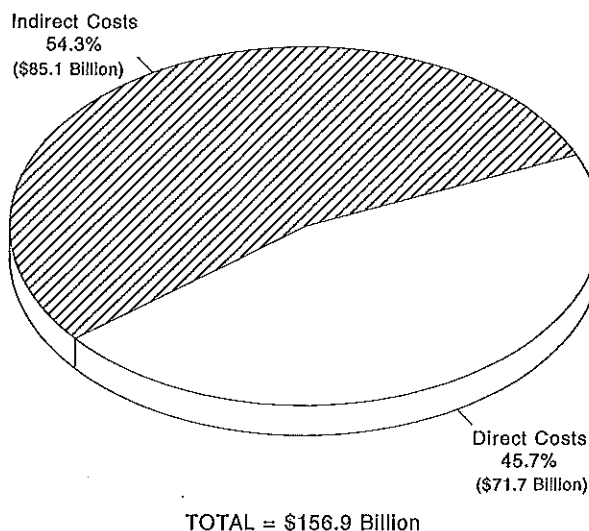


TABLE 2									
SUMMARY: ECONOMIC BURDEN (\$1000) OF ILLNESS BY DIAGNOSTIC CATEGORY, CANADA, 1993									
DIAGNOSTIC CATEGORY	DIRECT COSTS								
	Drugs		Physicians		Hospitals		Research (93/94)		TOTAL DIRECT COST
	% of total	Cost (\$1000)	% of total	Cost (\$1000)	% of total	Cost (\$1000)	% of total	Cost (\$1000)	% of total Cost (\$1000)
Infectious and Parasitic Diseases	3.2	228,628	1.7	181,109	1.3	345,071	6.2	31,875	1.8 786,683
Cancer	3.3	233,810	4.3	447,456	9.5	2,467,408	14.3	73,032	7.3 3,221,706
Endocrine and Related Diseases	7.0	499,009	2.7	275,058	2.0	526,785	6.4	32,773	3.0 1,333,625
Blood Diseases	0.4	30,306	0.8	78,311	0.6	156,808	1.7	8,651	0.6 274,076
Mental Disorders	8.4	601,543	7.7	800,607	13.9	3,631,788	3.4	17,510	11.4 5,051,448
Nervous System/Sense Organ Diseases	6.2	444,055	9.2	952,471	3.0	792,862	12.1	62,203	5.1 2,251,591
Cardiovascular Diseases	21.9	1,565,270	8.4	866,862	18.6	4,862,322	11.7	59,800	16.7 7,354,253
Respiratory Diseases	13.4	962,084	9.9	1,021,287	6.9	1,788,230	3.1	15,817	8.6 3,787,419
Digestive Diseases	8.1	578,580	6.2	637,723	8.0	2,093,374	3.2	16,501	7.5 3,326,178
Genitourinary Diseases	5.5	390,325	7.5	772,021	4.1	1,075,828	1.9	9,803	5.1 2,247,977
Pregnancy	0.6	40,308	3.2	331,137	6.3	1,649,707	0.7	3,506	4.6 2,024,658
Skin and Related Diseases	3.9	277,009	3.8	390,240	0.9	223,015	0.3	1,564	2.0 891,828
Musculoskeletal Diseases	6.8	490,091	6.5	668,802	4.9	1,285,910	2.9	14,984	5.6 2,459,787
Birth Defects	0.2	12,908	0.6	58,617	0.9	231,923	0.4	1,882	0.7 305,330
Perinatal Conditions	0.1	7,770	0.2	17,872	2.0	518,012	1.5	7,624	1.2 551,278
Ill-defined Conditions	4.6	330,809	6.5	675,308	3.2	844,567	N/A		4.2 1,850,684
Injuries	2.6	185,609	6.5	676,300	8.6	2,253,487	1.2	6,201	7.1 3,121,596
Well-patient Care	3.9	280,467	10.6	1,094,749	5.2	1,349,205	3.2	16,514	6.2 2,740,935
Other	N/A		4.0	416,672	N/A		25.8	132,143	1.2 548,814
TOTAL	100.0	7,158,580	100.0	10,362,600	100.0	26,096,300	100.0	512,381	100.0 44,129,865
SUBCATEGORY									
Diabetes	2.2	160,840	1.3	130,050	1.1	274,621	2.2	11,520	1.3 577,031
Coronary Heart Disease	3.3	239,224	2.5	262,896	6.0	1,571,999	0.3	1,296	4.7 2,075,414
Stroke	1.6	111,595	0.7	74,813	4.8	1,258,063	0.1	463	3.3 1,444,934
Chronic Bronchitis/Emphysema/Asthma	5.6	401,284	2.8	289,171	2.4	636,491	0.3	1,524	3.0 1,328,470
Motor Vehicle Traffic Accidents	N/A		N/A		1.1	283,106	0.1	500	0.6 283,606
Female Cancers	0.8	60,152	0.5	56,131	0.8	206,068	1.3	6,672	0.7 329,023
<p>In addition to these costs, there are \$27.6 billion in direct costs that could not be classified by diagnostic category.</p> <ul style="list-style-type: none"> — \$239 million for health science research — \$2.7 billion for non-prescription drugs and personal health supplies — \$6.1 billion for other professionals — \$7.0 billion for other institutions — \$11.6 billion for capital and other expenditures <p>Some of these areas could be allocated at aggregate levels to diagnostic categories.</p> <ul style="list-style-type: none"> — \$831 million for care and treatment in other institutions could be allocated to mental disorders — \$4.7 billion for dentistry and denturists could be allocated to digestive diseases — \$1.4 billion for eye care and hearing aids could be allocated to nervous system and sense organ diseases 									

Cost of Illness by Cost Component and Diagnostic Category

The relative magnitude of the major cost components given in Table 1 is illustrated in Figure 2. Hospital care was by far the largest direct cost, with \$26.1 billion (16.6%) of the total costs. This

was followed by the cost of services by physicians (\$10.4 billion, 6.6%), drugs (\$9.9 billion, 6.3%) and other miscellaneous health expenditures (\$9.3 billion, 5.9%). Health science research had the lowest direct cost, \$752 million, representing only 0.5% of the total cost of illness.

The major indirect cost components were the value of time lost due to long-term disability, estimated at \$38.3 billion (24.4% of the total), and the present value of future productivity lost due to premature mortality, \$29.3 billion (18.7%).

TABLE 2 (cont'd)

SUMMARY: ECONOMIC BURDEN (\$1000) OF ILLNESS BY DIAGNOSTIC CATEGORY, CANADA, 1993

INDIRECT COSTS										
Mortality		Long-term disability		Short-term disability		TOTAL INDIRECT COST		TOTAL COST		CATEGORY
% of total	Cost (\$1000)	% of total	Cost (\$1000)	% of total	Cost (\$1000)	% of total	Cost (\$1000)	% of total	Cost (\$1000)	
4.1	1,213,908	0.7	261,025	2.2	381,704	2.2	1,856,637	2.0	2,643,320	Infectious/Parasitic
30.3	8,866,063	1.9	727,921	1.4	251,205	11.6	9,845,189	10.1	13,066,894	Cancer
2.6	765,710	3.4	1,320,142	N/A		2.5	2,085,852	2.6	3,419,477	Endocrine/Related
0.3	86,099	N/A		0.5	86,926	0.2	173,025	0.3	447,101	Blood Diseases
1.3	374,900	4.2	1,600,769	4.6	811,508	3.3	2,787,177	6.1	7,838,625	Mental Disorders
2.4	703,404	14.9	5,721,836	5.1	896,058	8.6	7,321,297	7.4	9,572,888	Nervous System/Sense
25.4	7,440,458	11.8	4,501,786	2.4	425,348	14.5	12,367,592	15.3	19,721,846	Cardiovascular
4.8	1,396,540	6.9	2,639,619	24.8	4,357,224	9.9	8,393,383	9.4	12,180,802	Respiratory
3.7	1,070,437	1.8	702,940	6.5	1,147,567	3.4	2,920,943	4.8	6,247,121	Digestive
0.9	264,281	N/A		3.0	521,505	0.9	785,786	2.3	3,033,763	Genitourinary
0.0	8,509	N/A		3.9	681,726	0.8	690,235	2.1	2,714,893	Pregnancy
0.0	13,543	N/A		0.6	108,808	0.1	122,351	0.8	1,014,179	Skin/Related
0.3	95,531	35.2	13,479,056	10.0	1,753,851	18.0	15,328,438	13.8	17,788,225	Musculoskeletal
1.1	334,095	N/A		N/A		0.4	334,095	0.5	639,425	Birth Defects
0.9	265,152	N/A		0.4	66,696	0.4	331,848	0.7	883,125	Perinatal Conditions
2.4	697,700	N/A		10.4	1,819,170	3.0	2,516,870	3.4	4,367,554	Ill-defined Conditions
19.5	5,700,162	6.0	2,279,040	18.5	3,242,540	13.2	11,221,742	11.1	14,343,338	Injuries
N/A		N/A		N/A		0.0	0	2.1	2,740,935	Well-patient Care
N/A		13.2	5,043,318	5.7	996,937	7.1	6,040,255	5.1	6,589,069	Other
100.0	29,296,491	100.0	38,277,451	100.0	17,548,772	100.0	85,122,714	100.0	129,252,579	TOTAL
										SUBCATEGORY
1.9	559,272	N/A		N/A		0.7	559,272	0.9	1,136,303	Diabetes
15.7	4,595,443	1.8	695,656	N/A		6.2	5,291,099	5.7	7,366,514	CHD
4.2	1,225,658	N/A		N/A		1.4	1,225,658	2.1	2,670,592	Stroke
2.5	733,926	5.9	2,252,424	N/A		3.5	2,986,350	3.3	4,314,819	Bronch/Emph/Asthma
5.7	1,664,529	N/A		N/A		2.0	1,664,529	1.5	1,948,135	MVTAs
4.4	1,285,816	N/A		N/A		1.5	1,285,816	1.2	1,614,839	Female Cancers

However, information about these costs is not detailed enough to justify allocating the total figure to the diagnostic category. For instance, a large portion of dentistry might be considered well-patient care. To allocate the total cost to a diagnostic category would misrepresent the proportion of total costs for the diagnostic category, e.g. digestive diseases would rank sixth largely because of dental costs.

Direct and indirect costs are available by diagnostic category for \$129.3 billion; an additional \$27.6 billion in direct costs (approximately 18% of the total) was unclassifiable by diagnostic category. Table 2 provides a detailed breakdown of costs by diagnostic category and cost component. Figure 3 compares the direct

and indirect costs for all diagnostic categories.

Cardiovascular diseases, the largest diagnostic category, accounted for 15.3% of the total cost of illness classifiable by diagnostic category, \$7.4 billion in direct costs and \$12.4 billion in indirect costs. Musculoskeletal disorders and injuries

ranked second and third with total costs of \$17.8 billion and \$14.3 billion, respectively. Direct costs were small (\$2.5 billion, \$3.1 billion) in comparison with the enormous indirect costs (\$15.3 billion, \$11.2 billion) of these two disorders. Cancer followed next with a total cost of \$13.1 billion, comprising

FIGURE 2
Distribution of Costs by Cost Component, Canada, 1993

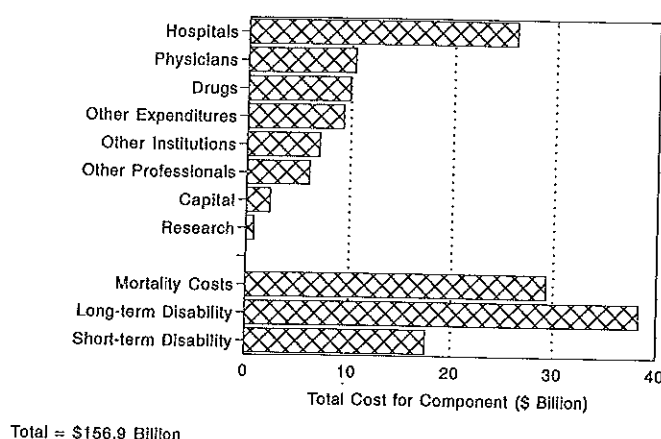


FIGURE 3
Distribution of Direct and Indirect Costs by Diagnostic Category, Canada, 1993

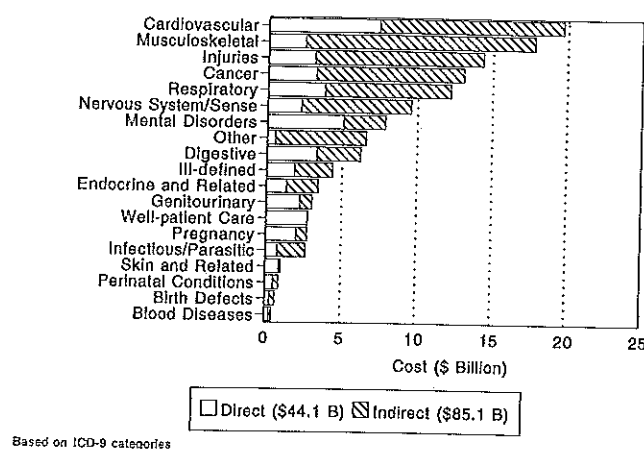
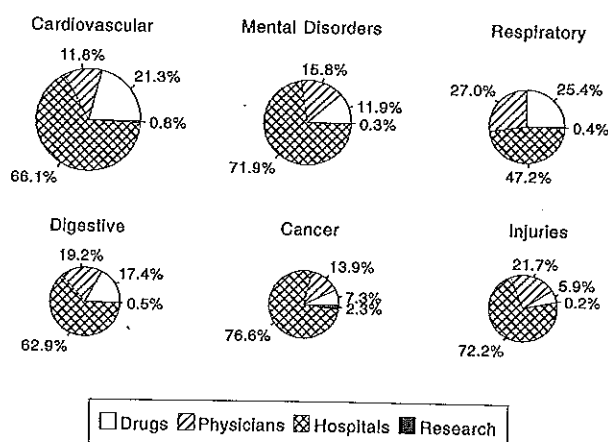


FIGURE 4
Distribution of Direct Costs for Diagnostic Categories with Highest Direct Costs, Canada, 1993



The disease-classifiable costs provided in Expenditures for Care in Other Institutions (i.e. mental disorders, \$831 million) and Additional Direct Health Expenditures (i.e. digestive disorders, \$4.7 billion; nervous system and sense organ diseases, \$1.4 billion) are not included here.

direct costs of \$3.2 billion and indirect costs of \$9.8 billion. Together these four categories accounted for half (50.2%) of the cost of illness that could be classified by diagnostic category.

