



Chronic Diseases in Canada

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ECONOMIC BURDEN OF ILLNESS IN CANADA, 1986

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Note to Our Readers

The disease cost comparison between Quebec and Canada that is explored in the discussion section of this document (p. 8) should be qualified in the following way:

The direct costs for Quebec taken from *Objective: A Health Concept in Quebec (A Report of the Task Force on Health Promotion)* do not include the pensions and benefits component that the present report has included as part of the direct costs for Canada. The Quebec government's report considers health-related public transfer payments to be indirect costs of disease, although the dollar amount is not incorporated in their indirect costs total of \$4.5 billion. Therefore, our comparison of indirect costs between Quebec and Canada is based solely on earning losses due to premature death and disability.

In addition it should be noted that, while the total of \$7.5 billion in direct costs for Quebec is for 1982, the percentage distribution of these costs is based on 1980-81 data.

ECONOMIC BURDEN OF ILLNESS IN CANADA, 1986

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Executive Summary and Recommendations

In order to set priorities for the allocation of limited health resources, there is an urgent need for Canadians to understand the magnitude of the economic cost of illness. This report has employed the human capital approach which translates morbidity and premature mortality into direct and indirect costs to society and affected individuals.

The total economic cost of illness, disability and premature death in Canada was estimated at \$97.2 billion in 1986. Direct costs accounted for \$50.2 billion. Hospital care was the most expensive direct cost component (\$17.1 billion), while research expenditure was the lowest (\$0.5 billion). Indirect costs totalled \$47 billion; more than half (54%) of this amount was attributed to the loss of future income due to premature mortality.

The leading disease categories were cardiovascular diseases (\$16.8 billion), injuries (\$11 billion) and cancer (\$9.1 billion). These three conditions collectively represented almost one half (47%) of the total costs which could be categorized by disease. A total of \$18 billion of direct costs could not be classified by disease.

Although there are limitations to the direct and indirect cost data used, the report provides a valuable overview of the distribution of the principal direct and indirect economic costs of disease. As a result of this analysis, it is recommended that efforts be made to:

1. Refine methods and improve data sources for the direct and indirect cost component estimates to provide more comprehensive information on diseases. Several specific suggestions are made in the discussion that relate to the present data limitations.
2. Organize all health-related cost data according to the major categories of the most recent revision of the World Health Organization's International Classification of Diseases (currently ICD-9) in order to effectively and accurately determine the distribution of health resources by disease category.
3. Develop methods to establish the costs of disease attributable to various risk factors (e.g. tobacco, alcohol, hypertension, elevated serum cholesterol) to further our understanding and appreciation of the economic costs of illness.
4. Strengthen health promotion and prevention programs, especially those directed towards chronic diseases which are responsible for the majority of the direct and indirect costs of disease in Canada.

The first three recommendations are aimed at enhancing future analyses of the economic burden of illness, while the last item suggests a future direction for attempting to reduce some of that burden in Canada. It is our hope that this report will be used by health planners, researchers and policy makers at all levels to make more effective decisions concerning the allocation of constrained health resources.

1. Introduction

Over the years, many agencies have asked the Laboratory Centre for Disease Control to provide estimates on the costs of disease to Canadian society. These type of estimates are of great interest to health planners, researchers and policy makers. In an effort to respond, however, we quickly discovered that complete systematic national information on disease costs was simply not available, and even ad hoc data were scarce.

This report attempts to estimate the 1986 economic burden created by illness, disability and premature death on affected individuals and on Canadian society. Whenever possible, we have examined costs in relation to 18 broad diagnostic categories based on the Ninth Revision of the World Health Organization's International Classification of Diseases.

The economic impact of diseases is analysed in terms of direct and indirect costs. Direct costs are the value of resources that could have been allocated to other uses in the absence of disease (Rice, Hodgson, Kopstein, 1985). This paper presents estimates of direct cost components such as hospital care, medical care provided by physicians, other professional health services, medical drugs, health science research, health-related pensions and benefits, non-institutional health care and related services, medical appliances and various health expenses of an administrative nature. Indirect costs are the value of lost productivity due to illness and disability and the present value of future earnings lost by people who die prematurely (Rice, Hodgson, Kopstein, 1985).

"The economic costs of illness continue to play an important role in decisionmaking regarding the allocation of resources in the health sector" (Rice, Hodgson, Kopstein, 1985). As Canada is faced with an aging population, rising health care costs and limited resources, the kind of information contained in this report becomes increasingly valuable for developing effective health strategies.

2. Materials and Methods

Because of the variety and complexity of materials and methods used in the preparation of the disease cost estimates contained in this document, detailed descriptions of the information sources and methodologies for each of the cost components are provided in the appendices. The tables of results in Appendix I offer explanatory footnotes and basic identification of the data sources involved for each cost component. Further details are provided in Appendix II. The reference list also itemizes information sources for the report in its entirety. The following brief outline of materials and methods serves as a general guide only.

Unless otherwise specified, the cost components examined in this economic study of illness are classified by diagnostic category according to the terminology defined in Section 7.0 of Appendix II, based on the 18 major chapter headings in the Ninth Revision of the World Health Organization's International Classification of Diseases. Four subcategories of significant specific diseases are also isolated whenever possible. Unfortunately, it was not always feasible to determine the distribution of costs by disease category.

This report adopts the human capital approach of estimating the economic cost of illness, translating morbidity and premature mortality into direct and indirect costs to society. Despite controversy over the indirect cost estimation, the human capital approach is still the most plausible method available to date. Inclusion of indirect costs may introduce bias to the overall cost estimation due to limitations in the direct and indirect cost data, but exclusion of indirect costs would lead to tremendous underestimation of the economic burden which illness places upon society.

The principle source for the methods used in this paper was Rice, Hodgson, and Kopstein's 1985 article, "The economic costs of illness: a replication and update," an analysis of American costs. The methodology used in their article reflects the methods of the original report, "Estimating the cost of illness," which developed the human capital approach mentioned above (Rice, 1966). Collishaw and Myers' article, "Dollar estimates of the consequences of tobacco use in Canada, 1979," also employed Rice's methodology. Since Collishaw and Myers used Statistics Canada publications and the Canada Health Survey as data sources, their report was an excellent reference guide for our endeavour.

The Quebec government's *Objective: A Health Concept in Quebec (A Report of the Task Force on Health Promotion)* was the only Canadian source we could find that presented an economic analysis of illness in terms of both direct and indirect costs by disease category. Although it contained data from only one province in the early 1980s, it was a useful source of comparison that is explored in the discussion.

3. Results

3.1 Canadian Drug Costs to the Consumer

During 1986, the total cost of drugs distributed to the Canadian consumer through drugstores and hospitals was estimated at \$3.6 billion (Table 1, p. 14). More than one third (35.8%) of this total was spent on drugs used for the treatment of cardiovascular diseases (\$749 million) and respiratory diseases (\$536 million).

Coronary heart disease (\$191 million) represented one quarter (25.5%) of the pharmaceutical cost of cardiovascular diseases. Drugs used for chronic bronchitis, emphysema and asthma totalled \$105 million, accounting for 19.6% of the amount spent on respiratory diseases.

The supplementary classification of well patient care, which corresponds in this case only with the ICD-8 category of special conditions and examinations without sickness, also had a significant impact on the pharmaceutical total. Consumer costs of \$330 million made up 9.2% of the total drug expenditure in drugstores and hospitals. Drugs in this category included contraceptives, infant formulae and some vitamins, biologicals and antimalarials.

It should be reiterated that the total drug cost applies only to drugs purchased by drugstores and hospitals. The limitations of this estimate are examined in the discussion.

3.2 Medical Care Expenditure

The cost of medical services provided by physicians across the country totalled \$6.98 billion in 1986 (Table 2, p. 15). The ICD-9 supplementary classification of factors influencing health status and contact with health services (termed "well patient care") was the leading diagnostic category within this component of health care costs, with expenditure of \$740 million accounting for 10.6% of the medical care total. General medical examinations and special investigations fall under this category.

Other major contributors to medical care costs were respiratory diseases (9.1%), cardiovascular diseases (8.9%), nervous system and sense organ diseases (8.2%), genitourinary diseases (7.6%) and ill-defined conditions (7.2%). Each of these disease categories cost more than \$500 million.

An additional \$3 billion was spent in 1986 on other professional health services which could not be classified by disease category. The costs of these non-physician professional services are outlined in the additional health expenditures in Table 9 (p. 24), which accompanies Section 3.9 of the results. In the summary of results in Section 3.11, the \$10 billion grand total expenditure on professional services (Figure 3, p. 6 and Table 11, p. 28) is the combined cost of medical care provided by physicians and other professional services.

3.3 Hospital Care Expenditure

The total hospital care expenditure estimated for 1986 was \$17.1 billion (Table 3, p. 16). This amount excludes the cost of hospital-supplied drugs incorporated in the estimate of drug costs in Section 3.1.

Cardiovascular diseases generated the greatest hospital expense by far: \$3.5 billion or 20.7% of the total expenditure. Mental disorders, cancer, digestive diseases, and injuries followed suit, with respective expenses of \$1.8, \$1.5, \$1.4, and \$1.35 billion. Respiratory diseases and nervous system and sense organ diseases were also over the one billion dollar mark in hospital care costs.

With a combined total of \$2.2 billion, the diagnostic subcategories of stroke and coronary heart disease contributed 12.9% to the total hospitalization expenditure. Diabetes constituted 65% (\$291 million) of the hospital care expenditure for the diagnostic class of endocrine and related diseases.

3.4 Research Costs

For the 1986-87 fiscal year, an estimated \$382 million was spent in Canada on health science research which could be classified by disease category (Table 4, p. 17). The category of endocrine and related diseases was responsible for the largest share (19%) of this research expenditure with \$72 million. Cancer, cardiovascular diseases and nervous system and sense organ diseases ranked second, third and fourth in research costs, accounting for \$54, \$53 and \$47 million, respectively.

Based on the data sources used for Table 4, the diagnostic category of injuries received one of the lowest amounts of research funding, accounting

for approximately \$1 million, only 0.3% of the total research expenditures.

The subcategories of coronary heart disease (21.1%) and stroke (4.5%) together represented more than one quarter of the cardiovascular disease research. Diabetes constituted 11.7% of the total endocrine research, whereas chronic bronchitis, emphysema and asthma contributed only 1.1% to the total research cost for respiratory diseases.

An additional amount (\$71 million in 1985-86) of biomedical research could not be classified by diagnostic class and is, therefore, included in Section 3.9. This amount is included in the grand total of research expenditure reported in Section 3.10, the summary of results.

3.5 Pensions and Benefits

3.5.1 Canada/Quebec Pension Plans

The combined total net payments for disability pensions from the Canada Pension Plan and the Quebec Pension Plan (CPP/QPP) were estimated at \$949 million in 1986 (Table 5A, p. 18). Payments for musculoskeletal (\$275 million) and cardiovascular (\$247 million) diseases together made up over one half (55.1%) of this total. Mental disorders were responsible for \$99 million in CPP/QPP disability payments, representing a significant 10.5% share.

In addition, another \$1.7 billion was spent in 1986 on CPP/QPP health-related payments which could not be identified by disease category (Table 5B, p. 19). These net payments consisted of survivors' pensions (\$1.3 billion), lump sum death benefits (\$160 million), orphans' pensions (\$131 million) and benefits to children of disabled contributors (\$77 million). Because these expenditures could not be assigned to the diagnostic categories, they were placed with the additional health expenditures in Section 3.9. They were also included in the grand total cost of pensions and benefits summarized in Section 3.10.

3.5.2 Unemployment Insurance

Unemployment Insurance (UI) health-related benefits totalled \$715 million in 1986 (Table 5C, p. 19). These payments were not broken down by diagnostic classification. Sickness benefits amounted to \$242 million, which was added to the unclassified additional

health expenditures in Section 3.9. We also chose to include UI maternity benefits of \$473 million in this report although pregnancy is not a disease. These maternity payments were included under the category of pregnancy in the pensions and benefits component of the summary Table 10 (p. 26). Both of the UI health-related benefits are part of the grand total expenditure on pensions and benefits in Section 3.10.