Distribution of Direct Costs by Diagnostic Category

The relative magnitude of each cost component varies substantially by type of illness. Figure 4 illustrates the distribution of direct costs for the six diagnostic categories with the highest direct costs. These categories represented over half (58.6%) of the direct costs classifiable by diagnostic category.

Hospital care alone contributed more than 70% of the total direct cost of mental disorders, cancer and injuries. Drugs accounted for more than 20% of the direct cost of cardiovascular and respiratory diseases, compared to only 5.9% for injuries. Physician care expenditures made up 27% of the direct cost of respiratory diseases.

At the same time, the research share of the direct cost of injuries, mental disorders and respiratory diseases appears almost negligible, less than 0.5%. The amount spent on research is an extremely small portion of the total cost of illness. Figures 5 and 6 show the research share of direct and total costs for each diagnostic category. Research represents less than 2% of the total cost of illness for each diagnostic category. Infectious and parasitic diseases and blood diseases had the highest proportion of research expenditure. A large portion of the former was for HIV/AIDS research.

Distribution of Indirect Costs by Diagnostic Category

Indirect costs were highest for musculoskeletal diseases, cardiovascular diseases, injuries and cancer, respectively. These four diagnostic categories represented over half (57.3%) of the total indirect cost of illness. As Figure 7 illustrates, at least 90.1% of the indirect cost of cancer resulted from mortality costs (i.e. the present value of lost productivity due to premature mortality). However, cancer often causes considerable short-term disability, which tends to be underreported on surveys such as the Quebec Health and Social Survey,

on which our short-term disability costs are based.

Mortality costs were also a considerable share of the indirect cost of cardiovascular diseases (60.2%). By contrast, 87.9% of the indirect cost of musculoskeletal diseases and 78.2% of the indirect costs of nervous and sense organ diseases were attributed to the productivity loss due to long-term disability; half (51.9%) of the indirect cost of respiratory diseases was attributed to productivity loss due to short-term disability.

Distribution of Total Costs by Diagnostic Category

Figure 8 shows the relative magnitude of direct costs, mortality costs (i.e. the present value of future productivity lost due to premature mortality) and morbidity costs (i.e. the value of lost productivity due to long-term and short-term disability) for the six diagnostic categories with the highest total costs. These categories represent two thirds (67.1%) of the total cost of illness we are able to classify.

The relative proportion of direct costs within the total cost varied significantly between diagnostic categories. Direct costs accounted for 37.3% of the total cost of cardiovascular diseases, the most costly diagnostic category, but only 13.8% for musculoskeletal diseases, the second most costly group, and 21.8% for injuries, the third most costly category. Thus, the potential reduction in direct costs from a reduction in illness or injury would be more significant for certain diagnostic categories.

However, for the six diagnostic categories with the greatest total costs, indirect costs were greater than direct costs (see Table 2 and Figure 8), demonstrating the enormous impact that the indirect costs of illness place on society and individuals and the necessity for research, health promotion and disease prevention aimed at reducing the health burden of these illnesses.

For categories where direct costs outweighed indirect costs, the highest proportion of direct costs was for skin and related disorders (87.9%), complications of pregnancy (74.6%) and

FIGURE 5
Research Share of Direct Cost by Diagnostic Category, Canada, 1993

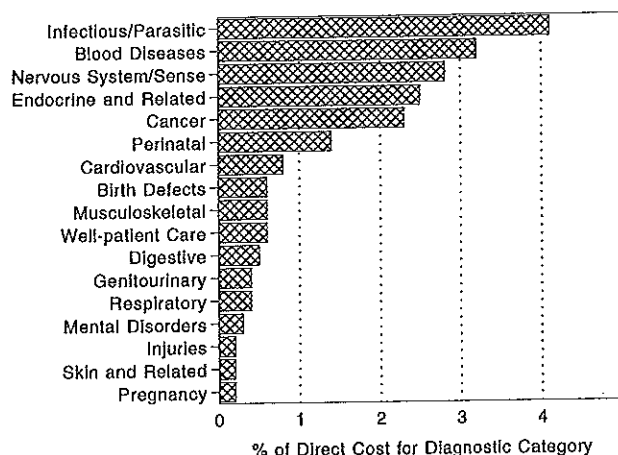


FIGURE 6
Research Share of Total Cost by Diagnostic Category, Canada, 1993

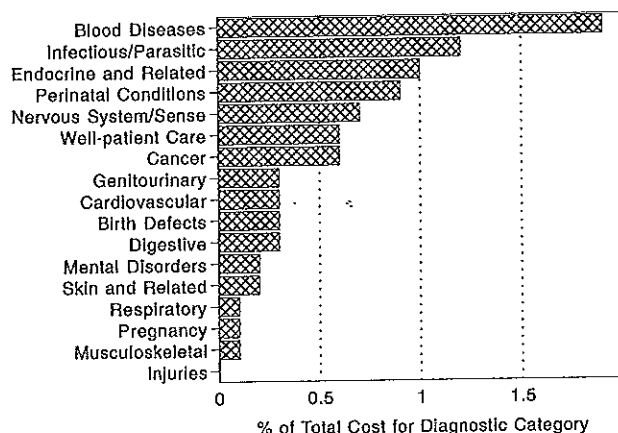


FIGURE 7
Distribution of Indirect Costs for Diagnostic Categories with Highest Indirect Costs, Canada, 1993

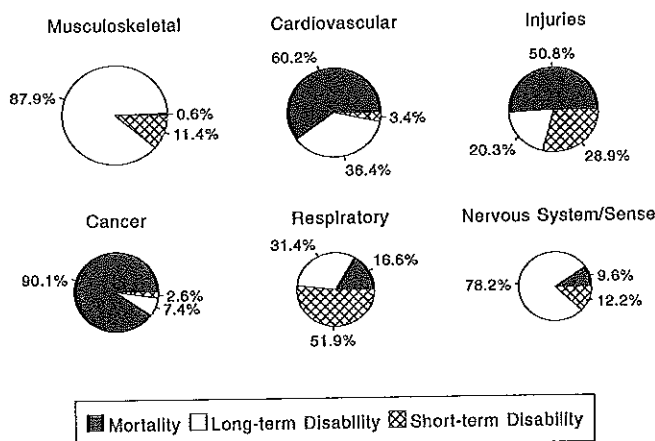


FIGURE 8
Distribution of Total Costs for Diagnostic Categories
with Highest Total Costs, Canada, 1993

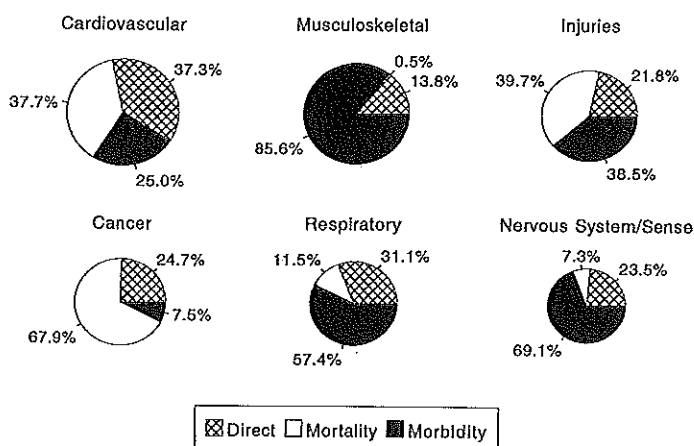


FIGURE 9
Distribution of Costs by Sex, Canada, 1993

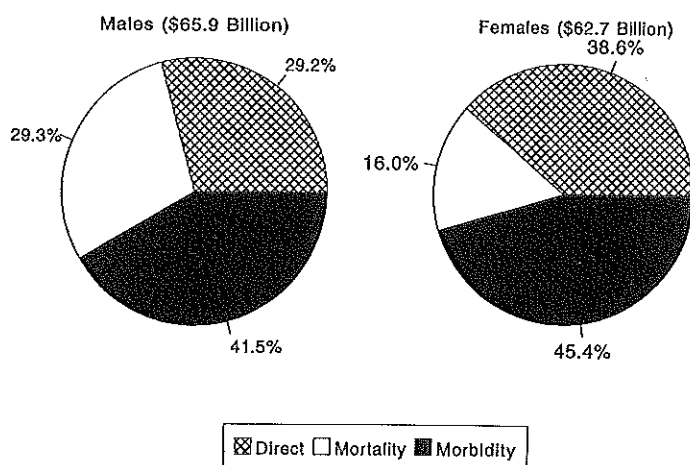
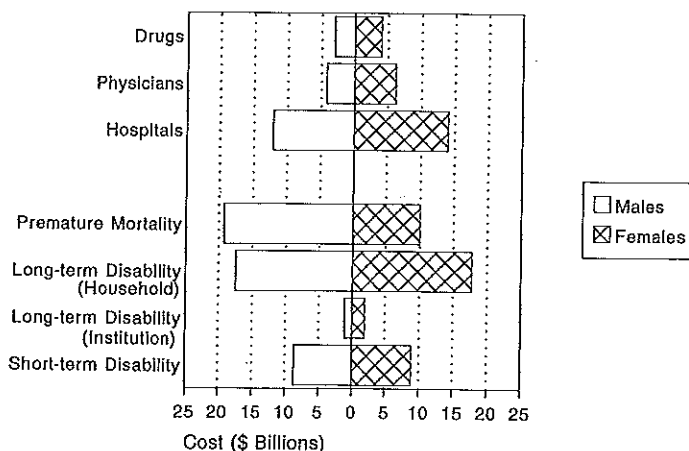


FIGURE 10
Distribution of Cost Components by Sex, Canada, 1993



genitourinary diseases (74.1%). However, each of these categories represented less than \$3.5 billion in total costs compared to \$9.7–19.7 billion for the six most costly diagnostic categories.

Distribution by Sex

Figure 9 illustrates the distribution of all direct, morbidity and mortality costs for the 82% of the cost of illness we were able to account for by sex. Costs for males and females were almost evenly distributed (\$65.9 billion and \$62.7 billion).

However, the distribution by sex varied considerably by type of cost as illustrated in Figure 10. Females accounted for 56% of the direct costs we could categorize by sex, although they represented only 50.4% of the population.¹ This reflects higher disease prevalence² and greater utilization of the health care system by women. Females accounted for \$14.0 billion, \$6.2 billion and \$4.0 billion of hospital care, physician care and drug expenditures in 1993. (Appendix 7 compares our sex distribution with other data sources.)

For both short-term and long-term disability among the household population, higher rates of disability for females were largely offset by lower labour force participation rates, earnings and value of unpaid work for women: short-term disability cost \$8.7 billion for males and \$8.9 billion for females; long-term disability, \$17.5 billion and \$17.7 billion, respectively. However, females represented 63% (\$1.9 billion) of long-term disability costs in institutions, reflecting the large number of women in institutions, especially in homes for the aged.³

Mortality costs attributed to males were almost twice as high as for females—\$19.3 billion compared to \$10.0 billion—resulting from higher labour force participation rates, earnings, value of unpaid work (e.g. construction work) and death rates for males.

Distribution by Age Group

We are able to account for 82% of the total cost of illness by age group.* As shown in Figure 11, the elderly (persons 65 years of age or over), who represented 11.4% of the total population in 1993,¹ accounted for 29.2% of the costs we were able to classify by age group. Distribution by age group varied by type of cost, as illustrated in Figures 12 to 14.

The prevalence of illness increases with age as does the use of medical services. Direct costs by age group are illustrated in Figure 12. The elderly population represented 40.1% (\$17.5 billion) of total direct costs. This reflects the substantial cost of hospitalization (\$12.2 billion, 46.7%) for this age group. Physician care and drug expenditures were highest for the population aged 35–64, amounting to almost 40% of physician care and drug expenditures (\$3.8 billion; \$2.9 billion). The elderly accounted for approximately 30% of these direct costs (\$2.9 billion; \$2.4 billion). Children (ages 0–4) were the least costly to the health care system, accounting for approximately 10% (\$2.5 billion for hospitals; \$1.3 billion for physicians; \$526 million for drugs) of direct costs available by age group. (Appendix 7 compares our age distribution with other data sources.)

The population aged 35–64 represented almost half (49.5%, \$14.5 billion) of the cost of premature mortality (Figure 13). The large share is indicative of this age group's high labour force participation rates, earnings and value of unpaid work as well as many years of life lost to premature mortality. The elderly accounted for approximately a third (31.1%, \$9.1 billion) of mortality costs. Although the elderly have shorter life expectancies and lower labour force participation rates and earnings, mortality costs reflect lost unpaid productivity and high mortality rates within this age group.

Figure 14 shows that, for the household population, the 45–64 age group had the highest long-term disability costs (42.6%, \$15.0 billion) in 1993,

* Estimates provided in *Expenditures for Care in Other Institutions*, the majority of which are for homes for the aged (\$6.1 billion), are not included in the total cost of illness by age group.

FIGURE 11
Distribution of Costs by Age Group, Canada, 1993

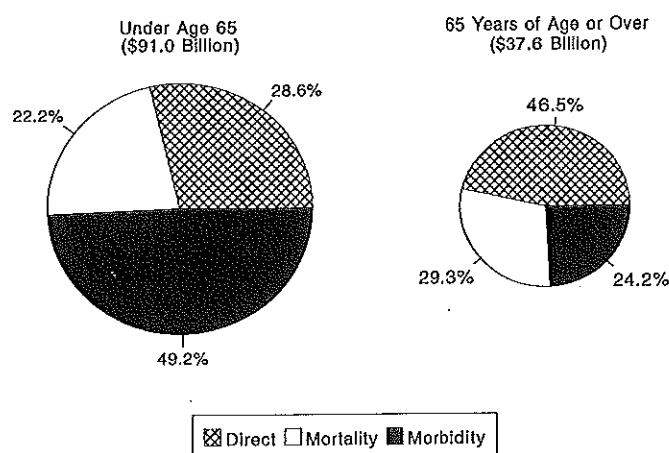


FIGURE 12
Distribution of Direct Costs by Age Group, Canada, 1993

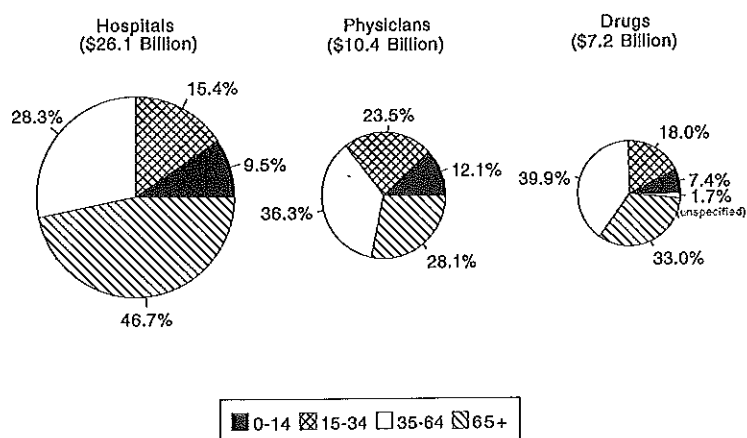


FIGURE 13
Distribution of Mortality Costs by Age Group, Canada, 1993

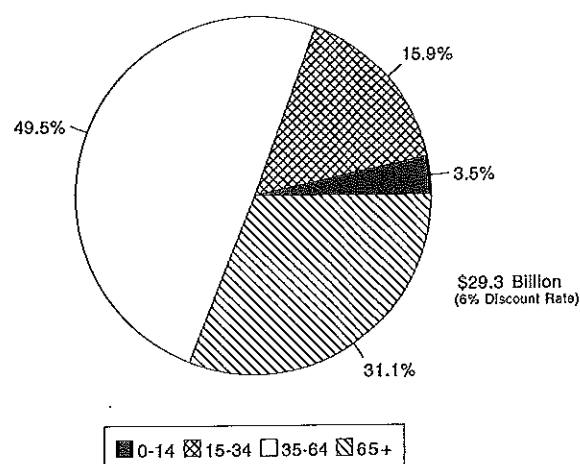
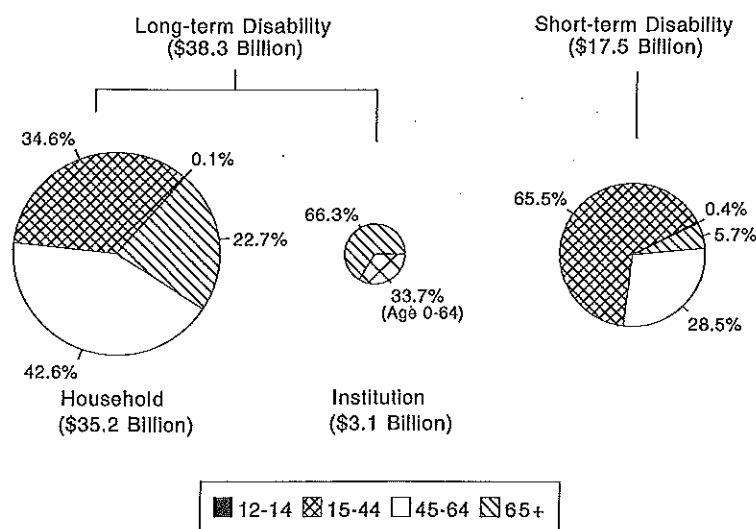


FIGURE 14
Distribution of Morbidity Costs by Age Group, Canada, 1993



followed by the group aged 15-44 (34.6%, \$12.2 billion). As with mortality costs, this is due to the high labour force participation rates, earnings and value of unpaid work for those aged 45-64. It also reflects the increased prevalence of long-term disability with age. The elderly represent just under one quarter (22.7%, \$8.0 billion) of long-term disability costs among the household population, but two thirds (66.3%, \$2.0 billion) of these costs among the institutionalized population. This can be explained by the large number of elderly people with chronic conditions, especially of those requiring professional health care.

In contrast, people aged 15-44 accounted for over two thirds (65.5%, \$11.5 billion) of short-term disability costs. Causes of short-term disability (e.g. injuries) among this population, the most productive age group, are largely preventable. The elderly have relatively low short-term disability costs (5.7%, \$902 million). This amount may be misleading because it is affected by the exclusion of short-term disability costs for people with long-term disability.

Unfortunately, the household component of the National Population Health Survey did not provide short-term and long-term disability estimates for the population aged 0-11. We anticipate that disability among this group is lower than among other age groups based on our other findings; however, the youngest age group is often undervalued in cost-of-illness studies because the value to society is based on productivity.

Expenditures by Cost Component

This section supplements general information given in previous sections, providing details for each cost component: data sources, specific methodologies, assumptions, limitations and results. A complete reference list is provided at the end of the document.

Where possible, costs have been distributed to diagnostic category. Unless otherwise stated, diagnostic categories are defined by the Ninth Revision of the World Health Organization's International Classification of Diseases (ICD-9, see Appendix 1). Six subcategories of significant specific diseases are also isolated. Costs are broken down by age group and sex where possible.

Cost estimates are for Canada in 1993 (unless otherwise indicated) and are rounded to the nearest \$1000. Definitions and criteria for inclusion and exclusion are provided in Appendix 2.

Drug Expenditures

DRUG EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA, 1993		
DIAGNOSTIC CATEGORY	1993 COST (\$1000)	% OF TOTAL
Cardiovascular Diseases	\$1,565,270	21.9%
Respiratory Diseases	\$962,084	13.4%
Mental Disorders	\$601,543	8.4%
Digestive Diseases	\$578,580	8.1%
Endocrine and Related Diseases	\$499,009	7.0%
Musculoskeletal Diseases	\$490,091	6.8%
Nervous System and Sense Organ Diseases	\$444,055	6.2%
Genitourinary Diseases	\$390,325	5.5%
Well-patient Care	\$280,467	3.9%
Skin and Related Diseases	\$277,009	3.9%
Cancer	\$233,810	3.3%
Infectious and Parasitic Diseases	\$228,628	3.2%
Injuries	\$185,609	2.6%
Pregnancy	\$40,308	0.6%
Blood Diseases	\$30,306	0.4%
Birth Defects	\$12,908	0.2%
Perinatal Conditions	\$7,770	0.1%
Ill-defined Conditions	\$330,809	4.6%
TOTAL	\$7,158,580	100.0%
SUBCATEGORY		
Chronic Bronchitis/Emphysema/Asthma	\$401,284	5.6%
Coronary Heart Disease	\$239,224	3.3%
Diabetes	\$160,840	2.2%
Stroke	\$111,595	1.6%
Female Cancers	\$60,152	0.8%

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lished tabulations).

Methods

The 1993 total national drug expenditure is derived from estimates provided by Health Canada's *National Health Expenditures in Canada, 1975-1994* (NHEC)¹ and Health Canada's Bureau of Drug Policy and Coordination. The NHEC provides cost estimates of non-prescription drugs and personal health supplies. The Bureau of Drug Policy and Coordination provides estimates primarily for 1993 Canadian prescription drug costs to the consumer. These estimates are based on three IMS audits²⁻⁴ and Statistics Canada's *Hospital Morbidity*.^{5,6} (Refer to Appendix 2 for definitions.)

The *Canadian Compuscript* (CS)² and *Canadian Disease and Therapeutic Index* (CDTI)³ audits are used to calculate the cost of drugs purchased directly by the consumer. The CS audit estimates the dollar value of prescriptions dispensed by Canadian pharmacies to the consumer by therapeutic class; the CDTI provides estimates of the frequency with which office-based physicians recommended drugs by diagnostic category, age and sex. These data are used to distribute the dollar value of prescriptions filled for each therapeutic class to a diagnostic category, age group and sex.

The *Canadian Pharmaceutical Market: Drug Store and Hospital Purchases* (CDH)⁴ and CDTI³ audits and *Hospital Morbidity*^{5,6} are used to calculate the cost of drugs used in hospitals. The CDH estimates the dollar value of drug purchases for hospitals by therapeutic class. These costs have been increased by 33% to approximate retail values, assuming hospital dispensing costs (pharmacists, storage, etc.) to be equivalent to retail dispensing fees and mark-ups.^{7*} The CDTI is used to assign dollar values of drugs in each therapeutic class to diagnostic category. Age and sex distributions are based on Statistics Canada's data on days in hospital for each diagnostic category.

* This figure is based on the experience of pharmacists and others in the health care setting. Although we were unable to obtain data to support this assumption, the figure appears to be a generally accepted estimate.

Assumptions

- The 1993 national drug expenditure¹ is assumed to include all drugs sold in retail drug stores as estimated by the Bureau of Drug Policy and Coordination.
- The distribution of drugs within a therapeutic class for each diagnostic category is assumed to be similar for office-based physicians and hospitals. Although the specific drugs used may differ, therapeutic drug classes are fairly broad.
- The distribution of days in hospital by diagnostic category, age group and sex is assumed to reflect the distribution of hospital drugs.

Limitations

- Part of the national drug expenditure could not be allocated by diagnostic category. This represents most non-prescription drugs and all personal health supplies.
- The extent to which NHEC overlaps with the three IMS audits is unknown. The latter represents mainly prescription drugs and some non-prescription drugs sold in retail drug stores.
- IMS audits are based on samples. Drug costs for some categories or subcategories may be underestimated.
- CDTI data reflect drugs prescribed, whether or not the prescription is actually filled.
- CS data include non-prescription drugs only if prescribed by a physician and dispensed by a pharmacist in a drug store.
- CDH data do not include the activities of specialty health clinics; thus some diagnostic categories may be underestimated (e.g. cancer, pregnancy).

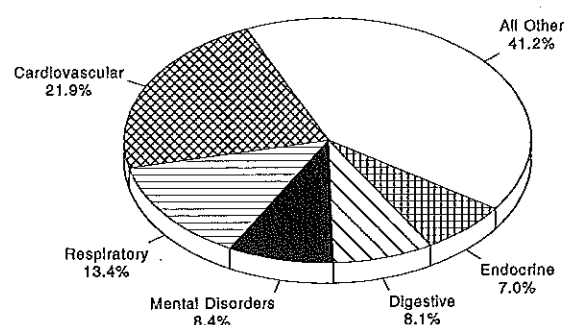
Results

The 1993 national expenditure for drugs is estimated at \$9.9 billion. An estimated \$7.2 billion of this expenditure can be allocated to diagnostic category. This figure represents mainly prescription drugs dispensed in retail drug stores (\$6.12 billion) or used in hospitals (\$1.04 billion). An additional \$2.7 billion, which primarily represents non-prescription drugs and personal health supplies, could not be categorized.

Cardiovascular diseases represented the largest share (\$1.6 billion) of the \$7.2 billion classified by diagnostic category, followed by respiratory diseases (\$962 million) and mental disorders (\$602 million).

Coronary heart disease (\$239 million) accounted for 15.3% of the

DISTRIBUTION OF DRUG EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA, 1993

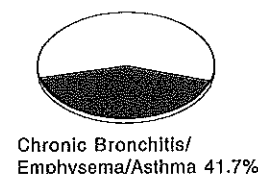


\$7.2 billion classifiable by diagnostic category

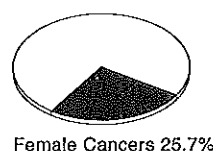
CARDIOVASCULAR



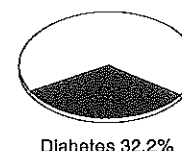
RESPIRATORY



CANCER



ENDOCRINE



Contribution within diagnostic category for selected diagnoses

pharmaceutical cost of cardiovascular diseases. Drugs used for the treatment of chronic bronchitis, emphysema and asthma (\$401 million) made up 41.7% of the amount spent on respiratory diseases. Diabetes (\$161 million) was responsible for 32.2% of the cost of drugs for the treatment of endocrine and related diseases. Female cancers (\$60 million) accounted for one quarter (25.7%) of drug costs to treat cancer.

Well-patient care (defined here by ICD-8 as special conditions and examinations without sickness) had a

significant impact on drug costs (\$280 million). This category includes contraceptives, infant formulae and vitamins, biologicals and prophylactic antimalarials.

Physician Care Expenditures

PHYSICIAN CARE EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA, 1993		
DIAGNOSTIC CATEGORY	1993 COST (\$1000)	% OF TOTAL
Well-patient Care	\$1,094,749	10.6%
Respiratory Diseases	\$1,021,287	9.9%
Nervous System and Sense Organ Diseases	\$952,471	9.2%
Cardiovascular Diseases	\$866,862	8.4%
Mental Disorders	\$800,607	7.7%
Genitourinary Diseases	\$772,021	7.5%
Injuries	\$676,300	6.5%
Musculoskeletal Diseases	\$668,802	6.5%
Digestive Diseases	\$637,723	6.2%
Cancer	\$447,456	4.3%
Skin and Related Diseases	\$390,240	3.8%
Pregnancy	\$331,137	3.2%
Endocrine and Related Diseases	\$275,058	2.7%
Infectious and Parasitic Diseases	\$181,109	1.7%
Blood Diseases	\$78,311	0.8%
Birth Defects	\$58,617	0.6%
Perinatal Conditions	\$17,872	0.2%
Ill-defined Conditions	\$675,308	6.5%
Without Diagnosis	\$416,672	4.0%
TOTAL	\$10,362,600	100.0%
SUBCATEGORY		
Chronic Bronchitis/Emphysema/Asthma	\$289,171	2.8%
Coronary Heart Disease	\$262,896	2.5%
Diabetes	\$130,050	1.3%
Stroke	\$74,813	0.7%
Female Cancers	\$56,131	0.5%

Sources

Health Canada, Policy and Consultation
Branch. *National health expenditures in
Canada, 1975-1994*. Ottawa: Supply
and Services Canada, 1996.

Manitoba Health, Health Information Systems
Branch. Medical services and costs by di-
agnostic classification, sex and age
group, 1993/94 (Unpublished tabula-
tions).

Methods

The 1993 total national expenditure for physician services is derived from Health Canada's *National Health Expenditures in Canada, 1975-1994*.¹ This estimate includes professional health services provided by both physicians and psychologists. (Appendix 2 provides more detailed definitions.) The largest component of this expenditure is professional fees paid primarily through provincial medical care insurance plans.

Seven provinces (Manitoba, Saskatchewan, Alberta, BC, Nova Scotia, PEI and Newfoundland) have provided total expenditures primarily for physician fee-for-service expenditures by diagnostic category and sex. The distribution of costs is similar for the seven provinces with the exception of well-patient care and ill-defined conditions (see figure in Appendix 3). Provincial officials suggest that disparities in these two categories can be attributed to overclassification of many diagnoses to one of these two categories that capture poorly defined diagnoses.²

The Manitoba data have been validated;^{3,4} Manitoba Health's distribution of 1993/94 physician expenditures⁵ is thus used to reflect national medical care costs by diagnostic category, age and sex.^{4,5} This distribution is applied to the 1993 national physician care expenditure to estimate the physician care expenditure by diagnostic category, age and sex for Canada in 1993. A non-ICD category, "Without Diagnosis," was added to correspond to Manitoba's categories.