3.5.3 Workers' Compensation

National workers' compensation expenditure on temporary disability, worker pensions and fatal benefits was \$2.7 billion in 1986 (Table 5D, p. 20). The diagnostic category of injuries was responsible for almost all (96.5%) of this expenditure. In contrast, musculoskeletal diseases cost \$57 million, only 2.1% of the total cost.

Money spent on workers' compensation health care benefits is excluded from this total. An estimated \$380.8 million in payments for workers' compensation health care benefits are incorporated into most of the other direct cost components of illness, and have not been isolated for the purposes of this report (Health and Welfare Canada, 1990).

3.6 Future Income Lost Due to Premature Mortality

One of the greatest indirect costs of illness is the loss of future earnings from people who die prematurely. In 1986 the present value of future income lost due to premature mortality in Canada was estimated at \$25.6 billion based on the normal life expectancy at the age of death (Table 6, p. 21). No distinction was made between those in and those out of the labour force at the time of death.

Cardiovascular diseases accounted for the largest proportion (31.9%) of this future productivity loss with an estimated value of \$8.2 billion. Cancer, followed by injuries, were the next diagnostic categories in line with respective losses of \$7.1 billion and \$4.8 billion. These three leading categories collectively cost 78.9% of the present value of income foregone due to premature mortality. Future income losses caused by respiratory (\$1.3 billion) and digestive diseases (\$1 billion) combined were responsible for 8.9% of the total loss.

The subcategory of coronary heart disease was of major concern as its premature mortality loss was valued at \$5.3 billion or 20.8% of the total loss

from all diseases. Together with stroke (\$1.2 billion), these two conditions represented 79.5% of future income lost due to cardiovascular diseases.

Motor vehicle traffic accidents caused 6.3% of the total loss of future income, accounting for one third of the premature mortality loss due to injuries. Premature death from diabetes cost 55.5% of future income lost due to endocrine and related disorders. Chronic bronchitis, emphysema and asthma made up 51.2% of the income foregone due to premature mortality from respiratory diseases.

3.7 Annual Value of Time Lost Due to Chronic Disability

The other major indirect cost of illness is the loss of productivity caused by disability or disease, whether long-term or short-term. During 1986 the estimated annual value of time lost due to long-term disability was \$19 billion (Table 7, p. 22). The measure of chronic disability was an inability or a restricted ability to perform a major or minor activity based on the Canada Health Survey (Health and Welfare Canada and Statistics Canada, 1983). Any activity limitation was included, rather than just restricted labour force participation, and all ages were included as well. If, however, the cut-off ages of 75 and 65 had been used instead, the respective values of lost income would have been \$16.7 billion and \$13.9 billion.

The Canada Health Survey examined disability related to specific health problems which did not adhere to the ICD-9 diagnostic categories. Based on Survey results, the leading cause of chronic disability was a combination of arthritis, rheumatism, and limb and joint disorders. These musculoskeletal problems cost \$6.1 billion in lost income in 1986, 31.9% of the total.

"Other" health problems which were too small to be categorized independently yielded the second greatest income loss valued at \$4.4 billion or 23% of the annual total. Hypertension and heart disease followed with an indirect cost of \$3.3 billion representing 17.4% of the total value of time lost due to chronic disability.

3.8 Annual Value of Time Lost Due to Short-term Disability

The indirect cost of short-term disability was also measured in terms of the Canada Health Survey, which reported short-term disability during the

two weeks prior to interview. The annual value of time lost due to short-term disability was estimated to be \$2.4 billion in 1986 (Table 8, p. 23). As with chronic disability in the previous section, all types of activity limitation (in or out of the labour force) and all ages were included in this estimate. Applying the cut-off ages of 75 and 65 as alternative approaches would have resulted in time losses valued at \$2.2 billion and \$2 billion, respectively.

Acute respiratory disease, influenza, bronchitis, emphysema, and asthma accounted for the greatest productivity loss attributed to short-term disability. These respiratory problems were responsible for approximately one third (33.8%) of the total, a value of \$0.8 billion.

The Canada Health Survey's classification of "other" small health problems ranked second for short-term disability as well, with \$0.6 billion worth of lost time making up 23.1% of the overall cost. Arthritis, rheumatism, and limb and joint disorders caused short-term losses of \$0.3 billion, 11.7% of the total.

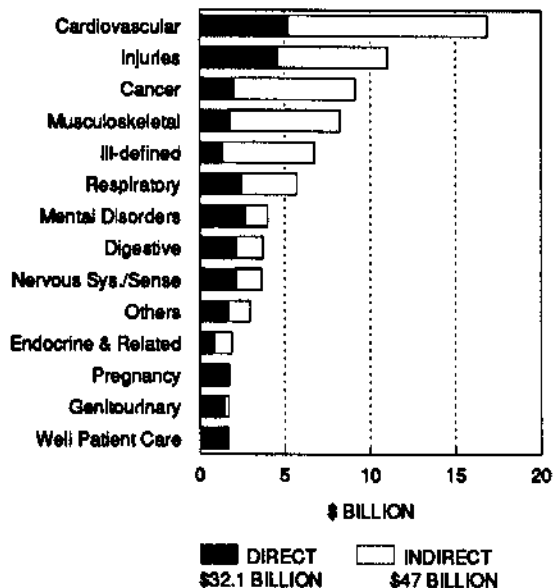
3.9 Additional Direct Health Expenditures

Additional direct health costs which could not be classified by disease category amounted to a substantial \$18 billion in 1986. These additional expenditures were grouped into the following major cost components in Table 9 (p. 24): pensions and benefits, \$2.8 billion; health care-related component, \$9.3 billion; and administration component, \$6 billion.

The health care-related component was a combination of institutional and related services (\$5.3 billion), professional services (\$3 billion) and medical appliances (\$1 billion). Non-hospital institutions alone accounted for \$4.5 billion, and the professional services of dentists cost a significant \$2.4 billion.

Within the administration component, the leading expenses were capital expenditure on medical facilities (\$2.1 billion) and public health costs (\$2 billion). Other administrative expenditures were for medical and dental schools, prepayment administration of insurance coverage and miscellaneous health costs involving training of health workers, voluntary health organizations and occupational health expenditures. An additional amount of 1985-86 research

**Figure 1
COST OF ILLNESS BY DISEASE CATEGORY,
CANADA 1986**



Source: Table 10
Based on ICD-9 categories.

expenditure was included here also, covering \$71 million spent on biomedical research in Canadian faculties of medicine from funding sources which were not part of the health science research expenditure broken down by diagnostic category in Table 4 (p. 17).

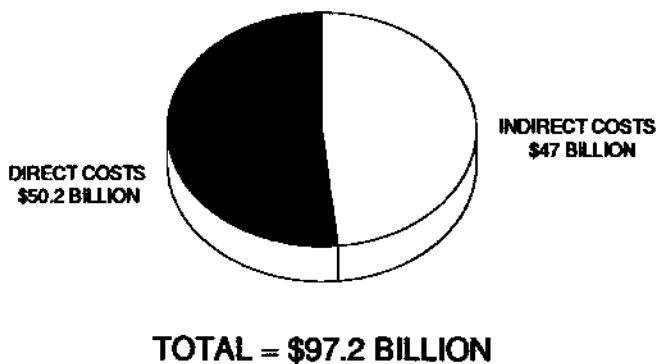
3.10 Summary of Results

A summary of the direct and indirect costs of illness which could be classified by diagnostic category is

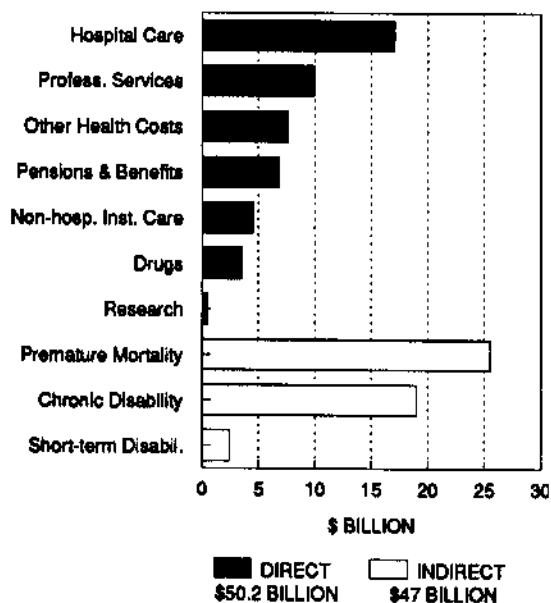
Injuries ranked in second place at a total cost of \$11 billion: direct costs were \$4.6 billion and indirect costs were \$6.4 billion. Cancer followed next with a total cost of \$9.1 billion: direct costs equalled \$2 billion and indirect costs equalled \$7.1 billion. Figure 1 illustrates the direct/indirect costs split for all of the disease categories with total costs over one billion dollars.

Figure 2 shows that the estimated 1986 grand total economic burden of illness was \$97.2 billion, comprising direct costs of \$50.2 billion (51.6%) and indirect costs of \$47 billion (48.4%). The additional direct health expenditures of \$18 billion that could not be categorized by disease have been added to this grand total.

**Figure 2
GRAND TOTAL COST OF ILLNESS,
CANADA 1986**



**Figure 3
GRAND TOTAL OF DISEASE COST COMPONENTS,
CANADA 1986**



Source: Table 11

presented in Table 10 (p. 26). These costs amounted to \$79.2 billion in 1986. They do not include the additional unclassifiable direct health expenditures identified in the preceding section.

Cardiovascular diseases accounted for over one fifth (21.3%) of the disease-classifiable total costs of illness, making it the most expensive category overall with direct costs of \$5.2 billion and indirect costs of \$11.6 billion.

The relative magnitude of the major disease cost components of the grand total is portrayed in Figure 3 and in Table 11 (p. 28). Hospital care was the single most costly direct component with \$17.1 billion representing 17.6% of the grand total cost. This was followed by the cost of all professional services (\$10 billion, 10.3%), other miscellaneous health expenditures (\$7.7 billion, 7.9%), and all health-related pensions and benefits (\$6.9 billion, 7.1%). Research had the lowest direct cost of \$0.5 billion, only 0.5% of the grand total. The major indirect cost components were the loss of future income due to premature death, estimated at \$25.6 billion or 26.3% of the grand total, and the \$19 billion value of time lost due to chronic disability which represented 19.6% of the grand total cost of illness.

4. Discussion

The goal of this report was to systematically estimate the economic cost of illness in Canada in 1986. Using the human capital approach, morbidity and premature mortality were translated into direct and indirect costs to society. Direct costs comprised expenditure on drugs, medical care provided by physicians and other professional services, hospital care, research, pensions and benefits, non-institutional care and related services, appliances and various administrative health costs. Indirect costs included the loss of future income due to premature death and the value of productivity lost in 1986 due to chronic and short-term disability. While it was not possible to categorize all of the direct cost components by diagnostic group, we were able to determine direct and indirect costs by disease category for approximately 81% of the \$97.2 billion which we estimated as the grand total cost of illness.

The ratio between the direct and indirect costs varied considerably for different disease categories. The potential reduction of direct costs from eliminating a particular disease class or condition

with a ratio over one would be relatively greater than for those diseases with a ratio below one.