Assumptions

- Most provinces could only provide 1991/92 data at the time of our comparison of provincial medical care expenditures. We assumed the distribution within each province to be fairly constant between 1991/92 and 1993/94.
- We assumed the distribution of medical care expenditures for Ontario, Quebec, New Brunswick and the territories to be

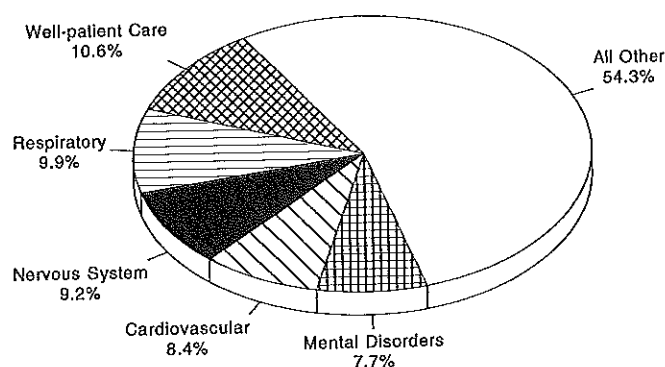
similar to that of the seven other provinces.

- Manitoba's distribution of medical service costs by diagnosis, age group and sex is assumed to reflect that of the national physician expenditure, based on comparison with seven other provinces.

Limitations

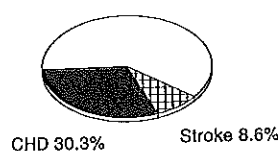
- Provincial data files used here are designed to administer payment of services and not to collect patient information. Although most provincial medical care plans collect data about patient diagnosis, not all physicians are required to record diagnostic coding. Limitations of coding include changes to initial diagnoses upon further investigation, use of a limited set of diagnostic codes, overclassification to categories that capture poorly defined conditions (i.e. ill-defined, without diagnosis, well-patient care) and lack of validation.
- Remuneration for services of psychologists represents a very small portion of the national expenditure for physician care. Any private expenditures for services of psychologists would be included in the category of Other Professionals in the cost component Additional Direct Health Expenditures. Expenditures for services of psychologists in hospitals and other institutions are included in Hospital Care Expenditures and Expenditures for Care in Other Institutions.
- Physicians paid by salary, session or contract are counted elsewhere (i.e. Hospital Care Expenditures and Expenditures for Care in Other Institutions).
- Medical expenditures by diagnostic category for Ontario, Quebec, New Brunswick and the territories, representing 67.5% of the national physician expenditure,¹ were unavailable; the distribution of disease costs for these areas will have an important impact on the national distribution.

DISTRIBUTION OF PHYSICIAN CARE EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA, 1993

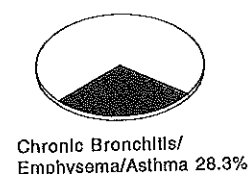


\$10.4 billion classifiable by diagnostic category

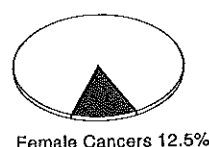
CARDIOVASCULAR



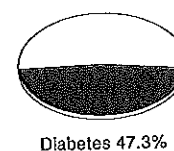
RESPIRATORY



CANCER



ENDOCRINE



Contribution within diagnostic category for selected diagnoses

Results

The 1993 cost of medical services provided by physicians was \$10.4 billion. Well-patient care (defined by ICD-9 as "factors influencing health status and contact with health services") was the leading medical care cost (\$1.1 billion), accounting for 10.6% of the expenditure for physician services. Well-patient care includes general medical examinations and special investigations. Other major contributors to the physician care expenditure were respiratory diseases and diseases of the nervous system and sense

organs, each costing approximately \$1 billion.

Diabetes accounted for 47.3% of the national physician expenditure for endocrine and related diseases. Coronary heart disease and stroke (\$338 million) made up almost 40% of the total medical care expenditure for cardiovascular diseases. The majority of this was for coronary heart disease (\$263 million).

Chronic bronchitis, emphysema and asthma (\$289 million) were responsible for 28.3% of the medical care costs for treating respiratory diseases.

Hospital Care Expenditures

HOSPITAL CARE EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA, 1993		
DIAGNOSTIC CATEGORY	1993 COST (\$1000)	% OF TOTAL
Cardiovascular Diseases	\$4,862,322	18.6%
Mental Disorders	\$3,631,788	13.9%
Cancer	\$2,467,408	9.5%
Injuries	\$2,253,487	8.6%
Digestive Diseases	\$2,093,374	8.0%
Respiratory Diseases	\$1,788,230	6.9%
Pregnancy	\$1,649,707	6.3%
Well-patient Care	\$1,349,205	5.2%
Musculoskeletal Diseases	\$1,285,910	4.9%
Genitourinary Diseases	\$1,075,828	4.1%
Nervous System and Sense Organ Diseases	\$792,862	3.0%
Endocrine and Related Diseases	\$526,785	2.0%
Perinatal Conditions	\$518,012	2.0%
Infectious and Parasitic Diseases	\$345,071	1.3%
Birth Defects	\$231,923	0.9%
Skin and Related Diseases	\$223,015	0.9%
Blood Diseases	\$156,808	0.6%
Ill-defined Conditions	\$844,567	3.2%
TOTAL	\$26,096,300	100.0%
SUBCATEGORY		
Coronary Heart Disease	\$1,571,999	6.0%
Stroke	\$1,258,063	4.8%
Chronic Bronchitis/Emphysema/Asthma	\$636,491	2.4%
Motor Vehicle Traffic Accidents	\$283,106	1.1%
Diabetes	\$274,621	1.1%
Female Cancers	\$206,068	0.8%

Sources

Health Canada, Policy and Consultation Branch. *National health expenditures in Canada, 1975-1994*. Ottawa: Supply and Services Canada, 1996.

Statistics Canada, Health Statistics Division. *Hospital statistics: preliminary annual report, 1993-94*. Ottawa: Minister of Industry, 1996; Catalogue 83-241 XMB.

Canadian Institute for Health Information (CIHI). 1993/94 total resource intensity weights (RIWs) [Unpublished tabulations].

Statistics Canada, Health Statistics Division. Hospital morbidity, 1993-94 (Unpublished tabulations).

Statistics Canada, Health Statistics Division. *Mental health statistics, 1993-94*. Ottawa: Minister of Industry, 1996; Catalogue 83-245 XMB.

Statistics Canada, Health Statistics Division. Mental health statistics, 1993-94 (Unpublished tabulations).

Methods

The 1993 total national hospital expenditure is derived from Health Canada's *National Health Expenditures in Canada, 1975-1994*.¹ The cost of hospital drugs (\$1.04 billion) calculated in our cost component Drug Expenditures has been deducted from this total.

Statistics Canada routinely collects hospital statistics from all public, private and federal hospitals operating in Canada. More than 90% of hospital beds are represented in *Hospital Statistics: Preliminary Annual Report, 1993-94*,² however, only public hospitals are required to report financial information. The total 1993/94 hospital expenditure by hospital type is estimated by multiplying the reporting public hospital's cost per bed for each type of hospital by the total number of operating beds within the hospital type. Drugs dispensed in hospitals have been deducted from the total.

Hospital expenditures by diagnostic category, age group and sex are estimated separately for three broad hospital categories: acute, long-term and psychiatric hospitals. (Refer to Appendix 2 for definitions.) The distribution of Statistics Canada's 1993/94 hospital expenditures to these three categories was determined and applied to Health Canada's 1993 hospital expenditure.

Acute care hospital expenditure is distributed using 1993 total resource intensity weights (RIWs) by diagnostic category and sex from the Canadian Institute for Health Information (CIHI).³ Total RIWs represent both typical and atypical acute inpatient cases, taking into account both the total cost of acute care (fixed and variable) and the total of services used for acute care. Acute care hospital expenditure is distributed by age group using days-in-hospital data.

Long-term care hospital expenditure is distributed using the 1993/94 one-year pattern of days in general and allied special hospitals by diagnostic category, age group and sex for stays of 100 or more days for patients who were discharged during 1993/94.⁴

The total psychiatric hospital expenditure, categorized as Mental Disorders, is distributed by age group and sex using the 1993/94 one-year pattern of days spent in psychiatric hospitals for patients who separated from hospital during 1993/94.^{5,6}

Assumptions

Acute Care Hospitals

- We assume the acute care hospitals identified above to be the same as those used in calculating total RIWs; the majority of operating costs for "non-teaching hospitals with long-term care units" and "teaching" hospitals are assumed to be for treatment of acute disease. Long-term care, outpatient and emergency ward costs (included in the national expenditure) are assumed to have diagnostic category, age and sex distributions similar to acute care costs. The cost of hospital drugs (included in total RIWs) is assumed to have little impact on the overall distribution of acute care hospital costs; drugs represented 4% of the total hospital expenditure before excluding them.

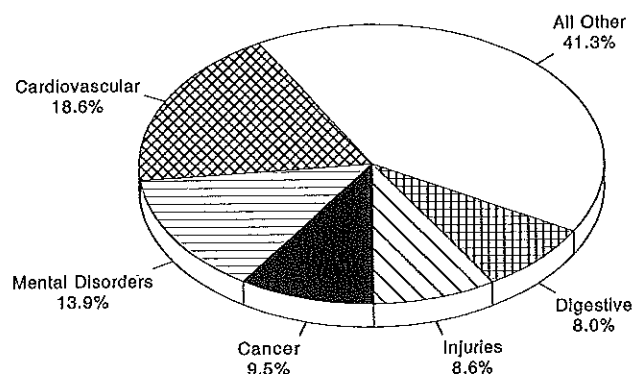
Long-term Care Hospitals

- There is no clear definition of "long-term" care; however, 100 days reflects the average length of stay in extended care hospitals and the criteria for copayment in some provinces.⁷ The 1993/94 one-year pattern of days in hospital for stays of 100+ days for patients who separated during the 1993/94 year is assumed to reflect the distribution of patients hospitalized in "long-term" hospitals. The average cost per day in long-term care hospitals is assumed to be similar for all diagnostic categories. The pattern of hospitalization in public hospitals (on which hospital morbidity is based) is assumed to reflect that of private and federal hospitals.

Psychiatric Hospitals

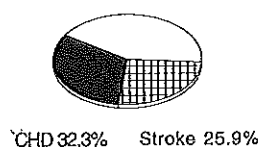
- The 1993/94 one-year pattern of days spent in psychiatric hospitals for patients discharged during 1993/94 is assumed to reflect the age and sex distribution of patients hospitalized in psychiatric hospitals.

DISTRIBUTION OF HOSPITAL CARE EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA, 1993

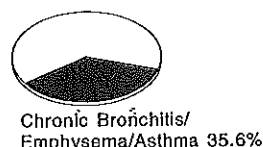


\$26.1 billion classifiable by diagnostic category

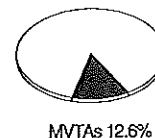
CARDIOVASCULAR



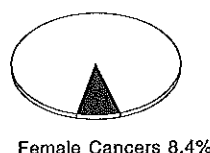
RESPIRATORY



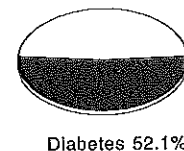
INJURIES



CANCER



ENDOCRINE



Contribution within diagnostic category for selected diagnoses

Limitations

- Statistics Canada² collects financial information only from reporting public hospitals. Private and federal hospitals, which represent 4% of hospital beds, do not report financial information.

Acute Care Hospitals

- CIHI³ provides about 80% coverage of Canada and less in Quebec, Manitoba and Nova Scotia. It is not possible to organize hospitals neatly into categories

(i.e. non-teaching hospitals with long-term care units provide both acute and long-term care). The hospitals used in calculating total RIWs may vary from those included in our acute care hospital category. Total RIWs include the cost of drugs dispensed in hospitals.

- More than 20% of beds in general and other short-stay hospitals (i.e. acute care hospitals) are long-term care beds. Total RIWs pertain only to the acute care provided within these hospitals.

Long-term Care Hospitals

- Statistics Canada⁴ does not provide hospital morbidity by hospital type (i.e. extended care, rehabilitation). Data also exclude the Yukon and the Northwest Territories and all federal and proprietary hospitals.

Psychiatric Hospitals

- Separation data are counts of patients showing deaths and discharges during the reporting year and may not represent the total number of patients being treated in hospital during that year. Our age and sex cost distributions may therefore vary from the actual distribution in psychiatric hospitals during the year.

Results

The total national hospital expenditure for 1993 was an estimated \$26.1 billion. Acute care, long-term care and psychiatric hospitals represented approximately \$22.6 billion, \$1.8 billion and \$1.7 billion of this expenditure, respectively.

Cardiovascular diseases represented almost one fifth of the total hospital expenditure, costing \$4.9 billion. Mental disorders, cancer and injuries cost \$3.6 billion, \$2.5 billion and \$2.3 billion, respectively.

Coronary heart disease and stroke together (\$2.83 billion) made up 58.2% of the total hospital expenditure for cardiovascular diseases. Diabetes accounted for 52.1% of the total hospital expenditure for endocrine and related diseases. Chronic bronchitis, emphysema and asthma represented 35.6% of respiratory diseases.

Expenditures for Care in Other Institutions

Methods

The 1993 total national expenditure for care in other institutions is derived from Health Canada's *National Health Expenditures in Canada, 1975-1994*.¹ Health Canada defines "other institutions" as residential care facilities (RCFs) that are approved, funded or licensed by provincial/territorial departments of health and/or social services. (Appendix 2 provides more detailed definitions.)

Residents of these facilities generally are chronically ill or disabled and reside in the facility more or less permanently. Usually RCFs do not provide the level of medical care and supporting diagnostic and therapeutic services provided by hospitals, although there is some overlap in services. Drugs prescribed in these institutions are included in this expenditure.

Statistics Canada's 1993/94 inventory of all RCFs in Canada, reported annually by provinces and territories, provides an expenditure breakdown by predominant type of care and principal characteristic of the predominant group of residents within the reporting facility.² Facilities providing Type II care or higher correspond to facilities included in Health Canada's definition and are used to distribute the 1993 Health Canada figures by principal characteristic of residents.

Assumptions

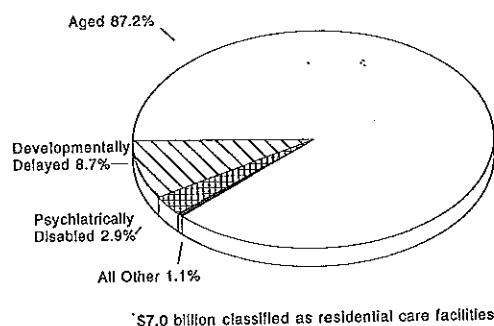
- The 1993/94 distribution of total expenditures in reporting RCFs that provide predominantly Type II care and higher² is assumed to represent the 1993 distribution for other institutions.¹
- The distribution of RCFs by predominant type of care and principal characteristic of residents² is assumed to represent that of Quebec.