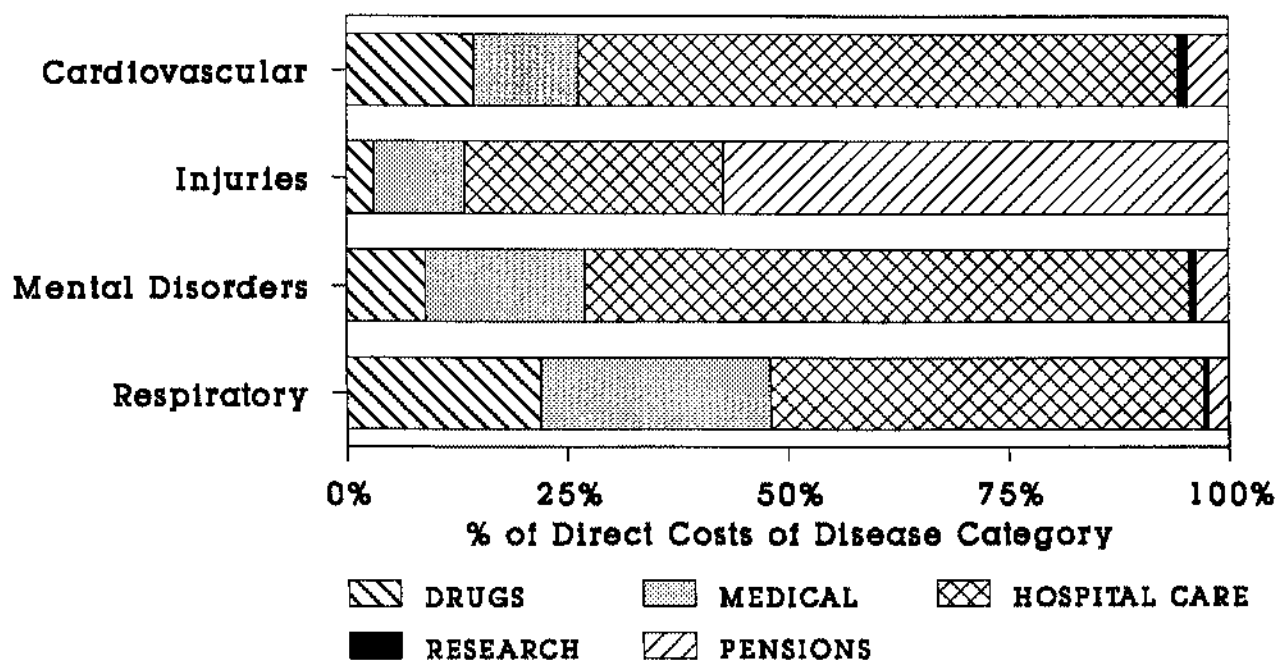
Cardiovascular diseases, the most expensive disease class, exhibited a direct to indirect cost ratio of 0.4 (\$5.2/\$11.6 billion). The second most expensive category, injuries, had a cost ratio of 0.7 (\$4.6/\$6.4 billion). The ratio for cancer, the third costliest disease group, was 0.3 (\$2/\$7.1 billion). In fact, the six most expensive disease categories all recorded direct to indirect cost ratios of less than one, demonstrating the enormous economic burden that the indirect costs of illness place on society and individuals.

On the other hand, certain diseases were more expensive in terms of their direct costs. Excluding pregnancy, the highest direct/indirect cost ratios were for genitourinary diseases (6.4), skin and related diseases (6.0), and infectious and parasitic diseases (2.8). Each of these disease categories represented less than \$2 billion in total costs.

Separate analysis of direct and indirect costs revealed that the relative importance of each cost component also varied by type of disease. Figure 4 shows the percentage distribution of direct cost components for the four disease classes with the highest direct costs. For both cardiovascular diseases and mental disorders, hospital care alone contributed almost 70% of the total direct costs. The proportion of direct costs attributed to drug expenditure was as high as 22% for respiratory diseases compared to only 3.1% in the case of injuries. Pensions and benefits made up over half (57%) of the total direct costs of injuries, a much greater proportion than for any other disease category. At the same time, the research share of the direct costs of injuries was merely 0.3%, an amount that does not even show on the graph.

The extremely small proportion of money spent on research efforts applied to all categories, accounting for only 1% of the direct costs of all diseases combined. The research share of direct costs and of total costs for each of the disease categories is portrayed in Figures

Figure 4
DIRECT COST COMPONENTS FOR DISEASES WITH HIGHEST DIRECT COSTS



5 and 6, respectively. Endocrine and related diseases and blood diseases were excluded due to limitations in our research estimates. The research expenditures were disproportionately high for these two categories because they contained a great deal of basic and immunology research that could not be accurately linked to a particular disease. Infectious and parasitic diseases therefore had the highest proportion of research expenditure, mainly due to AIDS research. The research share associated with the category of ill-defined conditions was too low to appear on either graph.

Indirect costs were highest for cardiovascular diseases, cancer, musculoskeletal diseases and injuries, in that order. As Figure 7 illustrates, at least 70% of the indirect costs of cardiovascular diseases and injuries resulted from future income losses due to premature death, and this appeared to be the sole indirect cost component associated with cancer. However, cancer often causes relatively short-term disability which is often underreported on surveys such as the Canada Health Survey which was the basis of the indirect disability data used here. In contrast, almost all (94.3%) of the indirect costs of

musculoskeletal diseases were ascribed to the productivity loss caused by chronic disability.

The varied distribution of cost components across disease categories is further illustrated in Figures 8-13 which show the relative magnitude of each direct and indirect cost component for the six disease categories with the highest total costs (excluding ill-defined conditions). The diverse patterns which appear reflect the distinct nature of each disease category.

Some comparisons can be made between our national study and the economic analysis of illness which was part of the Quebec government's report entitled *Objective: A Health Concept in Quebec (A Report of the Task Force on Health Promotion)* [Quebec, 1986]. It should be kept in mind that the Quebec direct health expenditures of \$7.5 billion were for 1982, while the indirect costs of \$4.5 billion were based on 1980-81 data.

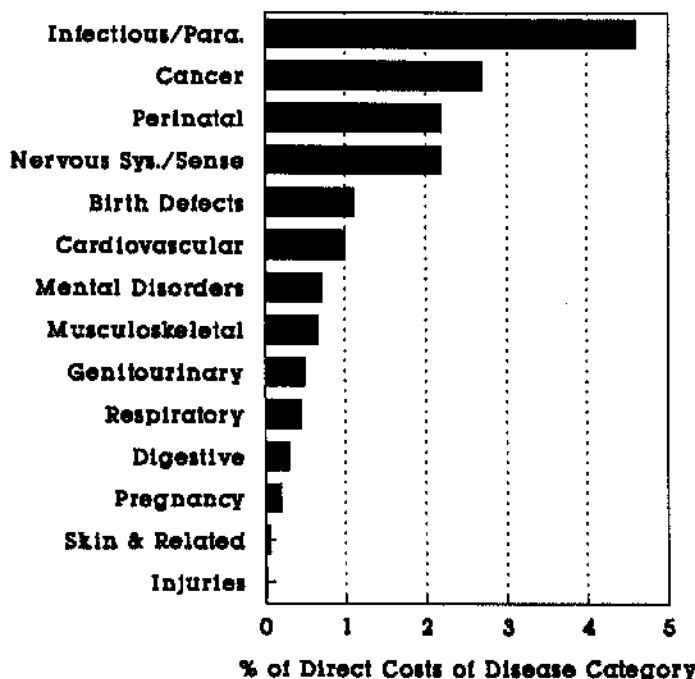
The percentage distribution of direct costs by diagnostic category was very similar in Quebec and across Canada for most diseases, with relative shares varying by only 2% or less. For three

disease groups, however, there were important differences in the proportions of direct expenditure. In Quebec, mental disorders were the most expensive disease category, accounting for 17.9% of the province's direct health costs compared to 8.3% for Canada. Digestive diseases ranked second in Quebec for direct expenditure but only fifth in Canada as a whole. Injuries placed second in Canada with 14.4% of national direct costs, whereas Quebec spent only 6.2% of its direct expenditure on this sixth place category.

In terms of indirect expenditure, cardiovascular diseases were the most costly for both Quebec and Canada, and musculoskeletal diseases ranked third. In contrast, injuries were the second highest indirect expense in Quebec compared to fourth highest in Canada. Cancer ranked second in indirect costs in Canada but only fifth in Quebec.

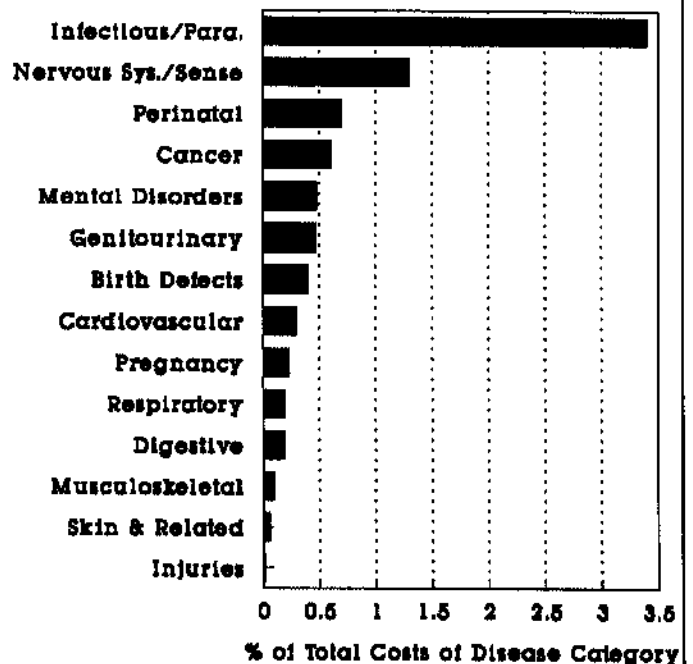
Economic analysis of illness does not usually include the deterioration in the qualitative aspects of life, often labelled as psychosocial costs. The pain and grief of impending death, loss of speech or a body part, disfigurement and disability can affect victims immeasurably, and