Limitations

- The 1993 expenditure for care in other institutions¹ could not be categorized by diagnostic category.
- The Statistics Canada 1993/94 expenditure for reporting RCFs² includes only 70% of operating facilities and 75%

EXPENDITURE FOR CARE IN OTHER INSTITUTIONS BY PRINCIPAL CHARACTERISTIC OF PREDOMINANT GROUP OF RESIDENTS, CANADA, 1993		
PRINCIPAL CHARACTERISTIC	1993 COST (\$1000)	% OF TOTAL
Aged	\$6,112,436	87.2%
Developmentally Delayed	\$609,143	8.7%
Psychiatrically Disabled	\$206,504	2.9%
Physically Challenged	\$41,925	0.6%
Emotionally Disturbed Children	\$23,682	0.3%
Alcohol/Drug Addiction	\$11,471	0.2%
Other	\$2,740	0.0%
TOTAL	\$7,007,900	100.0%

DISTRIBUTION OF EXPENDITURES IN OTHER INSTITUTIONS BY PREDOMINANT GROUP OF RESIDENTS, CANADA, 1993



of all operating beds, and it excludes Quebec. Thus, it underestimates the total national RCF expenditure.

- Quebec did not report the predominant type of care in a facility.

Results

The 1993 national expenditure for care in other institutions was \$7.0 billion. The majority of this expenditure (\$6.1 billion) was for homes for the aged. Another \$831 million (12.1%) was spent for the care and treatment of those with conditions classified as mental disorders: the developmentally delayed, the psychiatrically disabled, clients with alcohol and drug addictions, and emotionally disturbed children.

Sources

Health Canada, Policy and Consultation Branch. *National health expenditures in Canada, 1975-1994*. Ottawa: Supply and Services Canada, 1996.

Statistics Canada, Health Statistics Division. Total expenditures in reporting residential care facilities by predominant type of care and principal characteristic of the predominant group of residents, Canada 1993-94 (excluding Quebec) [Unpublished tabulations].

Health Science Research Expenditures

HEALTH SCIENCE RESEARCH EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA, 1993/94		
DIAGNOSTIC CATEGORY	1993/94 COST (\$1000)	% OF TOTAL
Basic Research	\$92,871	18.1%
Cancer	\$73,032	14.3%
Nervous System and Sense Organ Diseases	\$62,203	12.1%
Cardiovascular Diseases	\$59,800	11.7%
Endocrine and Related Diseases	\$32,773	6.4%
Infectious and Parasitic Diseases	\$31,875	6.2%
Education/Medical History	\$28,833	5.6%
Mental Disorders	\$17,510	3.4%
Well-patient Care	\$16,514	3.2%
Digestive Diseases	\$16,501	3.2%
Respiratory Diseases	\$15,817	3.1%
Musculoskeletal Diseases	\$14,984	2.9%
Equipment/Capital	\$10,439	2.0%
Genitourinary Diseases	\$9,803	1.9%
Blood Diseases	\$8,651	1.7%
Perinatal Conditions	\$7,624	1.5%
Injuries	\$6,201	1.2%
Pregnancy	\$3,506	0.7%
Birth Defects	\$1,882	0.4%
Skin and Related Diseases	\$1,564	0.3%
TOTAL	\$512,381	100.0%
SUBCATEGORY		
Diabetes	\$11,520	2.2%
HIV/AIDS	\$8,124	1.6%
Female Cancers	\$6,672	1.3%
Dentistry	\$5,147	1.0%
Chronic Bronchitis/Emphysema/Asthma	\$1,524	0.3%
Coronary Heart Disease	\$1,296	0.3%
Motor Vehicle Traffic Accidents	\$500	0.1%
Stroke	\$463	0.1%

Sources

Medical Research Council of Canada. *Reference list of health science research in Canada, 1993-1994*. Ottawa, 1993; Catalogue MRI-71/1994.

The Traffic Injury Research Foundation of Canada. *31st annual report 1993*. Ottawa: The Foundation, 1993.

The Association of Canadian Medical Colleges. *Canadian medical education statistics*

1995, Volume 17. Ottawa: The Association, 1995.

The Association of Canadian Medical Colleges. Expenditures for biomedical and health care research of Canadian faculties of medicine by granting agency, 1993/94 (Unpublished tabulations).

Methods

The 1993/94 health science research expenditure is derived from the *Reference List of Health Science Research in Canada, 1993-94*,¹ the *Traffic Injury Research Foundation (TIRF) 1993 Annual Report*² and the Association of Canadian Medical Colleges (ACMC) 1993/94 *Canadian Medical Education Statistics*.³

The *Reference List* provides the cost of health science research grants and awards made in Canada by federal, provincial and voluntary agencies for the fiscal year 1993/94 (see Appendix 4). Unfortunately, the grants and awards are not classified by diagnostic category. We have apportioned these costs to the relevant area of research, assigning projects to an appropriate diagnostic category based on project title. Diagnostic subcategories were created for diagnoses with a large number of grants/awards, and additional categories were created for grants/awards that could not be classified by diagnosis (see Appendix 2).

The 1993/94 cost of motor vehicle traffic accident research from the *TIRF Annual Report*² is added to the category of injuries.

The ACMC³ provides additional 1993/94 cost estimates for biomedical research at Canadian faculties of medicine; these are not categorized by diagnostic category. Funding sources include federal and provincial governments, national and provincial non-profit and charitable organizations, local community sources, universities and unaffiliated hospitals, and foreign and miscellaneous sources.

ACMC research expenditures which overlap⁴ with research expenditures in the *Reference List*¹ have been excluded to avoid double counting. Similarly, research by private industry (i.e. pharmaceutical companies) is excluded as research costs would be recovered from product sales.

Assumptions

- The *Reference List* gives 1993/94 figures for most agencies. A few agencies, because of different fiscal years or other reasons, were unable to provide 1993/94 figures. In these cases, we reported 1992/93 grants and assumed the type and value of research to be similar for the two years.

Limitations

- Although these sources provide a conservative estimate, totals reflect the vast majority of health research in Canada for 1993/94 (see exclusions, Appendix 2).
- The *Reference List*¹ was compiled in July 1993 and does not include any subsequent changes or additions.
- We were unable to adjust our estimates to a 1993 expenditure because the 1993/94 *Reference List* reported a combination of 1992/93, 1993 and 1993/94 expenditures. The Medical Research Council of Canada (MRC) has not produced the 1994/95 *Reference List* [at the time of writing]; thus, 1993/94 figures for agencies that reported 1992/93 expenditures are not available.
- Totals for diagnostic subcategories may underestimate costs as they reflect only projects identifiable by project title. Diagnostic category totals are more comprehensive.

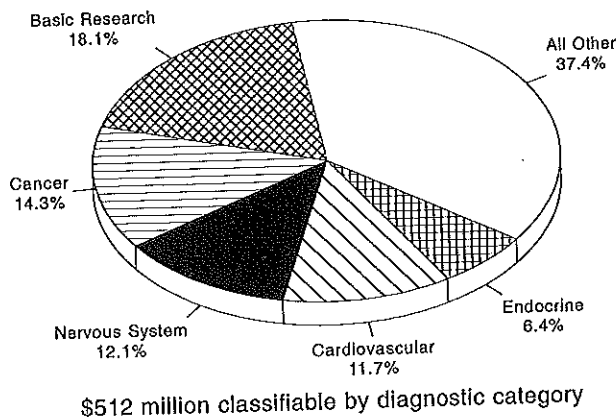
Results

The 1993/94 national expenditure for Canadian health science research was an estimated \$752 million, \$512 million of which could be classified by diagnostic category. An additional \$239 million was spent on biomedical research that could not be categorized.

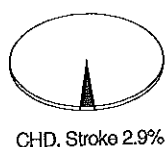
The largest share (18.1%) of the \$512 million we could classify by diagnostic category was for basic research (\$93 million). Cancer, nervous system and sense organ diseases, and cardiovascular diseases accounted for \$73, \$62 and \$60 million, respectively.

A large proportion of the total research expenditure for endocrine and related diseases and for infectious diseases was identified as research on diabetes (35.2%) and HIV/AIDS (25.5%), respectively. Dentistry (31.2%) accounted for almost half the research cost for digestive diseases.

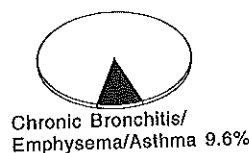
DISTRIBUTION OF HEALTH SCIENCE RESEARCH EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA, 1993/94



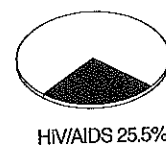
CARDIOVASCULAR



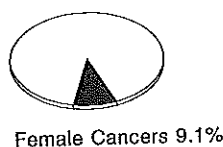
RESPIRATORY



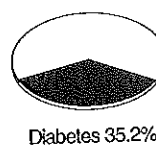
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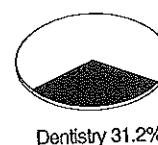
CANCER



ENDOCRINE



DIGESTIVE



Contribution within diagnostic category for selected diagnoses

Additional Direct Health Expenditures

ADDITIONAL DIRECT HEALTH EXPENDITURES NOT CLASSIFIED BY DIAGNOSTIC CATEGORY, CANADA, 1993		
CATEGORY OF EXPENDITURE	1993 COST (\$1000)	% OF TOTAL
Health Care-Related Component		
Dentists and Denturists	\$4,707,920	26.7%
Eyeglasses	\$1,421,850	8.1%
Other Professionals	\$1,348,180	7.6%
Home Care	\$991,200	5.6%
Ambulances	\$847,870	4.8%
Other Private Health Care	\$323,910	1.8%
Health Appliances	\$318,280	1.8%
Unspecified Services	\$234,810	1.3%
Hearing Aids	\$12,880	0.1%
Subtotal	\$10,206,900	57.9%
Administrative Component		
Public Health	\$3,551,380	20.1%
Capital	\$2,290,700	13.0%
Prepayment Administration	\$1,325,610	7.5%
Miscellaneous Health Care	\$266,100	1.5%
Subtotal	\$7,433,790	42.1%
TOTAL	\$17,640,690	100.0%

Source

Health Canada, Policy and Consultation
Branch. *National health expenditures in
Canada, 1975-1994*. Ottawa: Supply
and Services Canada, 1996.

Methods

The 1993 total national expenditure for care by other professionals and for other direct health expenditures and capital is taken directly from *National Health Expenditures in Canada, 1975-1994* (NHEC).¹ (Refer to Appendix 2 for definitions.)

Although expenditures are not available by subcategory of expenditure for 1993, they are available and consistent for previous years.¹ The 1992 percentage distribution of expenditure is used to distribute costs to each 1993 subcategory. Several of these cost components represent either system costs that should not be attributed to specific diagnostic groups (e.g. public health, prepayment administration) or areas that could be allocated at aggregate levels (dentists and denturists; digestive diseases; eyeglasses and hearing aids; nervous system and sense organ diseases).

NHEC additional expenditures also include the cost of health science research; we have excluded research costs here and included them in the previous section, Health Science Research Expenditures.

Assumptions

- The 1992 distribution of expenditures for each subcategory¹ is assumed to reflect the 1993 distribution, based on the minimal variation in this distribution over the last two decades.

Results

Additional direct health costs totalled \$17.6 billion in 1993. These additional expenditures are grouped into two major cost components: health care-related (\$10.2 billion) and administrative (\$7.4 billion).

The health care-related component includes professional health services and medical appliances. Professional services of dentists and denturists cost \$4.7 billion, almost 80% of the cost of other professionals. This could be allocated at aggregate levels to digestive diseases. Eyeglasses and hearing aids (\$1.4 billion) were allocated to nervous system and sense organ disorders. The remaining health care-related expenditure could not be assigned to any diagnostic category.

Within the administration component, the largest expense was public health (\$3.6 billion), followed by capital expenditures for medical facilities (\$2.3 billion). Other administrative expenditures were for prepayment administration of insurance coverage and miscellaneous health costs: training for health workers, voluntary health organizations and occupational health expenditures.

Mortality Costs

PRESENT VALUE OF FUTURE PRODUCTIVITY LOST DUE TO PREMATURE MORTALITY BY DIAGNOSTIC CATEGORY, CANADA, 1993		
DIAGNOSTIC CATEGORY	1993 COST (\$1,000)	% OF TOTAL
Cancer	\$8,866,063	30.3%
Cardiovascular Diseases	\$7,440,458	25.4%
Injuries	\$5,700,162	19.5%
Respiratory Diseases	\$1,396,540	4.8%
Infectious and Parasitic Diseases	\$1,213,908	4.1%
Digestive Diseases	\$1,070,437	3.7%
Endocrine and Related Diseases	\$765,710	2.6%
Nervous System and Sense Organ Diseases	\$703,404	2.4%
Mental Disorders	\$374,900	1.3%
Birth Defects	\$334,095	1.1%
Perinatal Conditions	\$265,152	0.9%
Genitourinary Diseases	\$264,281	0.9%
Musculoskeletal Diseases	\$95,531	0.3%
Blood Diseases	\$86,099	0.3%
Skin and Related Diseases	\$13,543	0.0%
Pregnancy	\$8,509	0.0%
Ill-defined Conditions	\$697,700	2.4%
TOTAL	\$29,296,491	100.0%
SUBCATEGORY		
Coronary Heart Disease	\$4,595,443	15.7%
Motor Vehicle Traffic Accidents	\$1,664,529	5.7%
Female Cancers	\$1,285,816	4.4%
Stroke	\$1,225,658	4.2%
Chronic Bronchitis/Emphysema/Asthma	\$733,926	2.5%
Diabetes	\$559,272	1.9%

Sources

Statistics Canada. Abridged life tables, 1990-1991 (Unpublished tabulations).

Statistics Canada, Household Surveys Division. 1994 Survey of Consumer Finances. Counts and average earnings of earners by sex, age group and work activity, 1993 (Unpublished tabulations).

Statistics Canada, National Accounts and Environment Division. Average replacement cost generalist estimates of unpaid work by age and sex, 1993 (Unpublished tabulations).

Statistics Canada. *Estimates of labour income, October to December 1993*. Ottawa: Minister of Industry, Science and Technology, 1995; Catalogue 72-005/48(4).

Statistics Canada, Health Statistics Division. Causes of death, 1993 (Unpublished tabulations).