Figure 5
RESEARCH SHARE OF DIRECT COSTS
BY DISEASE CATEGORY, CANADA 1986



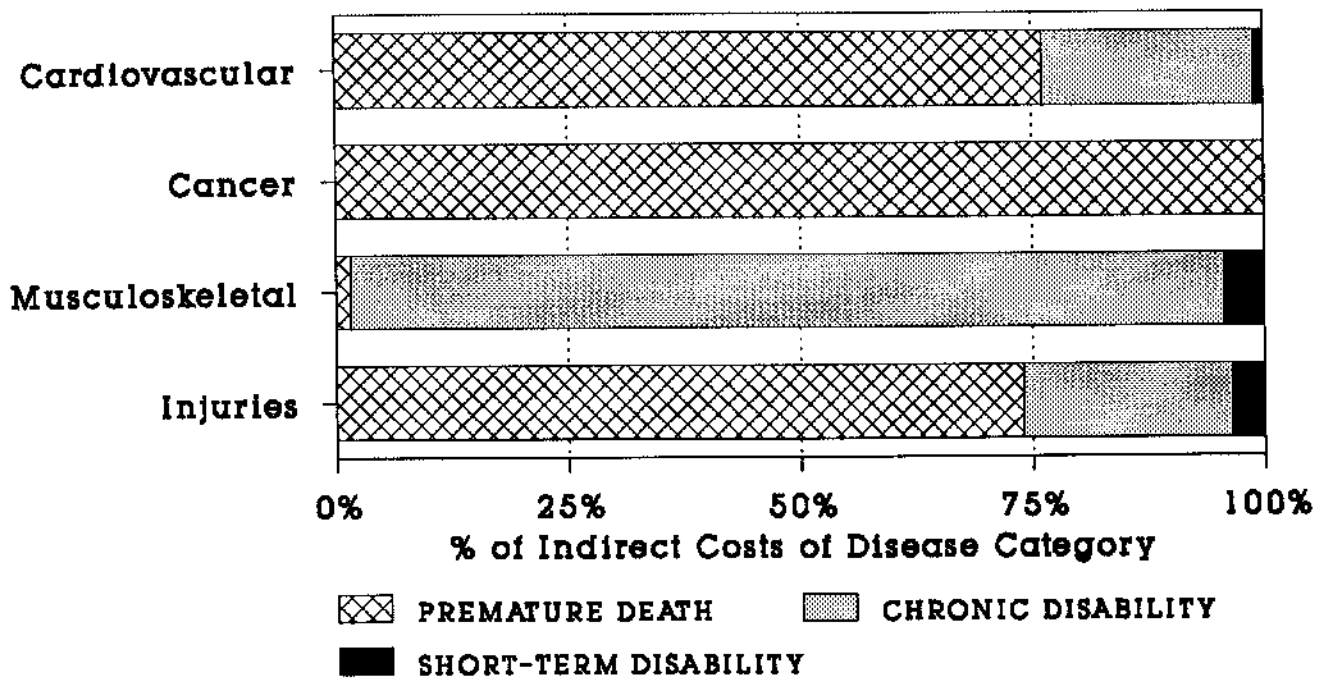
Source: Table 10

Figure 6
RESEARCH SHARE OF TOTAL COSTS BY
DISEASE CATEGORY, CANADA 1986

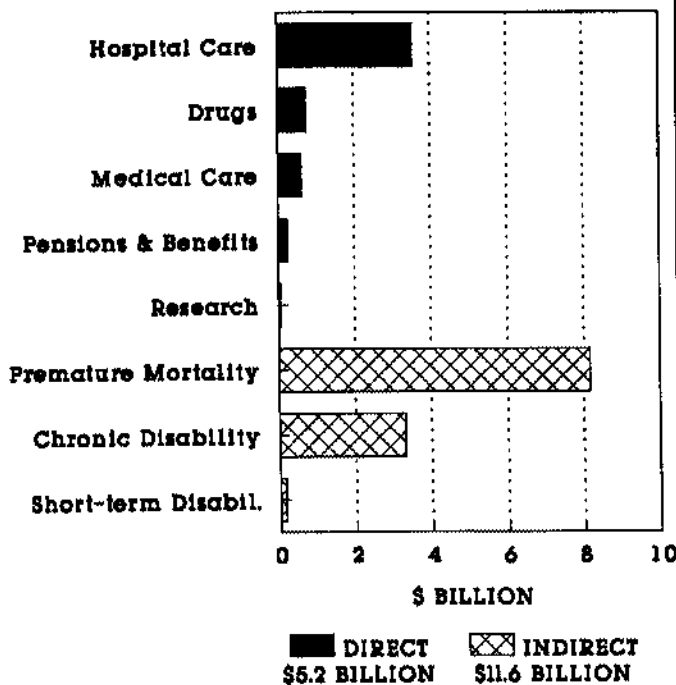


Source: Table 10

Figure 7 INDIRECT COST COMPONENTS FOR DISEASES WITH HIGHEST INDIRECT COSTS

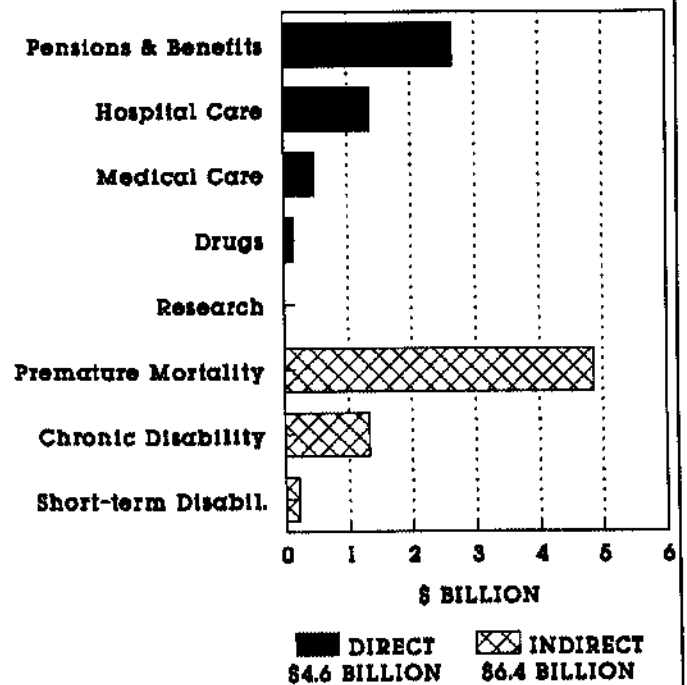


**Figure 8
COST COMPONENTS OF CARDIOVASCULAR
DISEASES, CANADA 1986**



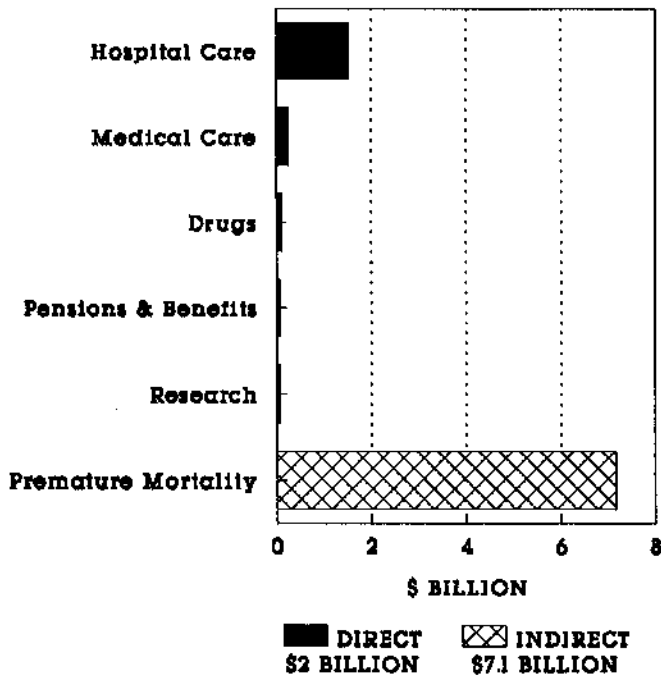
Source: Table 10

**Figure 9
COST COMPONENTS OF INJURIES,
CANADA 1986**



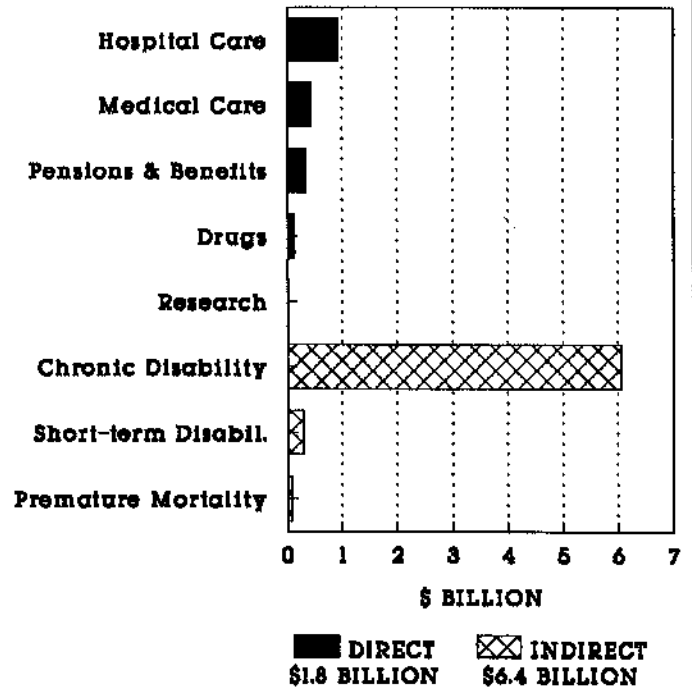
Source: Table 10

Figure 10
COST COMPONENTS OF CANCER,
CANADA 1986



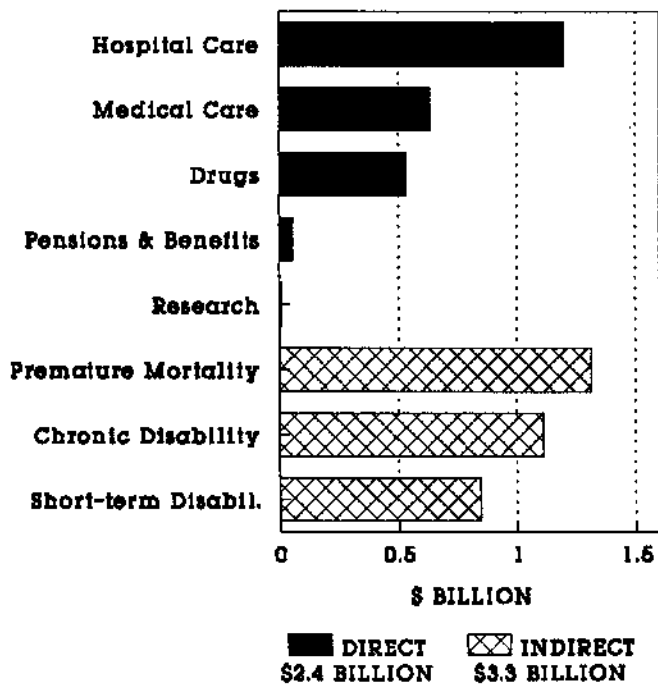
Source: Table 10

Figure 11
COST COMPONENTS OF MUSCULOSKELETAL
DISEASES, CANADA 1986



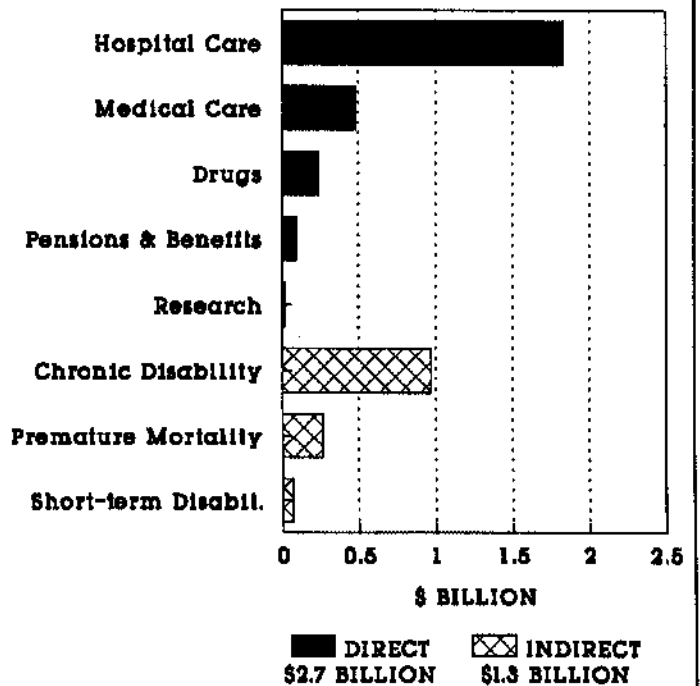
Source: Table 10

Figure 12
COST COMPONENTS OF RESPIRATORY DISEASES,
CANADA 1986



Source: Table 10

Figure 13
COST COMPONENTS OF MENTAL DISORDERS,
CANADA 1986



Source: Table 10

they and those around them may experience economic dependence, social isolation, loss of opportunities for promotion and education, and other unwanted changes in life plans (Rice, Hodgson, Kopstein, 1985). We were unable to assign a monetary value to the psychosocial effects that illness can cause for its victims as well as for their family, friends and care givers. As the Quebec report suggests, however, any political decision in the health care field should explicitly take these psychosocial costs into account.

There were other limitations to the data contained in our report on the economic burden of illness in Canada which deserve some discussion. To continue with the analysis of indirect costs, it should be noted that using average income as the measurement of lost productivity may not provide the most accurate value because it does not measure actual output. Because average income is less than average productivity, the indirect costs calculated are probably conservative estimates of lost productivity. Moreover, the age- and sex-specific average annual income of individuals was assumed for both those in and those not in the labour force. Therefore, improvements could be made by determining the economic value of housework and other non-labour force participation.