Methods

Using the human capital approach, mortality costs are represented by the current monetary value of future productivity lost due to premature mortality. The estimated cost or value to society of all deaths is the product of the number of deaths and the discounted value, with age and sex taken into account, of an individual's lifetime productivity.¹

The discounted present value of lifetime productivity (future labour force work and unpaid work) by age and sex is calculated using the lifetime productivity loss model (refer to Appendix 5).^{2,3} The model sums productivity in the current year plus productivity expected in future years if the individual continues to live. This model accounts for life expectancy for different age and sex groups,⁴ earnings at successive ages,⁵ varying labour force participation rates,⁵ the value of unpaid work,⁶ the productivity growth rate¹ and the appropriate discount rate to convert a stream of costs or benefits into present worth.¹

We apply a discount rate of 6% to both employment earnings and the value of unpaid work to reflect the present value of future productivity. A sensitivity analysis using discount rates varying from 2% to 10% provides a range of possible lifetime productivity losses (see Appendix 5). Productivity growth rates of 1% for labour force work and 0% for unpaid work are applied to account for future productivity gains. These rates reflect conservative estimates of projected and past experience in Canada and the United States.¹⁻³

The 1993 national average supplementary labour income rate⁷ is applied to the discounted value of future labour force work to account for wage supplements (i.e. employer contributions to employee welfare, pensions [CPP/QPP], workers' compensation and unemployment insurance funds).

The value of future unpaid work is added to the adjusted value of future labour force work for each age group and sex. The resulting values are multiplied by the number of deaths in 1993⁸ for each diagnostic category, age group and sex to obtain final estimates of the present value of future productivity loss due to premature mortality.

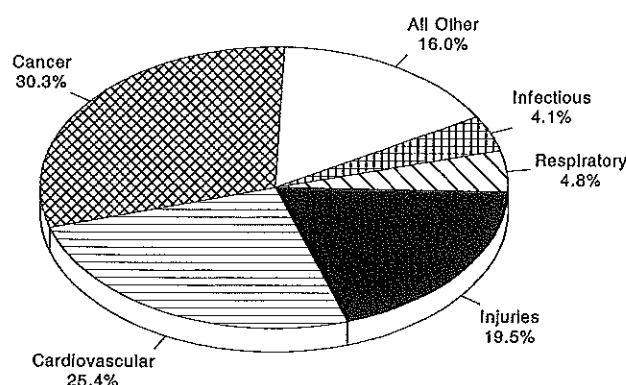
Assumptions

- The 1991 survival pattern is assumed to reflect 1993 life expectancy.
- We use average annual earnings for all earners, rather than full year, full-time workers,⁹ to provide a more accurate estimate of future earnings that reflect existing labour variations (i.e. seasonal and part-time work).
- It is assumed that no earnings are earned between the ages of 0 and 14. Earning patterns for people aged 75–79, 80–84 and 85 or older are assumed to vary according to patterns for US residents in these age cohorts.^{10,11}
- The future pattern of earnings for an average individual within a sex group is assumed to follow the pattern reported by Statistics Canada in 1993.⁵ The average individual may expect his or her earnings to rise with age and experience in accordance with the cross-sectional data for 1993.
- People are assumed to be working and productive during their expected lifetime in accordance with the current patterns for their age group and sex.¹ No distinction is made between those in or those out of the labour force at the time of death.
- Average values of annual unpaid work for age 85 and over were inferred from the values for age 75 and over, using the US ratios for these age groups.¹¹
- Average values of unpaid work in 1993 are based on 1992 replacement cost generalist estimates of unpaid work by age group and sex, inflated to 1993 dollars.⁶

Limitations

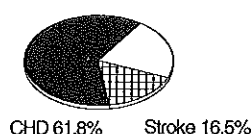
- Survival probabilities are averaged across five-year time periods.⁴
- Average earnings are estimated across five-year age groups⁵ and the value of unpaid work is estimated across ten-year age groups.⁶
- Employment income and the value of unpaid work for children under 15 are not available.
- Employment income and the value of unpaid work for ages 75 and over are not disaggregated due to sample size limitations.^{5,6}

DISTRIBUTION OF MORTALITY COSTS BY DIAGNOSTIC CATEGORY, CANADA, 1993

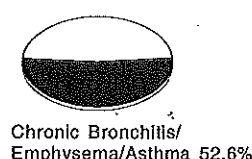


\$29.3 billion (at 6% discount rate) classifiable by diagnostic category

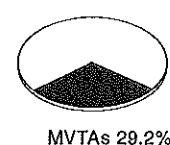
CARDIOVASCULAR



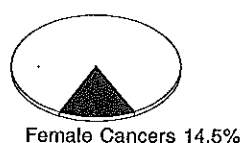
RESPIRATORY



INJURIES



CANCER



ENDOCRINE



Contribution within diagnostic category for selected diagnoses

Results

The present value of future productivity lost due to premature mortality in 1993 was an estimated \$29.3 billion at a 6% discount rate. A sensitivity analysis produced productivity losses for premature mortality between \$22.3 billion (using a discount rate of 10%) and \$43.7 billion (using a discount rate of 2%). The figure in Appendix 5 illustrates the results of the sensitivity analysis.

Cancer, cardiovascular diseases and injuries had the highest mortality costs in

1993. These three diagnostic categories represented three quarters (75.1%) of the total mortality costs in 1993.

Coronary heart disease (\$4.6 billion) accounted for two thirds (61.8%) of the mortality costs for cardiovascular diseases. Diabetes was responsible for almost three quarters (73.0%, \$559 million) of the mortality costs of endocrine and related disorders. Chronic bronchitis, emphysema and asthma (\$734 million) represented just over half (52.6%) of the mortality costs of respiratory diseases.

Morbidity Costs Due to Long-term Disability

ANNUAL VALUE OF LOST PRODUCTIVITY DUE TO LONG-TERM DISABILITY BY DIAGNOSTIC CATEGORY, CANADA, 1993		
DIAGNOSTIC CATEGORY	1993 COST (\$1000)	% OF TOTAL
Musculoskeletal Diseases	\$13,479,056	35.2%
Nervous System and Sense Organ Diseases	\$5,721,836	14.9%
Cardiovascular Diseases	\$4,501,786	11.8%
Respiratory Diseases	\$2,639,619	6.9%
Injuries	\$2,279,040	6.0%
Mental Disorders	\$1,600,769	4.2%
Endocrine and Related Diseases	\$1,320,142	3.4%
Cancer	\$727,921	1.9%
Digestive Diseases	\$702,940	1.8%
Infectious and Parasitic Diseases	\$261,025	0.7%
Other Diagnostic Categories	\$5,043,318	13.2%
TOTAL	\$38,277,451	100.0%
SUBCATEGORY		
Arthritis	\$4,361,591	11.4%
Musculoskeletal Disorders—back and spine	\$4,311,011	11.3%
Musculoskeletal Disorders—lower limb	\$2,108,163	5.5%
Musculoskeletal Disorders—upper limb	\$1,028,906	2.7%
Asthma	\$1,828,331	4.8%
Sight Disorders	\$1,150,754	3.0%
Hearing Disorders	\$943,093	2.5%
Coronary Heart Disease	\$695,656	1.8%
Bronchitis and Emphysema	\$424,093	1.1%
Hypertensive Diseases	\$397,156	1.0%

Sources

Statistics Canada, Health Statistics Division.
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(NPHS, household component, 1994).
Weighted number of people who reported
long-term disability by age, sex and dis-
ease category (Unpublished tabulations).

Statistics Canada, Health Statistics Division.
National Population Health Survey
(NPHS, institutional component, 1994). Es-
timated number of people residing in long-
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Canada in 1995 (Unpublished tabulations).

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(NPHS, institutional component, 1994).
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Statistics Canada, National Accounts and Envi-
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tions).

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(Unpublished tabulations).

Statistics Canada. *Estimates of labour income,
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ter of Industry, Science and Technology,
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Santé Québec. The Quebec Health and Social
Survey (1993). Percentage distribution of
long-term disability by age, sex and sever-
ity: household population (Unpublished
tabulations).

Methods

The value of productivity lost to
long-term disability is calculated for the
household and institutionalized
population.

The National Population Health
Survey (NPHS) household component¹
provides the number of people who
reported a long-term disability by
diagnostic category, age group and sex.
These figures are adjusted for severity
and annual average length of long-term
disability, applying distributions from the
Quebec Health and Social Survey
(QHSS).^{2,3} Weights are assigned to
account for lost productivity at different
levels of long-term disability⁴⁻⁷ (see
Appendix 6).

The NPHS institutional component⁸
provides the number of people living in
Canadian long-term health care facilities
by age and sex. These figures, multiplied
by the distribution of long-term disability
in institutions according to diagnostic
category, age group and sex⁹ and the
annual average length of stay in
institutions,¹⁰ provide estimates of the
number of people in long-term health care
facilities by diagnostic category, age
group and sex. Weights are applied to
account for productivity loss at different
levels of long-term disability.⁴⁻⁷

The adjusted figures for long-term
disability by diagnostic category, age
group and sex for the household and
institutionalized populations are summed.
These figures, multiplied by the 1993
annual average value of labour force
work,¹¹ adjusted for wage supplements¹²
and unpaid work,¹³ are used to estimate
the total value of productivity lost to
long-term disability by diagnostic
category, age group and sex.

Assumptions

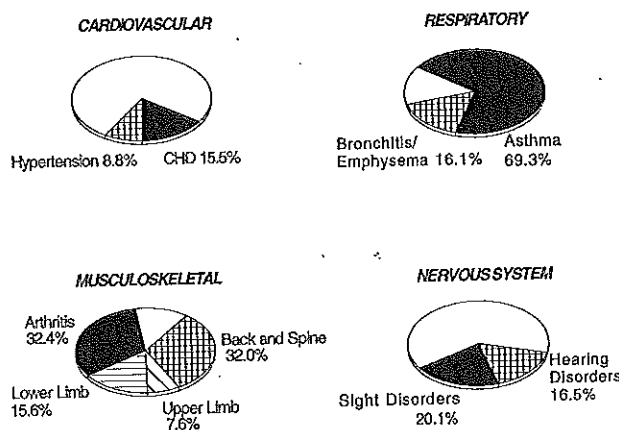
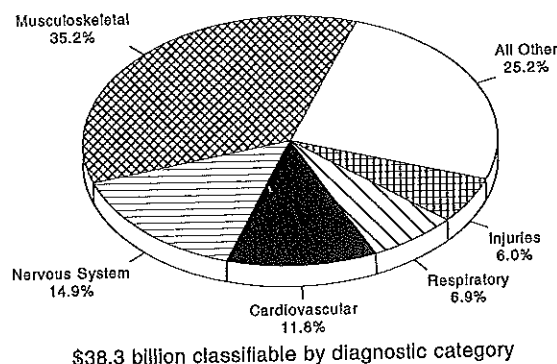
- The distribution of severity levels and
the annual average length of long-term
disability obtained from the QHSS are
assumed to represent those of the
Canadian household population.

- The estimated annual average length of stay in institutions from NPHS cross-sectional data is assumed to represent the annual average length of stay consistently over the year 1993.
- Annual average labour force earnings and the value of unpaid work are assumed to be the same for people in and not in the labour force. People living in institutions are assumed to have the same potential annual average labour force earnings and value of unpaid work as the household population.
- Labour force earnings have been adjusted for wage supplements. The 1993 supplementary labour income rate (13.78%) is assumed to be the same for various age and sex groups.
- The annual average value of unpaid work for youths aged 12–14 is not available and is assumed to be half that for young people aged 15–19.
- Loss of productivity to long-term disability by diagnostic category is based on the main health problem (by ICD-9 code or V-code) obtained from the NPHS.
- The 9% of respondents to the NPHS (institutional component)⁸ who did not answer the long-term disability question are assumed to have the same prevalence of long-term disability as people who did respond.

Limitations

- The QHSS^{2,3} is used to estimate the length and severity of long-term disabilities since the NPHS household component¹ did not collect this information.
- Only two age groups (less than 65, 65 and older) were available from the NPHS institutional component due to small numbers within some diagnostic categories. The estimated costs for youths aged 12–14, from the NPHS household component, should be treated with caution because of small numbers in this age group.
- Indirect costs are slightly underestimated since the NPHS^{1,8} excludes people residing at home or in health care facilities on Indian reserves, on Canadian Forces bases or in some remote areas.
- Productivity lost to long-term disability is calculated for people aged 12 and over. We cannot estimate the value of school work and unpaid work lost to long-term disability for children under age 12.
- Using the number of people living in institutions in 1995 to estimate the indirect costs due to long-term disability for 1993 may introduce bias.
- The NPHS uses V-codes developed by Statistics Canada to code musculoskeletal diseases. Injuries are included in this coding system. We apply

DISTRIBUTION OF MORBIDITY COSTS DUE TO LONG-TERM DISABILITY BY DIAGNOSTIC CATEGORY, CANADA, 1993



Contribution within diagnostic category for selected diagnoses

the 1986 distribution of long-term disability costs for musculoskeletal diseases and injuries¹⁴ to the 1993 cost of musculoskeletal diseases to split out the 1993 cost of injuries.

Results

The estimated value of productivity lost due to long-term disability in 1993 was \$38.3 billion, based on weights of 0.9 for "very severe," and, for the household population only, 0.1 for "minor limitations" (see Appendix 6). The institutionalized population represented \$3.1 billion of this total.

A sensitivity analysis, using a range of weights, produced productivity losses from \$31.8 billion (0.8; 0.0) to \$44.7 billion (1.0; 0.2).

Musculoskeletal diseases, the leading cause of long-term disability, accounted for \$13.5 billion, roughly one third (35.2%) of long-term disability costs. Nervous system and sense organ diseases (14.9%, \$5.7 billion) and cardiovascular diseases (11.8%, \$4.5 billion) also had high disability costs.

Arthritis and musculoskeletal disorders of the back and spine each represented a third of the cost of all musculoskeletal diseases (\$4.4 billion; \$4.3 billion). Sight and hearing disorders made up 36.6% of the cost of nervous system and sense organ disorders (\$1.2 billion; \$943 million). Asthma and bronchitis/emphysema (\$1.8 billion; \$424 million) accounted for 85.3% of the cost of long-term disability due to respiratory diseases.

Morbidity Costs Due to Short-term Disability

ANNUAL VALUE OF LOST PRODUCTIVITY DUE TO SHORT-TERM DISABILITY BY DIAGNOSTIC CATEGORY, CANADA, 1993		
DIAGNOSTIC CATEGORY	1993 COST (\$1000)	% OF TOTAL
Respiratory Diseases	\$4,357,224	24.8%
Injuries	\$3,242,540	18.5%
Musculoskeletal Diseases	\$1,753,851	10.0%
Digestive Diseases	\$1,147,567	6.5%
Nervous System and Sense Organ Diseases	\$896,058	5.1%
Mental Disorders	\$811,508	4.6%
Pregnancy	\$681,726	3.9%
Genitourinary Diseases	\$521,505	3.0%
Cardiovascular Diseases	\$425,348	2.4%
Infectious and Parasitic Diseases	\$381,704	2.2%
Cancer	\$251,205	1.4%
Skin and Related Diseases	\$108,808	0.6%
Blood and Related Diseases	\$86,926	0.5%
Perinatal Conditions	\$66,696	0.4%
Ill-defined Conditions	\$1,819,170	10.4%
Other Diagnostic Categories	\$996,937	5.7%
TOTAL	\$17,548,772	100.0%

Sources

Statistics Canada, Health Statistics Division. National Population Health Survey (NPHS, household component, 1994). Annual average days in bed or cut-down days of major activity by age and sex based on two-week disability (Unpublished tabulations).

Santé Québec. The Quebec Health and Social Survey (1993). Percentage distribution of days lost due to short-term disability by disease category (Unpublished tabulations).

Statistics Canada, Household Surveys Division. 1994 Survey of Consumer Finances. Counts and average earnings of earners by sex, age group and work activity, 1993 (Unpublished tabulations).

Statistics Canada, National Accounts and Environment Division. Average replacement cost generalist estimates of unpaid work by age and sex, 1993 (Unpublished tabulations).

Statistics Canada. *Estimates of labour income, October to December 1993*. Ottawa: Minister of Industry, Science and Technology, 1995; Catalogue 72-005/48(4).

Statistics Canada, Health Statistics Division. General population by age and sex in Canada, 1993 (Unpublished tabulations).

Statistics Canada. Household Surveys Division. 1994 Survey of Consumer Finances. Counts and estimated number of all individuals by sex and age group, 1993 (Unpublished tabulations).

Methods

The National Population Health Survey¹ provides the average number of days of short-term disability by age and sex for two levels of severity: "days in bed" or "days of reduced major activity." Weights are assigned to these levels to account for the loss of productivity at different severity levels of short-term disability: 0.9 for "days in bed" and 0.5 for "days of reduced major activity"²⁻⁵ (see Appendix 6). A sensitivity analysis of productivity losses using weights of 0.8 and 1.0 for "days in bed" has also been conducted.

The adjusted values are applied to the general population⁶ to estimate total annual days of productivity lost due to short-term disability by age and sex. Annual days of productivity lost due to short-term disability by diagnostic category, age group and sex are generated by applying these values to the distribution of days lost due to short-term disability by diagnostic category, age group and sex obtained from the Quebec Health and Social Survey (QHSS).⁷

The number of annual days of productivity lost according to diagnostic category, age group and sex is then multiplied by an average value per day of labour force work,⁸ adjusted for wage supplements⁹ and unpaid work,¹⁰ to estimate the value of productivity lost to short-term disability by diagnostic category, age and sex. Labour force earnings and the value of unpaid work are available by age and sex.

Assumptions

- The distribution of days lost to short-term disability by diagnostic category, age group and sex obtained from the QHSS is assumed to reflect the distribution for the Canadian population. Quebec represents 25% of the Canadian population.¹¹
- It is assumed that there are 250 days of labour force activity and 365 days of unpaid work per year.
- Average daily earnings and the value of unpaid work by age and sex are applied

similarly to people in the labour force and those not in the labour force.

- The average daily value of unpaid work for youths aged 12-14 is not available. Unpaid work for this age group is assumed to be half that for youths aged 15-19.
- Labour force earnings have been adjusted for wage supplements. The 1993 supplementary labour income rate (13.78%) is assumed to be the same for various age and sex groups.

Limitations

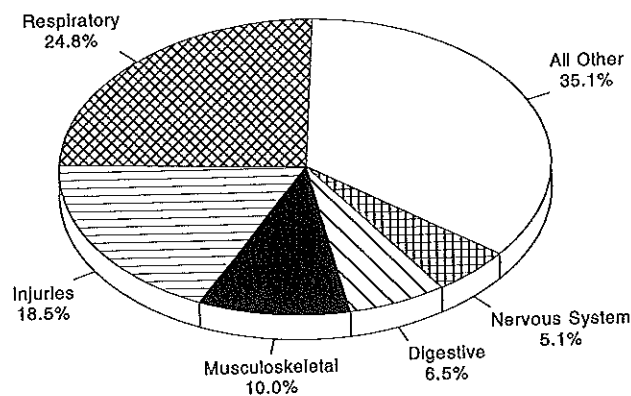
- Productivity lost to short-term disability is underestimated because the NPHS does not include people living on Indian reserves, or on Canadian Forces bases or children under age 12.
- The National Population Health Survey household component¹ does not provide short-term disability by diagnostic category. Applying the distribution of short-term disability by diagnostic category obtained from the QHSS may introduce bias.
- We may underestimate the economic impact of short-term disability by excluding people with long-term disabilities from our calculation.

Results

The total productivity lost due to short-term disability was an estimated \$17.5 billion in 1993. The leading cause of short-term disability was respiratory diseases (\$4.4 billion, 24.8%), followed by injuries (\$3.2 billion, 18.5%), musculoskeletal diseases (\$1.8 billion, 10.0%) and digestive diseases (1.2 billion, 6.5%).

A sensitivity analysis produced productivity losses for short-term disability of \$16.8 billion to \$18.3 billion, using respective weights of 0.8 and 1.0 for the severity level "days in bed" (see Appendix 6).

DISTRIBUTION OF MORBIDITY COSTS DUE TO SHORT-TERM DISABILITY BY DIAGNOSTIC CATEGORY, CANADA, 1993



\$17.5 billion classifiable by diagnostic category

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APPENDIX 1

Classification of Diseases

ICD-9 CODE	ICD-9 CHAPTER NAME	DIAGNOSTIC CATEGORY TERM USED IN REPORT
001-999	ALL CAUSES	All Causes
001-139	INFECTIOUS AND PARASITIC DISEASES	Infectious and Parasitic Diseases
140-239	NEOPLASMS	Cancer
240-279	ENDOCRINE, NUTRITIONAL AND METABOLIC DISEASES, AND IMMUNITY DISORDERS	Endocrine and Related Diseases
280-289	DISEASES OF THE BLOOD AND BLOOD-FORMING ORGANS	Blood Diseases
290-319	MENTAL DISORDERS	Mental Disorders
320-389	DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS	Nervous System and Sense Organ Diseases
390-459	DISEASES OF THE CIRCULATORY SYSTEM	Cardiovascular Diseases
460-519	DISEASES OF THE RESPIRATORY SYSTEM	Respiratory Diseases
520-579	DISEASES OF THE DIGESTIVE SYSTEM	Digestive Diseases
580-629	DISEASES OF THE GENITOURINARY SYSTEM	Genitourinary Diseases
630-676	COMPLICATIONS OF PREGNANCY, CHILDBIRTH AND THE PUERPERIUM	Pregnancy
680-709	DISEASES OF THE SKIN AND SUBCUTANEOUS TISSUE	Skin and Related Diseases
710-739	DISEASES OF THE MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE	Musculoskeletal Diseases
740-759	CONGENITAL ANOMALIES	Birth Defects
760-779	CERTAIN CONDITIONS ORIGINATING IN THE PERINATAL PERIOD	Perinatal Conditions
780-799	SYMPTOMS, SIGNS AND ILL-DEFINED CONDITIONS	Ill-defined Conditions
800-999	INJURY AND POISONING	Injuries
V01-V82	SUPPLEMENTARY CLASSIFICATION OF FACTORS INFLUENCING HEALTH STATUS AND CONTACT WITH HEALTH SERVICES	Well-patient care
ICD-9 CODE	ICD-9 SUBCATEGORY	SUBCATEGORY TERM USED IN REPORT
250	DIABETES MELLITUS	Diabetes
410-414	ISCHEMIC HEART DISEASE	Coronary Heart Disease
430-438	CEREBROVASCULAR DISEASE	Stroke
E810-E819	MOTOR VEHICLE TRAFFIC ACCIDENTS	Motor Vehicle Traffic Accidents
490-496	CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND ALLIED CONDITIONS	Chronic Bronchitis/Emphysema/Asthma
174, 175, 179-184	BREAST CANCER, FEMALE GENITAL CANCER	Female Cancers

APPENDIX 2

Definitions

National Health Expenditures in Canada, 1975-1994

All expenditures in *National Health Expenditures in Canada, 1975-1994* (NHEC) are based on public and private sectors of finance. The four main areas of public sector finance are these.

- federal direct health expenditures
- provincial and territorial government health expenditures (supported by health-related federal transfers to the provinces and provincial and territorial government funds)
- municipal government health expenditures
- workers' compensation board health expenditures

Private sector health expenditures are subdivided into three major categories.

- expenditures from health insurance plans (commercial and non-profit)
- out-of-pocket expenditures of individuals
- revenue of health care institutions from patient and non-patient services

Unless otherwise stated, total direct health expenditures are based on NHEC figures. In the NHEC report, total health expenditures always refer to the sum of public and private sectors of finance.

For more details, refer to Health Canada's *National Health Expenditures in Canada, 1975-1994* (or the 1975-1987 version for some of the definitions of terms).

Drug Expenditures

The IMS audits include:

- prescription drugs used in hospitals or purchased in computerized chain and independent retail drug stores, whether paid through provincial or other third party plans or directly by the patient
- some non-prescription drugs prescribed by a physician and dispensed by a pharmacist in a retail drugstore

and exclude:

- non-prescription products sold in retail outlets other than drugstores
- 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.)

The NHEC national drug expenditure includes:

- prescription drugs, non-prescription drugs and personal health supplies purchased in retail stores
- and excludes:
- drugs prescribed in hospitals and in other institutions (These are included in Hospital Care Expenditures and Expenditures for Care in Other Institutions.)

The NHEC 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*. Cost estimates for non-prescription drugs and personal health supplies were developed from a special tabulation obtained from A.C. Nielsen (Canada).

Physician Care Expenditures

The NHEC national physician expenditure includes:

- professional fees paid by provincial medical care insurance plans
- physicians' salaries and contractual professional incomes
- fee payments by workers' compensation boards
- direct expenditures by federal agencies and private sector payments for physicians' services not covered by provincial plans

and excludes:

- physicians on hospital, public health agency payrolls, etc. (These are included in Hospital Care Expenditures).

The Manitoba physician expenditure includes:

- payments made on a fee-for-service basis
- and excludes:
- psychiatrists paid through the provincial mental health services branch
 - radiologists and pathologists paid through hospitals
 - out-of-province medical care costs
 - optometric, oral, dental, periodontal and chiropractic services and costs

Hospital Care Expenditures

Acute care hospitals include:

- non-teaching general hospitals with no long-term care units
- non-teaching general hospitals with long-term care units
- pediatric hospitals
- teaching general hospitals (excluding pediatric)
- nursing stations, outposts
- other (cancer hospitals, cardiology hospitals or institutes, maternity hospitals, neurological institutes, orthopedic hospitals, etc.)

Long-term care hospitals include:

- extended care hospitals (including chronic)
- rehabilitation hospitals (including convalescent)

Psychiatric hospitals include:

- short-term care, including alcohol/drug recovery
- long-term care

Statistics Canada hospital expenditures 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

all medical staff remuneration, employee benefits, supplies and other expenses.

Refer to Statistics Canada's *Hospital Statistics: Preliminary Annual Report, 1993-94* for more detail.

Expenditures for Care in Other Institutions

The Health Canada definition of **Other Institutions** includes residential care facilities for the following groups.

- aged (including nursing homes)
- physically handicapped
- mentally handicapped
- developmentally delayed
- psychiatrically disabled
- clients with alcohol and drug problems
- emotionally disturbed children

These estimates do not include:

- non-health expenditures in these facilities
- facilities solely of a custodial or domiciliary nature (i.e. Type I care or less)
- facilities for transients and delinquents

Types of Care

Self-sufficient:

- only minor supervision required

Type I care:

- 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

Type II care or higher:

- a minimum of 1.5-2.5 hours, in a 24-hour day, of medical and professional nursing supervision and provision of support in meeting psycho-social needs

Health Science Research Expenditures

Additional categories include the following:

Basic Research

- metabolism
- immunology
- cell and molecular biology
- embryology
- other basic research not classified

Education/Medical History

- certain conferences
- workshops
- symposia
- visiting professors and scientists
- scholarships
- studentships
- fellowships
- travel grants
- history of health care

Equipment/Capital

Health

- general health promotion and disease prevention programs
- approaches to patient care
- communication with health professionals

Granting sources not included in the Medical Research Council's *Reference List*:

- agencies situated outside Canada (e.g. National Institutes of Health)
- Canadian and foreign business enterprises (e.g. pharmaceutical industry)
- smaller, local and regional agencies and foundations
- endowments and funds at the discretion of universities, hospitals and affiliated institutions

Additional Direct Health Expenditures

Other professionals include chiropractors, optometrists, podiatrists, osteopaths, naturopaths, private duty nurses and physiotherapists.

Home care represents "care rendered to patients in the patients' homes by nursing or other staff." When home care is provided by a hospital, it is included in Hospital Care Expenditures.

Other private health care costs comprise extended health benefits (hearing aids, appliances, etc.) that many insurance companies were unable to categorize.

Public health consists of "governmental expenditures for the prevention of disease and the protection of health and for the general administration of health departments . . . The internal administration of health institutions (hospitals, nursing homes, etc.) is treated as part of the expenditures for institutional care."

Capital expenditures include "expenditures on construction, machinery and equipment of hospitals, clinics, first-aid stations, and homes for special care."

Prepayment administration "is intended to measure the cost of having insurance coverage; that is to say, the amount of expense over and above the cost of the health care rendered that is involved in providing that care on a prepaid basis."

Miscellaneous health costs comprise the following three subcategories.