Certain problems existed in the disability component of indirect costs which are related to the Canada Health Survey as the principle basis of the disability data. For one thing, Indians on reserves and the population of the Northwest Territories and the Yukon were excluded from the Survey. Another difficulty was that disability days from the two-week disability section of the Survey (Section I) frequently overlapped with the activity limitation population identified elsewhere in the Survey (Section V). Although the results were adjusted to avoid double counting in our estimates of long-term and short-term disability costs, future surveys may want to consider this problem. Furthermore, the estimated indirect costs of injuries were

conservative insofar as disability costs were concerned. This is because the volume of disability due to injuries was severely underestimated in the Canada Health Survey which only asked a single question about the cause of activity limitation. In the Quebec Health Survey, the amount of disability due to accidental causes doubled when a supplementary question asked if the activity limitation was due to an accident or injury. Another shortcoming in the disability data concerned the institutionalized population. Although we added to the Canada Health Survey data, which did not provide information on patients who were hospitalized for more than 90 days, our estimates of the productivity loss of the long-term institutionalized population were confined to the mentally disabled. Therefore, chronically ill patients in nursing homes and other residential care facilities were not taken into account. The value of the productivity loss incurred by these people remains to be determined in future studies.

There were also some restrictions on the direct cost component estimates identified in this report. To begin with, total drug expenditure of \$3.6 billion was limited to drugs purchased by drugstores and hospitals because this was the only source of national drug data that was available in terms of disease categories (Bureau of Pharmaceutical Surveillance, 1987). Another source used different methods to provide an alternative 1986 estimate of total drug costs which was \$1.3 billion dollars higher than the one used, not including the cost of drugs supplied by hospitals (Health and Welfare Canada, 1990). This large difference points to the need for further evaluation to determine the most reliable method of estimating drug costs by disease classification. The drug costs we have presented are somewhat underestimated in total, particularly in the area of nonprescription drugs sold outside of drugstores.

Due to the lack of suitable data for other provinces, the percentage distribution by disease category for physicians' medical care expenditure was

based on only one province's experience (Manitoba). This was also the case for the workers' compensation payments included in the pensions and benefits component, as they reflected Ontario's cost distribution.

The average cost of hospitalization per patient day was used to estimate the distribution of hospital care costs. Treatment of cardiovascular diseases and cancer can involve complex and expensive diagnostic and therapeutic regimens such as chemotherapy and intensive coronary care, so that the costs of treating these diseases in hospitals are higher than average (Collishaw, Myers, 1984). This would have led to an underestimation of hospital costs for these two disease categories. By the same token, the cost of hospital care for some other diseases may be overestimated.

There were also limitations in the estimates of research expenditure. The grand total of \$453 million which appears in Table 11 is a combination of 1987-88 data deflated to 1986-87 costs (Table 4) and 1984-85 data which was not converted to 1986 values (Table 10). This grand total does not cover every single organization which spent money on health research in Canada and is, therefore, underestimated. It does, however, likely represent the vast majority of research expenditure, clearly indicating the small part that research plays among the other direct cost components.

In summary, the data limitations described show that there are several areas of potential underestimation in the direct and indirect costs of illness that were calculated for this report. Therefore, \$97.2 billion is a conservative estimate of the grand total cost of illness, disability and premature death in Canada in 1986. Despite limitations in the data, however, the relative proportion of costs allocated to different diseases and cost components should provide a useful overview of the economic burden of illness on Canadian society.

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6. Appendix I: Tables of Results

TABLE 1

CANADIAN DRUG COSTS TO THE CONSUMER BY DIAGNOSTIC CATEGORY, CANADA 1986

DIAGNOSTIC CATEGORY	COST TO CONSUMER ¹ (\$1000)	% OF TOTAL
Cardiovascular Diseases	749,300	20.9
Respiratory Diseases	535,500	14.9
Well Patient Care ²	330,000	9.2
Digestive Diseases	286,200	8.0
Nervous System and Sense Organ Diseases	279,400	7.8
Skin and Related Diseases	256,000	7.1
Mental Disorders	239,200	6.7
Ill-defined Conditions	220,700	6.2
Injuries	145,000	4.0
Musculoskeletal Diseases	134,000	3.8
Cancer	100,700	2.8
Infectious and Parasitic Diseases	98,400	2.7
Endocrine and Related Diseases	76,800	2.2
Genitourinary Diseases	72,400	2.0
Perinatal Conditions	50,500	1.5
Blood Diseases	8,400	0.2
Pregnancy	1,400	-
TOTAL	3,583,900^{a,b}	100.0
SUBCATEGORY		
Coronary Heart Disease	191,400	5.4
Chronic Bronchitis/Emphysema/Asthma	105,400	2.9
Diabetes	56,300	1.6
Stroke	1,500	-

Data Sources:

^a IMS Canada:

- Canadian Pharmaceutical Market: Drug Store and Hospital Purchases, December 1986.
- Canadian Disease and Therapeutic Index, Diagnosis, Fourth Quarter 1986.

^b Bureau of Pharmaceutical Surveillance. The Canadian Pharmaceutical Market 1986: Annual Review (Internal document).

Notes:

¹ Cost to consumer reflects the acquisition cost of drugs purchased by drugstores and hospitals, plus an estimated mark-up to the consumer level (based on average mark-up figure, 1986). It does not include nonprescription drugs sold in retail outlets other than drugstores, prescription drugs supplied by dispensing physicians or health clinics outside of hospitals, or federal government direct pharmaceutical expenditure.

² Well patient care refers here to IMS Canada's Canadian Disease and Therapeutic Index (CDTI) class no. 18, special conditions without sickness. 1986 CDTI classification corresponds with ICD-8. Drugs for this category include antimalarials taken prophylactically, contraceptives, some biologicals, infant formulae and some vitamins.

* Totals and percentages may not sum due to rounding.

* For complete sources and method of calculation, see Section 7.1 in Appendix II.

TABLE 2
MEDICAL CARE EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA 1986

DIAGNOSTIC CATEGORY	COST ^a (\$1000)	% OF TOTAL ^b
Well Patient Care	740,007	10.6
Respiratory Diseases	635,289	9.1
Cardiovascular Diseases	621,327	8.9
Nervous System and Sense Organ Diseases	572,458	8.2
Genitourinary Diseases	530,571	7.6
Ill-defined Conditions	502,646	7.2
Mental Disorders	481,703	6.9
Injuries	474,722	6.8
Digestive Diseases	460,759	6.6
Musculoskeletal Diseases	432,834	6.2
Without Diagnosis ¹	307,173	4.4
Pregnancy	265,286	3.8
Cancer	258,304	3.7
Skin and Related Diseases	258,304	3.7
Endocrine and Related Diseases	195,474	2.8
Infectious and Parasitic Diseases	125,661	1.8
Blood Diseases	62,831	0.9
Birth Defects	41,887	0.6
Perinatal Conditions	13,962	0.2
TOTAL²	6,981,200	100.0

Data Sources:

^a Health and Welfare Canada. National Health Expenditures in Canada 1975-1987. (Preliminary data: Table 6, Total health expenditure by category, Canada, 1975 to 1987.)

^b Manitoba Health Services Commission. Annual Report 1985-86. (Table IX, Medical services and costs by diagnostic category, 1985/86.)

Notes:

¹ This non-ICD category was added to correspond with Source b categories.

² Total used as basis for percent distribution (Source b) excludes out-of-province medical as well as optometric, oral, dental, periodontal and chiropractic services. The total medical care cost here is the cost of professional services provided by physicians. This mainly reflects the cost of professional fees, largely paid by provincial medical care insurance programs. Payments to physicians employed by hospitals, public health agencies, etc. are included with the appropriate direct cost component. Other professional health services are included in Table 9, Part B, as additional health expenditures not classified by diagnostic category. The grand total of professional services (Table 11 and Figure 3) represents the combined cost of physician services and other professional services.

* Totals and percentages may not sum due to rounding.

* For complete sources and method of calculation, see Section 7.2 in Appendix II.

TABLE 3

HOSPITAL CARE EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA 1986

DIAGNOSTIC CATEGORY	COST (\$1000)	% OF TOTAL ^a
Cardiovascular Diseases	3,539,081	20.7
Mental Disorders	1,829,380	10.7
Cancer	1,521,634	8.9
Digestive Diseases	1,384,858	8.1
Injuries	1,350,664	7.9
Respiratory Diseases	1,196,791	7.0
Nervous System and Sense Organ Diseases	1,179,694	6.9
Pregnancy	974,530	5.7
Musculoskeletal Diseases	906,142	5.3
Genitourinary Diseases	854,851	5.0
Ill-defined Conditions	632,589	3.7
Well Patient Care	598,395	3.5
Endocrine and Related Diseases	444,522	2.6
Skin and Related Diseases	205,164	1.2
Infectious and Parasitic Diseases	188,067	1.1
Birth Defects	136,776	0.8
Blood Diseases	102,582	0.6
Perinatal Conditions	68,388	0.4
TOTAL¹	17,097,011^{b,c}	100.0
SUBCATEGORY		
Stroke	1,367,761	8.0
Coronary Heart Disease	837,754	4.9
Chronic Bronchitis/Emphysema/Asthma	427,425	2.5
Diabetes	290,649	1.7
Motor Vehicle Traffic Accidents	188,067	1.1

Data Sources:

- ^a Statistics Canada. Hospital Morbidity: 1983-84 and 1984-85. Catalogue 82-206. (1984-85 Tables)
- ^b Health and Welfare Canada. National Health Expenditures in Canada 1975-1987. (Preliminary data: Table 6, Total health expenditure by category, Canada, 1975 to 1987.)
- ^c Total subtracted the cost of hospital-supplied drugs (based on IMS data provided in The Canadian Pharmaceutical Market 1986: Annual Review) to avoid double counting.

Notes:

- ¹ Total hospital expenditure covers all types of public and private hospitals for acute, chronic, and convalescent care, including general hospitals; special hospitals such as pediatric, orthopedic, cancer, rehabilitation, and extended-care; mental hospitals, tuberculosis hospitals, and federal hospitals.
- * Totals and percentages may not sum due to rounding.
- * For complete sources and method of calculation, see Section 7.3 in Appendix II.

TABLE 4
RESEARCH COSTS BY DIAGNOSTIC CATEGORY, CANADA 1986-87

DIAGNOSTIC CATEGORY	COST ^{a,b} (\$1000)	% OF TOTAL
Endocrine and Related Diseases ¹	72,475	19.0
Cancer	54,292	14.2
Cardiovascular Diseases	52,900	13.9
Nervous System and Sense Organ Diseases	47,095	12.3
Miscellaneous ²	44,869	11.8
Infectious and Parasitic Diseases ³	19,763	5.2
Mental Disorders	18,551	4.9
Blood Diseases ⁴	13,770	3.6
Musculoskeletal Diseases ⁵	12,144	3.2
Respiratory Diseases ⁶	11,237	2.9
Genitourinary Diseases	7,902	2.1
Digestive Diseases	7,049	1.8
Dentistry	5,186	1.4
Pharmacology/Toxicology	4,347	1.1
Pregnancy	4,020	1.1
Perinatal Conditions ⁷	2,973	0.8
Birth Defects	1,613	0.4
Injuries ^c	1,211	0.3
Skin and Related Diseases	469	0.1
Ill-defined Conditions	28	-
TOTAL	381,894	100.0
SUBCATEGORY		
Coronary Heart Disease	11,168	2.9
Diabetes	8,489	2.2
Stroke	2,390	0.6
Motor Vehicle Traffic Accidents ^d	416	0.1
Chronic Bronchitis/Emphysema/Asthma	120	-

Data Sources:

- ^a Medical Research Council of Canada. Reference List of Health Science Research in Canada 1987-88.
- ^b Statistics Canada. The Consumer Price Index, September 1987. Catalogue 62-001. (Table 2, Consumer price index for Canada, all items (not seasonally adjusted), 1972-1987, 1981=100.)
- ^c This category includes 1986 research expenditure from the Traffic Injury Research Foundation of Canada as indicated in TIRF Annual Report 1987.
- ^d This subcategory is exclusively 1986 TIRF research expenditure.