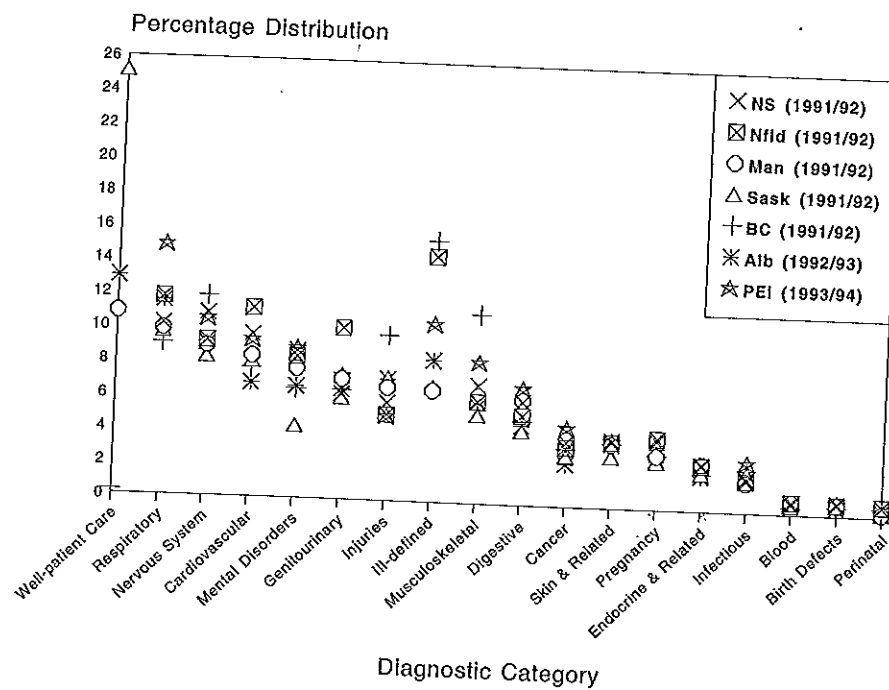
- **Training of health workers:** "reported expenditures, by federal and provincial departments responsible for health, that are specifically designated as being for the training of health workers. Only incidental expenditures of the departments are included here, not the cost of programs for complete training of persons to become health workers. Where the expenditures for training are made by hospitals, the amounts are included under [Hospital Care Expenditures]."
- **Voluntary health organizations:** "selected expenditures of certain national non-profit health organizations. The figures . . . exclude data for personal health care and for research, which have been included under other headings."
- **Occupational health expenditures:** "expenditures to promote and enhance health and safety at the workplace and to provide emergency care in the event of injury at work."

Mortality Costs

Employment income refers to total income received by persons 15 years of age and over during 1993 as wages and salaries, net income from unincorporated non-farm business and/or professional practice, and net farm self-employment income.

APPENDIX 3

Distribution of Physician Expenditures by Diagnostic Category and Province



APPENDIX 4

Health Science Research Granting Agencies

The Medical Research Council's *Reference List of Health Science Research in Canada, 1993-1994* includes grants and awards from the following agencies.

Addiction Research Foundation of Ontario	Dalhousie Medical Research Foundation	Multiple Sclerosis Society of Canada
Alberta Cancer Board	Easter Seal Research Institute	Muscular Dystrophy Association of Canada
Alberta Cancer Foundation	EJLB Foundation	National Cancer Institute of Canada
Alberta Foundation of Nursing Research	Fonds de la recherche en santé du Québec	National Institute of Nutrition
Alberta Heritage Foundation for Medical Research	Fonds pour la formation de chercheurs et l'aide à la recherche	Ontario Cancer Treatment and Research Foundation
Alzheimer Society of Canada	Hannah Institute for the History of Medicine	Ontario Mental Health Foundation
Arthritis Society	Health Canada	Ontario Ministry of Health
Atkinson Charitable Foundation	Health Services Utilization and Research Commission	Parkinson Foundation of Canada
Banting Research Foundation	Heart and Stroke Foundation of Canada	Physicians' Services Incorporated Foundation
B.C. Health Research Foundation	Hospital for Sick Children Foundation	PMAC—Health Research Foundation
Canadian Cystic Fibrosis Foundation	Huntington Society of Canada	Quebec Diabetes Association Inc.
Canadian Diabetes Association	Institut de recherche en santé et en sécurité du travail du Québec	Rick Hansen Man in Motion Foundation
Canadian Fund for Dental Education	J.P. Bickell Foundation	RP Research Foundation
Canadian Liver Foundation	Juvenile Diabetes Foundation Canada	St. Boniface General Hospital Research Foundation Inc.
Canadian National Institute for the Blind: E.A. Baker Foundation for the Prevention of Blindness	Kidney Foundation of Canada	Vancouver Foundation: British Columbia Medical Services Foundation
Canadian Nurses Foundation	The Lung Associations	Vancouver Foundation: W.J. VanDusen Foundation
Canadian Psychiatric Research Foundation	Manitoba Health Research Council	Workplace Health and Safety Agency
Canadian Red Cross Society	Manitoba Medical Service Foundation	
Cancer Research Society	Max Bell Foundation	
Crohn's and Colitis Foundation of Canada	Medical Research Council of Canada	
Dairy Bureau of Canada	Miles Canada Inc.	

APPENDIX 5

Lifetime Productivity Loss Model

Lifetime productivity loss is essentially the sum of productivity in the current year and productivity expected in future years if the individual continues to live. This concept is captured in the following equation, which is applied separately to compute the discounted value of future labour force work and unpaid work.^{1,2}

$$\text{Prod (age}_i, \text{sex}_j) = \text{Prod (age}_{i+1}, \text{sex}_j) \times \text{Plive (age}_i, \text{sex}_j) \times (1+p) / (1+r) + \text{Earn (age}_i, \text{sex}_j)$$

Where:

$$\text{Prod (age}_i, \text{sex}_j) = \text{discounted value of lifetime productivity for a person at age } i \text{ and sex } j$$

$$\text{Plive (age}_i, \text{sex}_j) = \text{probability that person of sex } j \text{ will be alive at age } i, \text{ given they are alive at age } i - 1$$

$$p = \text{productivity growth rate}$$

$$r = \text{discount rate}$$

$$\text{Earn (age}_i, \text{sex}_j) = \text{average annual employment income or the average value of annual unpaid work for person of age } i \text{ and sex } j$$

The average annual employment income or the average value of annual unpaid work is computed as follows.

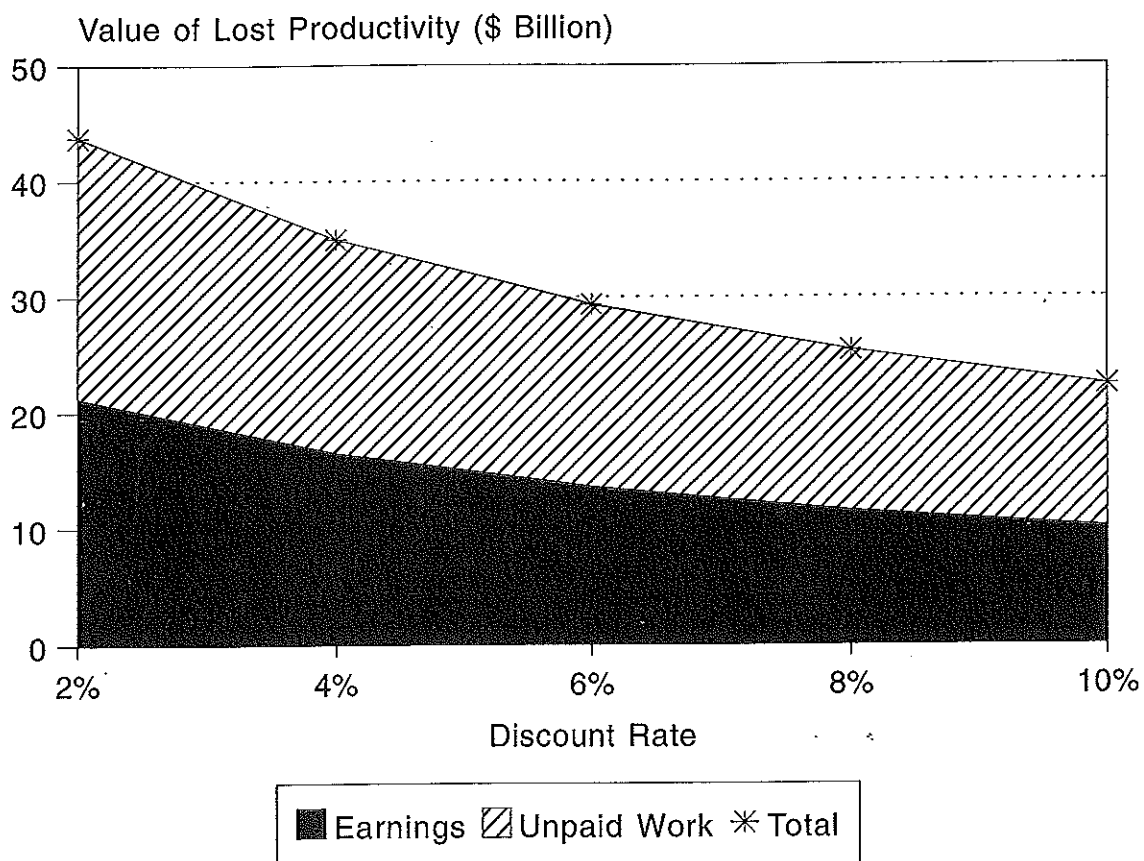
$$\text{Earn (age}_i, \text{sex}_j) = P (\text{age}_i, \text{sex}_j) \times E (\text{age}_i, \text{sex}_j)$$

Where:

$$P (\text{age}_i, \text{sex}_j) = \text{percentage of Canadian population by age group and sex with earnings during 1993}$$

$$E (\text{age}_i, \text{sex}_j) = \text{average earnings in 1993 for those with earnings, by age group and sex}$$

Sensitivity Analysis: Value of Lost Productivity Due to Premature Mortality, 1993



APPENDIX 6

Weights for Loss of Productivity at Different Levels of Disability

Weights for various levels of disability based on "loss of health" have been developed by Russell Wilkins.¹ However, loss of health may not be equal or linearly related to "loss of earnings/productivity."¹⁻⁴

Dr John Dorland² of Queen's University suggests that the association between long-term disability and "loss of earnings" may have three phases: with a minor long-term disability, people suffer some loss of health but no loss of earnings because their work habits do not change; as the disability gets worse, people cut back on work, becoming less productive; then, at a certain severe level of disability, earnings drop to near zero as people stop work entirely, although the quality of life does not necessarily decrease at the same rate.

Based on personal communication with Russell Wilkins, John Dorland and Michael Cassidy, we estimate weights for "loss of productivity" at different levels of disability for the household and institutionalized population.

Severity	Weights for loss of productivity
<i>Long-term disability (household)</i>	
Very severe	0.8-1.0
Somewhat severe	0.5
Somewhat major	0.3
Minor	0.0-0.2
<i>Long-term disability (institution)</i>	
Very severe	0.8-1.0
Minor	0.3
<i>Short-term disability (household)</i>	
Days in bed	0.8-1.0
Days of reduced major activity	0.5

Weights for loss of earnings are generally poorly defined and lack validation.³ In addition, the weights for various levels of disability may vary by diagnostic category and occupation. We did not consider these factors in our calculations because of the lack of literature on this topic. Our weights may overestimate productivity losses for people able to adapt to their conditions and may underestimate productivity losses for people with more debilitating conditions.

APPENDIX 7

Comparison of Age and Sex Distributions with Other Data Sources

The *National Health Expenditures in Canada, 1975–1994 (NHEC)*¹ provides the age and sex breakdown for provincial governments' expenditures for many of the direct cost components. Since the proportion of the total national expenditure that the provincial expenditures represent varies by cost component, some cost components (e.g. physicians, 97.4%; hospitals, 86.9%) are more reliable to use in making comparisons than others (e.g. drugs, 30.7%; other professionals, 12.3%). Preliminary 1992/93 data from the National Physician Database (NPDB)² also provide a distribution of fee-for-services physician claims by age and sex for all provinces except Quebec.

The table in this appendix compares the age and sex distributions of several cost components provided by the two data sources above as well as by our own report (Burden '93).

Physician Care Expenditures

We estimated that female patients were responsible for 59.8% of the cost of physician care in 1993. This proportion is very similar to that calculated from the NPDB² in 1992/93 (59.6%) and the proportion shown in the NHEC¹ (58.9%) for 1993. However, our age distribution of expenditures varies somewhat from the NHEC and NPDB distributions.

The use of an age distribution for only one province (Manitoba) to calculate our costs may explain part of this discrepancy. Physician expenditures for Manitoba differ slightly from the national average. However, Manitoba provides age and sex breakdowns for each diagnostic category; the NHEC and NPDB are unable to provide this detail.

Comparison of Age and Sex Distributions by Cost Component for Various Data Sources					
Cost Component	Age Group			Sex	
	0–14	15–64	65+	Male	Female
<i>Physicians</i>					
NHEC '93	12.0%	63.6%	24.4%	41.1%	58.9%
Burden '93	12.1%	59.8%	28.1%	40.2%	59.8%
NPDB '92/93	12.0%	65.1%	22.9%	40.4%	59.6%
<i>Hospitals</i>					
NHEC '93	4.4%	38.6%	57.0%	42.5%	57.5%
Burden '93	9.5%	44.7%	46.7%	46.4%	53.6%
<i>Drugs</i>					
NHEC '93	2.1%	24.0%	73.9%	43.2%	56.8%
Burden '93	7.4%	57.9%	33.0%	44.4%	55.6%
<i>Other Institutions</i>					
NHEC '93	2.8%	24.7%	72.5%	37.7%	62.3%
<i>Other Professionals</i>					
NHEC '93	16.4%	53.5%	30.1%	42.9%	57.1%
<i>Other Expenditures</i>					
NHEC '93	9.4%	59.3%	31.4%	44.3%	55.8%

Hospital Care Expenditures

Our proportion of hospital expenditures attributed to females (53.6%) is lower than that shown in the 1993 NHEC¹ data (57.5%). Comparison of our percentage distribution of hospital care expenditures by age group with that of the NHEC shows considerable differences. The NHEC age distributions are based on hospital expenditures of the provincial governments that represent 86.9% of the national hospital expenditure and include hospital drugs. We excluded the cost of hospital drugs from our hospital expenditure, including it in Drug Expenditures instead.

Drug Expenditures

Females accounted for 55.6% of the prescription drug costs for 1993 that we were able to categorize by sex. Although this figure is consistent with the 56.8% estimated by the NHEC,¹ the age distribution between the two sources differs. This is because the NHEC

provincial governments' drug expenditures represent only 30.7% of the total drug expenditure and exclude drugs dispensed in hospitals. In this report, we were able to categorize more than 90% of all prescription drugs sold in pharmacies by age and sex. We also estimated hospital drug expenditure by age and sex.

Expenditures for Care in Other Institutions

We were unable to categorize expenditures for other institutions. The NHEC¹ classified 69.8% (\$4.9 billion) of the expenditures by age and sex. Females represented 62.3% (\$3.0 billion) of these costs. The 65+ age group made up 72.5% (\$3.5 billion) of the expenditure for other institutions. These NHEC estimates are consistent with the large proportion of this expenditure represented by homes for the aged (82%).

Other Professionals and Other Health Expenditures

We were unable to categorize other professionals and other additional direct health expenditures. Similarly, the NHEC¹ could provide estimates by age and sex for only 12.3% of expenditures for care by other professionals (including dentists and denturists), and for only 51.3% of other expenditures.