Notes:

- ¹ This category includes genetic diseases and studies of normal development. Basic research at the metabolic level may have applications to several disease categories.
- ² This category was added to include costs which could not be allocated to any diagnostic category, such as expenditures for certain conferences, symposia and research scholarships and general research grants for various faculties of medicine.
- ³ Costs for this category are mainly for AIDS research.
- ⁴ This category includes immune disorders and immunology.
- ⁵ This category includes autoimmune diseases such as lupus.
- ⁶ This category includes allergies.
- ⁷ This category includes prematurity.
- * Totals and percentages may not sum due to rounding.
- * For complete sources and method of calculation, see Section 7.4 in Appendix II.

TABLE 5A

CANADA/QUEBEC PENSION PLAN PAYMENTS FOR DISABILITY PENSIONS BY DIAGNOSTIC CATEGORY, 1986

DIAGNOSTIC CATEGORY	TOTAL COST ¹ (\$1000)	TOTAL ^a
Musculoskeletal Diseases	275,359	29.0
Cardiovascular Diseases	247,310	26.1
Mental Disorders	99,409	10.5
Nervous System and Sense Organ Diseases	74,396	7.8
Injuries	72,702	7.7
Respiratory Diseases	50,588	5.3
Cancer	47,126	5.0
Endocrine and Related Diseases	29,383	3.1
Digestive Diseases	19,248	2.0
Ill-defined Conditions	10,174	1.1
Genitourinary Diseases	6,660	0.7
Birth Defects	6,222	0.7
Infectious and Parasitic Diseases	5,895	0.6
Skin and Related Diseases	2,911	0.3
Blood Diseases	1,446	0.2
Perinatal Conditions	183	-
Pregnancy	124	-
TOTAL	949,138^{b,c}	100.0

Data Sources:

- ^a Health and Welfare Canada. (Unpublished Canada Pension Plan tabulations: Table 1, Distribution of disability pensions by class of principle diagnosis and by age, June 1986.)
- ^b Health and Welfare Canada. (Unpublished 1986 calendar year tabulations: Table, Canada Pension Plan net payments.)
- ^c Régie des rentes du Québec. (Unpublished tabulations of 1986 Quebec Pension Plan net payments by benefit type)

Notes:

- ¹ Total cost represents the sum of CPP and QPP net disability payments.
- * Totals and percentages may not sum due to rounding.
- * For complete sources and method of calculation, see Section 7.5.1 in Appendix II.

TABLE 5B

CANADA/QUEBEC PENSION PLAN HEALTH-RELATED PAYMENTS NOT CLASSIFIED BY DIAGNOSTIC CATEGORY, 1986

BENEFIT TYPE	NET PAYMENT ^{a,b} (\$1000)
Survivors' Pensions	1,335,896
Death Benefits	159,761
Orphans' Pensions	130,931
Children of Disabled Contributors	76,644
TOTAL¹	1,703,232

Data Sources:

- * Health and Welfare Canada. (Unpublished 1986 calendar year tabulations: Table, Canada Pension Plan net payments.)
- ^b Régie des rentes du Québec. (Unpublished tabulations of 1986 Quebec Pension Plan net payments by benefit type.)

Notes:

- ¹ The total amount of these benefits was added to the additional health expenditures not classified by diagnostic category in Table 9, Part A, as well as to the grand total of pensions and benefits in Table 11 and Figure 3.
- * Totals may not sum due to rounding.
- * For complete sources and method of calculation, see Section 7.5.1 in Appendix II.

TABLE 5C

UNEMPLOYMENT INSURANCE HEALTH-RELATED PAYMENTS BY TYPE OF BENEFIT, CANADA 1986

BENEFIT	NET PAYMENT (\$1000)
Sickness ¹	242,065
Maternity ²	472,547
TOTAL	714,612

Data Source:

Statistics Canada. Unemployment Insurance Statistics, December 1986. Catalogue 73-001. (Table 5, Benefit activities, by type of benefit.)

Notes:

- ¹ Since the benefits for "sickness" could not be classified by disease category, this amount was added to the additional non-classified health expenditures in Table 9, Part A.
- ² Unemployment Insurance maternity benefits were included in this report because of the health care costs that are usually incurred at some point during pregnancy or delivery, although the condition of pregnancy is not a disease. This amount appears in the pensions and benefits component under the category of pregnancy in the summary Table 10.
- * Both of these benefits were included in the grand total cost of pensions and benefits in Table 11 and Figure 3.
- * For complete source and additional details, see Section 7.5.2 in Appendix II.

TABLE 5D

WORKERS' COMPENSATION EXPENDITURE BY DIAGNOSTIC CATEGORY, CANADA 1986

DIAGNOSTIC CATEGORY	COST (\$1000)	% OF TOTAL ^a
Injuries	2,577,568	96.5
Musculoskeletal Diseases	56,679	2.1
Cancer	16,827	0.6
Respiratory Diseases	7,238	0.3
Skin and Related Diseases	6,710	0.2
Well Patient Care	5,182	0.2
Infectious and Parasitic Diseases	1,282	-
Nervous System and Sense Organ Diseases	21	-
TOTAL¹	2,671,000^b	100.0

Data Sources:

- ^a The percentage distribution was calculated based on unpublished data provided by the Workers' Compensation Board of Ontario, excluding payments for health care benefits. (Table, Compensation claims initially settled in 1986, number of claims and cost by ICD and type of disability).
- ^b Statistics Canada. National Income and Expenditure Accounts: Annual Estimates, 1977-1988. Catalogue 13-201. (Table 56, Government transfer payments to persons.)

Notes:

- ¹ Total national 1986 workers' compensation payments classified by diagnostic category represent temporary disability, worker pension and fatal benefits, but exclude health care benefits. Workers' compensation expenditures on health care benefits are incorporated in the other direct cost components, i.e. drugs (Table 1), medical care (Table 2) and hospital care (Table 3), as well as items 1 to 13 in Table 9, Part B, and items 1, 2 and 5 in Table 9, Part C.
- * Totals and percentages may not sum due to rounding.
- * For complete sources and method of calculation, see Section 7.5.3 in Appendix II.

TABLE 6

PRESENT VALUE OF FUTURE INCOME LOST DUE TO PREMATURE MORTALITY BY DIAGNOSTIC CATEGORY, CANADA 1986

DIAGNOSTIC CATEGORY	FUTURE INCOME ^{a,b} (\$1000)	% OF TOTAL ^c
Cardiovascular Diseases	8,167,737	31.9
Cancer	7,145,996	28.0
Injuries	4,847,881	19.0
Respiratory Diseases	1,311,008	5.1
Digestive Diseases	959,551	3.8
Endocrine and Related Diseases	728,930	2.9
Nervous System and Sense Organ Diseases	510,046	2.0
Ill-defined Conditions	405,328	1.6
Birth Defects	355,384	1.4
Perinatal Conditions	293,290	1.1
Mental Disorders	268,325	1.0
Genitourinary Diseases	230,929	0.9
Infectious and Parasitic Diseases	156,013	0.6
Blood Diseases	85,549	0.3
Musculoskeletal Diseases	84,233	0.3
Skin and Related Diseases	12,178	-
Pregnancy	3,476	-
TOTAL	25,565,854	100.0
SUBCATEGORY		
Coronary Heart Disease	5,327,838	20.8
Motor Vehicle Traffic Accidents	1,598,046	6.3
Stroke	1,163,447	4.6
Chronic Bronchitis/Emphysema/Asthma	678,755	2.7
Diabetes	404,454	1.6

Data Sources:

- ^a The present value of future income lost due to premature mortality was derived from individual 1985 income data in Income Distributions by Size in Canada, 1985 (Statistics Canada Catalogue 13-207) using methods suggested by Rice and Hodgson (1981), Rice (1966), Shillington (1977), and Collishaw and Myers (1984). Adjustments were made for future productivity gains (2% per year) and discounted future earnings of 6% per year (Shillington, 1977).
- ^b The Consumer Price Index for Canada, All Items (not seasonally adjusted) was applied to the 1985 figures to estimate the 1986 value of future income lost.
- ^c Total number of deaths by diagnostic category, age, and sex were obtained from Causes of Death, Vital Statistics Volume IV, 1986 (Statistics Canada Catalogue 84-203). This determined the final distribution by diagnostic category.

Notes:

- * Totals and percentages may not sum due to rounding.
- * For more complete sources and methods of calculation, see Section 7.6 in Appendix II.

TABLE 7

ANNUAL VALUE OF TIME LOST DUE TO CHRONIC DISABILITY BY SPECIFIC HEALTH PROBLEM, CANADA 1986

SPECIFIC HEALTH PROBLEM ^a	DIAGNOSTIC CATEGORY	VALUE OF TIME LOST ¹ (\$1,000)	% OF TOTAL
Arthritis/Rheumatism/Limb and Joint Disorders	Musculoskeletal Diseases	6,057,025	31.9
Other ²	Ill-defined Conditions	4,370,876	23.0
Hypertension/Heart Disease	Cardiovascular Diseases	3,305,750	17.4
Trauma	Injuries	1,327,573	7.0
Mental Disorders ^c	Mental Disorders	974,131	5.1
Acute Respiratory Disease/Influenza/Bronchitis/ Emphysema/Asthma	Respiratory Diseases	959,276	5.0
Headache/Sight and Hearing Disorders	Nervous System and Sense Organ Diseases	822,787	4.3
Gastric Duodenal Ulcers/Digestive Disorders	Digestive Diseases	465,644	2.4
Diabetes/Thyroid	Endocrine and Related Diseases	339,093	1.8
Hay Fever	Respiratory Diseases	151,294	0.8
Anemia	Blood Diseases	103,634	0.5
Skin Disorders	Skin and Related Diseases	81,934	0.4
TOTAL^{a,b}		19,007,336^{d,e,f}	100.0

Data Sources:

- ^a Health and Welfare Canada and Statistics Canada. Canada Health Survey, 1978-79. (Unpublished tabulations: Section V, Activity Limitation.)
- ^b Income data were derived from Income Distributions by Size in Canada, 1985 (Statistics Canada Catalogue 13-207).
- ^c In addition to the Canada Health Survey data on the activity limitation days of the household population with psychiatric impairment, the length of stay (91 days and over) for those in a psychiatric hospital or psychiatric ward of a general hospital were obtained from Mental Health Statistics, 1985-86 (Statistics Canada Catalogue 83-204 - General hospitals, separations, 1984-85: Table 6, Length of stay, by age and sex; Psychiatric hospitals, 1985-86: Table 6, Length of stay, by age and sex). Many residents of nursing homes and other residential care facilities are also thought to be institutionalized for mental health reasons, but data were not available by diagnostic category, so they have not been included.
- ^d Results were adjusted to reflect the rest of the national population based on the Canada Health Survey sample. The adjustment ratio was derived from the estimated 1978 population aged 15 and over (Statistics Canada Catalogue 82-207) and the surveyed population (Table 67, Population by age and sex, by major activity and activity limitation. In: The Health of Canadians: Report of the Canada Health Survey).
- ^e Results were adjusted to reflect the population growth between 1978 and 1986 for those aged 15 and over using estimated 1978 (Statistics Canada Catalogue 82-207) and 1986 (Statistics Canada Catalogue 11-402E) populations.
- ^f The Consumer Price Index for Canada, All Items (not seasonally adjusted) was applied to the 1985 figures to estimate the 1986 value of time lost.

Notes:

- ¹ Weights were based on the mix of different severities of disability in each age and sex group, according to the following weights for varying degrees of severity first suggested by Wilkins and Adams (1983):

Can't do major activity (work, housework, school)	0.5
Restricted in major activity	0.4
Restricted in minor activity	0.3

- ² "Other" includes all health problems that were too small to be categorized as specific independent health problems in the Canada Health Survey. We have arbitrarily classified them as ill-defined conditions for inclusion in the summary Table 10.
- * Totals and percentages may not sum due to rounding.
- * For complete sources and further methods of calculation, see Section 7.7 in Appendix II.

TABLE 8

ANNUAL VALUE OF TIME LOST DUE TO SHORT-TERM DISABILITY BY SPECIFIC HEALTH PROBLEM, CANADA 1986

SPECIFIC HEALTH PROBLEM ^a	DIAGNOSTIC CATEGORY	VALUE OF TIME LOST ¹ (\$1000)	% OF TOTAL
Acute Respiratory Disease/Influenza/Bronchitis/ Emphysema/Asthma	Respiratory Diseases	828,370	33.8
Other ²	Ill-defined Conditions	564,108	23.1
Arthritis/Rheumatism/Limb and Joint Disorders	Musculoskeletal Diseases	285,258	11.7
Trauma	Injuries	213,225	8.7
Hypertension/Heart Disease	Cardiovascular Diseases	162,632	6.6
Headache/Sight and Hearing Disorders	Nervous System and Sense Organ Diseases	142,897	5.8
Gastric Duodenal Ulcers/Digestive Disorders	Digestive Diseases	115,828	4.7
Mental Disorders	Mental Disorders	69,101	2.8
Skin Disorders	Skin and Related Diseases	28,117	1.1
Hay Fever	Respiratory Diseases	15,793 ³	0.6
Diabetes/Thyroid	Endocrine and Related Diseases	15,793 ³	0.6
Anemia	Blood Diseases	6,108	0.2
TOTAL ^{a,b}		2,447,228 ^{c,d,e,f}	100.0

Data Sources:

- ^a Health and Welfare Canada and Statistics Canada. Canada Health Survey, 1978-79. (Unpublished tabulations: Section I, Two-week Disability: Cut-down Days and Major Activity-loss Days.)
- ^b Income data were derived from Income Distributions by Size in Canada, 1985 (Statistics Canada Catalogue 13-207).
- ^c About 50% of the two-week disability days were attributable to persons with long-term activity limitations identified elsewhere in the Canada Health Survey (Section V - included in our Table 7); therefore, the results were adjusted to avoid double counting.
- ^d Results were adjusted to reflect the rest of the national population based on the Canada Health Survey sample. The adjustment ratio was derived from the estimated 1978 population aged 15 and over (Statistics Canada Catalogue 82-207) and the surveyed population (Table 67, Population by age and sex, by major activity and activity limitation. In: The Health of Canadians: Report of the Canada Health Survey).
- ^e Results were adjusted to reflect the population growth between 1978 and 1986 for those aged 15 and over using estimated 1978 (Statistics Canada Catalogue 82-207) and 1986 (Statistics Canada Catalogue 11-402E) populations.
- ^f The Consumer Price Index for Canada, All Items (not seasonally adjusted) was applied to the 1985 figures to estimate the 1986 value of time lost due to short-term disability.

Notes:

- ¹ Weights were based on the mix of different severities of disability in each age and sex group, according to the following weights for varying degrees of severity, first suggested by Wilkins and Adams (1983):

Restricted in major activity (Major Activity-loss Days)	0.4
Restricted in minor activity (Cut-down Days)	0.3

- ² "Other" includes all health problems that were too small to be categorized as specific independent health problems in the Canada Health Survey. We have arbitrarily classified these health problems as ill-defined conditions for inclusion in the summary Table 10.
- ³ The value of time lost because of hay fever and diabetes/thyroid were estimated to be the same since both conditions had the same number of two-week disability days.
- * Totals and percentages may not sum due to rounding.
- * For complete sources and further methods of calculation, see Section 7.8 in Appendix II.

TABLE 9

ADDITIONAL DIRECT HEALTH EXPENDITURES NOT CLASSIFIED BY DIAGNOSTIC CATEGORY, CANADA 1986

	TOTAL COST (\$1000)
A) <u>PENSIONS AND BENEFITS COMPONENT</u>	
1. CPP/QPP Payments (Survivors' and Orphans' Pensions, Death Benefits and Payments to Children of Disabled Contributors)	1,703,232 ^{a,b}
2. Veterans Disability and Dependents' Pensions (1986-87)	817,433 ^c
3. Unemployment Insurance Sickness Benefits	242,065 ^d
<hr style="border-top: 1px dashed black;"/>	
COMPONENT TOTAL	2,762,730
<hr/>	
B) <u>HEALTH CARE-RELATED COMPONENT</u>^e	
1. Non-hospital Institutions ¹	4,549,900
2. Ambulances	387,000
3. <u>Home Care</u> ² (Institutional and Related Services Subtotal)	<u>327,000</u> (5,263,900)
4. Dentists	2,418,400
5. Chiropractors	314,400
6. Optometrists	131,100
7. Physiotherapists	75,200
8. Podiatrists	33,000
9. Private Duty Nurses	23,100
10. <u>Osteopaths</u> (Professional Services Subtotal)	<u>1,300</u> (2,996,500)
11. Eyeglasses	780,100
12. Other Appliances	195,300
13. <u>Hearing Aids</u> (Medical Appliances Subtotal)	<u>45,200</u> (1,020,600)
<hr style="border-top: 1px dashed black;"/>	
COMPONENT TOTAL	9,281,000
<hr/>	
C) <u>ADMINISTRATION COMPONENT</u>	
1. Capital Expenditure ³	2,107,600 ^e
2. Public Health ⁴	1,966,600 ^e
3. Medical & Dental Schools (1986-87)	730,500 ^f
4. Prepayment Administration ⁵	588,500 ^e
5. Miscellaneous Health Costs ⁶	527,300 ^e
6. Research (1985-86) ⁷	71,209 ^g
<hr style="border-top: 1px dashed black;"/>	
COMPONENT TOTAL	5,991,709
<hr/>	
TOTAL	18,035,439

Table 9
(continued)

Data Sources:

- ^a Health and Welfare Canada. (Unpublished 1986 calendar year tabulations: Table, Canada Pension Plan net payments.)
 - ^b Régie des rentes du Québec. (Unpublished tabulations of 1986 Quebec Pension Plan net payments by benefit type)
 - ^c Health and Welfare Canada. Social Security Statistics, Canada and Provinces, 1960-61 to 1984-85. (Table 154, Veterans disability and dependents' pensions, federal payments by province and for Canada.)
 - ^d Statistics Canada. Unemployment Insurance Statistics, December 1986. Catalogue 73-001. (Table 5, Benefit activities, by type of benefit.)
 - ^e Health and Welfare Canada. National Health Expenditures in Canada 1975-1987. (Preliminary data**: Table 6, Total health expenditure by category, Canada, 1975 to 1987.)
- **Because these data were obtained prior to publication, the explanatory notes (1-6) provided for some of the items taken from Source e) are quotations extracted from the appropriate headings in Appendix B of the published document identified below in Source f).
- ^f Health and Welfare Canada. National Health Expenditures in Canada 1975-1985. (Table C-1, Estimated total expenditures in medical and dental schools, by province, 1969-70 to 1984-85.)
 - ^g The Association of Canadian Medical Colleges. Canadian Medical Education Statistics. (Table 65, Expenditures for biomedical research of Canadian faculties of medicine by source of funds, 1981/82 - 1985/86.)

Notes:

- ¹ Non-hospital institutions comprise "homes for the aged; institutions for the physically handicapped, the mentally retarded, the mentally handicapped (a group that includes, according to the Statistics Canada reporting document, 'ex-psychiatric patients, individuals with chronic mental illness and/or those convalescing from a mental illness'), emotionally disturbed children, alcoholics, and drug addicts; and nursing homes. Facilities solely of a custodial or domiciliary nature are excluded, as are those for transients and for delinquents."
 - ² Home care represents "care rendered to patients in the patients' homes by nursing or other staff. When such care is provided by a hospital, it is included in the [hospital cost component]. . . ."
 - ³ Capital expenditure includes "expenditure on construction, repair, machinery and equipment of hospitals, clinics, first-aid stations, and homes for special care."
 - ⁴ 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."
 - ⁵ 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 provided, that is involved in providing that care on a prepaid basis."
 - ⁶ Miscellaneous health costs comprise the following three subcategories:
 - i) Training of health workers: "This subcategory represents 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 [the hospital cost component]. . . ."
 - ii) Voluntary health organizations: "This heading represents 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."
 - iii) Occupational health expenditures represent expenditures to promote and enhance health and safety at the workplace and to provide emergency care in the event of injury at work."
 - ⁷ This amount represents 1985-86 expenditures for biomedical research carried out by Canadian faculties of medicine from sources which are not included in Table 4. Funding sources include the federal government (National Research Council, Natural Science and Engineering Research Council, and other agencies and departments excluding Medical Research Council and Health and Welfare Canada), private industry (including pharmaceutical companies), local community sources, internal university sources, hospitals and universities, foreign sources and miscellaneous sources.
- * Totals may not sum due to rounding.
- * For complete sources and methods of calculation, see Section 7.9 in Appendix II.

TABLE 10

SUMMARY: ECONOMIC COST OF ILLNESS BY DIAGNOSTIC CATEGORY, CANADA 1986
\$ MILLION AND [PERCENT OF ROW TOTAL (AS IN PREVIOUS TABLES)]

COST COMPONENT	DIAGNOSTIC CATEGORY												
	INFECTIOUS & PARASITIC DISEASES	CANCER	ENDOCRINE & RELATED DISEASES	BLOOD DISEASES	MENTAL DISORDERS	NERVOUS SYSTEM & SENSE ORGAN DISEASES	CARDIO-VASCULAR DISEASES	RESPIRATORY DISEASES	DIGESTIVE DISEASES	GENITO-URINARY DISEASES	PREGNANCY	SKIN & RELATED DISEASES	MUSCULO-SKELETAL DISEASES
DIRECT COSTS													
Drugs	98 [2.7]	101 [2.8]	77 [2.2]	8 [0.2]	239 [6.7]	279 [7.8]	749 [20.9]	536 [14.9]	286 [8.0]	72 [2.0]	1 [-]	256 [7.1]	134 [3.8]
Medical Care	126 [1.8]	258 [3.7]	195 [2.8]	63 [0.9]	482 [5.9]	572 [8.2]	621 [8.9]	635 [9.1]	461 [6.6]	531 [7.6]	265 [3.8]	258 [3.7]	433 [6.2]
Hospitals	188 [1.1]	1522 [8.9]	444 [2.6]	103 [0.6]	1829 [10.7]	1180 [6.9]	3539 [20.7]	1197 [7.0]	1385 [8.1]	855 [5.0]	975 [5.7]	205 [1.2]	906 [5.3]
Research	20 [5.2]	54 [14.2]	72 [19.0]	14 [3.6]	19 [4.9]	47 [12.3]	53 [13.9]	11 [2.9]	7 [1.8]	8 [2.1]	4 [1.1]	<1 [0.1]	12 [3.2]
Pensions & Benefits ¹	7 [0.2]	64 [1.6]	29 [0.7]	1 [-]	99 [2.4]	74 [1.8]	247 [6.0]	58 [1.4]	19 [0.5]	7 [0.2]	*473 [11.5]	10 [0.2]	332 [8.1]
SUBTOTAL	439 [1.4]	1998 [6.2]	817 [2.5]	189 [0.6]	2688 [8.3]	2153 [6.7]	5399 [16.2]	2437 [7.6]	2158 [6.7]	1873 [4.8]	1718 [5.3]	730 [2.3]	1817 [5.7]
INDIRECT COSTS													
Premature Mortality ²	156 [0.6]	7146 [28.0]	729 [2.9]	86 [0.3]	268 [1.0]	510 [2.0]	8168 [31.9]	1311 [5.1]	960 [3.8]	231 [0.9]	3 [-]	12 [-]	84 [0.3]
Chronic Disability ³	N/A	N/A	339 [1.8]	104 [0.5]	974 [5.1]	823 [4.3]	3306 [17.4]	1111 [5.8]	466 [2.4]	N/A	N/A	82 [0.4]	6057 [31.9]
Short-term Disability ⁴	N/A	N/A	16 [0.6]	6 [0.2]	69 [2.8]	143 [5.8]	163 [6.6]	844 [34.5]	116 [4.7]	N/A	N/A	28 [1.1]	285 [11.7]
SUBTOTAL	156 [0.3]	7146 [15.2]	1084 [2.3]	195 [0.4]	1311 [5.3]	1476 [3.3]	11837 [24.7]	3268 [18.9]	1542 [3.3]	231 [0.5]	3 [-]	122 [0.3]	6428 [13.7]
TOTAL	595 [0.8]	9145 [11.6]	1901 [2.4]	385 [0.5]	3979 [5.0]	3629 [4.8]	6586 [21.9]	5705 [7.2]	3700 [4.7]	1704 [2.2]	1721 [2.3]	852 [1.1]	3243 [10.4]

Legend:

- 1 Pensions & Benefits
Canada Pension Plan and Quebec Pension Plan disability pensions, Unemployment Insurance maternity benefits and workers' compensation payments excluding health care benefits
- 2 Premature Mortality
Present value of future income lost due to premature mortality
- 3 Chronic Disability
Annual value of time lost due to chronic disability
- 4 Short-term Disability
Annual value of time lost due to short-term disability (among persons not counted in #3 above)
Percent of row total is less than 0.1%.
Data were not available.

TABLE 10 (continued)

SUMMARY: ECONOMIC COST OF ILLNESS BY DIAGNOSTIC CATEGORY, CANADA 1986
\$ MILLION AND [PERCENT OF ROW TOTAL (AS IN PREVIOUS TABLES)]

COST COMPONENT	DIAGNOSTIC CATEGORY							DIAGNOSTIC SUBCATEGORY				
	BIRTH DEFECTS	PERINATAL CONDITIONS	ILL-DEFINED CONDITIONS	INJURIES	WELL PATIENT CARE	TOTAL COST	CORONARY HEART DISEASE	CHRONIC BRONCHITIS/ EMPHYSEMA/ ASTHMA	DIABETES	STROKE	MOTOR VEHICLE TRAFFIC ACCIDENTS	
DIRECT COSTS												
Drugs	N/A	51 [1.5]	221 [6.2]	145 [4.0]	330 [9.2]	354 [100.0]	191 [5.4]	105 [2.9]	56 [1.6]	2 [-]	N/A	
Medical Care	42 [0.6]	14 [0.2]	503 [7.2]	475 [6.8]	740 [10.6]	6981 [100.0]	N/A	N/A	N/A	N/A	N/A	
Hospitals	137 [0.8]	68 [0.4]	633 [3.7]	1351 [7.9]	598 [3.5]	17397 [100.0]	838 [4.9]	427 [2.5]	291 [1.7]	1368 [8.0]	188 [1.1]	
Research	2 [0.4]	3 [0.8]	<1 [-]	1 [0.3]	0 [0.0]	392 [100.0]	11 [2.9]	[-]	8 [2.2]	2 [0.6]	<1 [0.1]	
Pensions & Benefits ¹	6 [0.1]	<1 [-]	10 [0.2]	2650 [64.7]	5 [0.1]	4053 [100.0]	N/A	N/A	N/A	N/A	N/A	
SUBTOTAL	187 [0.8]	137 [0.4]	1363 [4.3]	4923 [14.4]	1673 [5.2]	32137 [100.0]	1040 [3.2]	533 [1.7]	355 [1.1]	1372 [4.5]	189 [0.6]	
INDIRECT COSTS												
Premature Mortality ²	355 [1.4]	293 [1.1]	405 [1.6]	4848 [19.0]	0 [0.0]	25566 [100.0]	5328 [20.8]	679 [2.7]	404 [1.6]	1163 [4.6]	1588 [6.3]	
Chronic Disability ³	N/A	N/A	4371 [23.0]	1328 [7.0]	0 [0.0]	19007 [100.0]	N/A	N/A	N/A	N/A	N/A	
Short-term Disability ⁴	N/A	N/A	9564 [23.0]	213 [8.7]	0 [0.0]	2447 [100.0]	N/A	N/A	N/A	N/A	N/A	
SUBTOTAL	355 [0.8]	293 [0.9]	5340 [11.4]	6389 [19.6]	0 [0.0]	47020 [100.0]	5328 [11.3]	679 [1.4]	404 [0.9]	1163 [2.5]	1588 [3.4]	
TOTAL	542 [0.7]	430 [1.5]	8703 [9.5]	11012 [18.9]	1673 [2.1]	79157 [100.0]	5968 [8.0]	1212 [1.5]	759 [1.0]	2535 [3.2]	1787 [2.3]	

Notes:

- a The \$473 million under pregnancy are almost entirely maternity benefits from Unemployment Insurance, as CPP/QPP payments for this category are less than \$1 million (Tables 5C and 5A).
- b Well patient care drug expenditure is for the ICD-8 category of special conditions and examinations without sickness (Table 1).
- c Total medical care expenditure of \$6981 million includes some expenditure without diagnosis (\$307 million, 4.4%) [Table 2].
- d Total research expenditure of \$392 million includes expenditure for dentistry (\$5 million, 1.4%), pharmacology/toxicology (\$4 million, 1.1%) and miscellaneous (\$45 million, 11.8%) non-ICD categories (Table 4). Also see Table 9 for additional research costs not classified by disease category.
- e Additional health-related pensions and benefits not classified by diagnostic category are included in Table 9.
- f Chronic disability costs under ill-defined conditions are for the "other" health problems in Table 7.
- g Short-term disability costs under ill-defined conditions are for the "other" health problems in Table 8.
- h Table 10 does not include the additional direct health expenditures which were not classified by diagnostic category in Table 9.
- i Refer to Tables 1-8 for additional footnotes.
- j Totals and percentages may not sum due to rounding.
- k For complete sources and methods of calculation, see Sections 7.1 to 7.8 in Appendix II.

TABLE 11
GRAND TOTAL COST OF ILLNESS, CANADA 1986

COST COMPONENTS	\$ MILLION	% OF TOTAL
DIRECT COSTS:		
Hospital Care	17,097	17.6
Professional Services (Medical Care + Other Professional Services)	9,978	10.3
Pensions and Benefits (All)	6,856	7.1
Non-hospital Institutions	4,550	4.7
Drugs	3,584	3.7
Research (All)	453	0.5
Other Health Expenditures ¹	7,655	7.9
SUBTOTAL:	50,172	51.6
INDIRECT COSTS:		
Premature Mortality	25,566	26.3
Chronic Disability	19,007	19.6
Short-term Disability	2,447	2.5
SUBTOTAL:	47,020	48.4
GRAND TOTAL:	97,192	100.0

Notes:

- ¹ These other health expenditures are the remaining additional direct costs which could not be allocated to the diagnostic categories or otherwise included in the direct cost components listed in this grand total summary table (i.e. ambulances, home care, medical appliances, capital expenditure, public health, medical and dental schools, prepayment administration and miscellaneous health costs in Table 9).
- * Refer to Tables 1-9 for additional footnotes.
 - * Totals and percentages may not sum due to rounding.
 - * For complete sources and methods of calculation, see Sections 7.1 to 7.9 in Appendix II.

7. Appendix II: Information Sources and Methodologies

7.0 CLASSIFICATION OF DISEASES

ICD-9 CODE	ICD-9 CHAPTER NAME	DIAGNOSTIC CATEGORY TERM USED IN REPORT
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
490-496	Chronic Obstructive Pulmonary Disease and Allied Conditions	CHRONIC BRONCHITIS/EMPHYSEMA/ASTHMA
E810-E819	Motor Vehicle Traffic Accidents	MOTOR VEHICLE TRAFFIC ACCIDENTS

7.1 Canadian Drug Costs to the Consumer

The following sources were used by the Bureau of Pharmaceutical Surveillance (formerly the Bureau of Drug Quality), Health Protection Branch, Health and Welfare Canada to arrive at estimates of the cost of drugs to the Canadian consumer according to ICD-8 disease categories:

- 1) IMS Canada. Canadian Pharmaceutical Market: Drug Store and Hospital Purchases, December 1986. Ambler: IMS America Ltd., 1987.
- 2) IMS Canada. Canadian Disease and Therapeutic Index, Diagnosis, Fourth Quarter 1986. Ambler: IMS America Ltd., 1987.
- 3) Bureau of Pharmaceutical Surveillance. The Canadian Pharmaceutical Market 1986: Annual Review (Internal document). 1987. Drugs Directorate, Health Protection Branch, Health and Welfare Canada.

The estimates of prescription and nonprescription drug costs to the consumer calculated by the Bureau of Pharmaceutical Surveillance were based on data obtained from the two different IMS Canada audits mentioned above. The starting point was the Diagnosis volume

of the 1986 Canadian Disease and Therapeutic Index (CDTI), which identified diagnosis categories according to ICD-8. CDTI data are based on physician mentions and, therefore, do not directly translate into patient usage of drugs. However, they do provide some indication of drug utilization patterns in relation to the treatment of diseases.

To estimate drug costs, the CDTI data were analysed to determine which drug classes and what percentage of each were mentioned for each diagnosis class. The next step was to assign a dollar value to the drug classes mentioned for each ICD category using IMS estimates of the acquisition cost of drugs purchased by drugstores and hospitals. The costs were then adjusted to reflect the consumer purchase price.

The final cost estimates are for drugs distributed through drugstores and hospitals only. They do not include nonprescription drugs sold in retail outlets other than drugstores, prescription drugs supplied by dispensing physicians or health clinics outside of hospitals, or federal government pharmaceutical expenditure.

IMS did not code for Motor Vehicle Traffic Accidents (MVTA) (E810-E819); instead, any resulting injury was coded to the injury. The drug costs of MVTA were therefore not available.

As mentioned in the discussion of this report, a preliminary estimate from another source, National Health Expenditures in Canada 1975-1987 (Health and Welfare Canada, 1990), was \$1.3 billion larger than the Bureau of Pharmaceutical Surveillance's estimate of total 1986 drug costs. The discrepancy in the estimates was probably due to the somewhat limited coverage of the IMS-based data as described above, as well as the different estimation methods used. We have used the estimates provided by the Bureau of Pharmaceutical Surveillance for this report because they allowed for the allocation of costs by disease category. For a detailed description of the alternative drug costs methodology, please refer to the section on drugs and appliances in Appendix B of the National Health Expenditures in Canada 1975-1985 (Health and Welfare Canada, 1987).

7.2 Medical Care Expenditure

Medical care expenditures in Table 2 were estimated using the following sources of information:

- 1) Manitoba Health Services Commission. Annual Report 1985-1986. Manitoba, 1986. (Table IX, Medical services and costs by diagnostic category, 1985/86.)
- 2) Health and Welfare Canada. National Health Expenditures in Canada 1975-1987 (Preliminary data). February 1990. Health Information Division, Policy, Planning and Information Branch. (Table 6, Total health expenditure by category, Canada, 1975 to 1987.)

Unfortunately, no national data were available on the average distribution of medical care costs by diagnostic category, but such data existed for Manitoba (Source 1). It was assumed that the Manitoba medical services data (grouped

by ICD-9 classifications) reflected the national distribution, although the extent of medical services covered varies somewhat by province. The Manitoba data excluded out-of-province medical costs as well as optometric, oral, dental, periodontal and chiropractic services.

The national total cost of medical care was obtained from the second source listed above. This total is the cost of professional services provided by physicians. Professional fees, which are mainly paid by provincial medical care insurance programs, represent the largest part of this expenditure. Payments to physicians employed by hospitals, public health agencies, etc. are included with the appropriate direct cost component. For a complete description of the total medical care cost in Table 2, please refer to the section on physicians in Appendix B of the National Health Expenditures in Canada 1975-1985 (Health and Welfare

Canada, 1987). In summary, the Manitoba percentage distribution of 1985-86 medical services costs by diagnostic category, multiplied by the 1986 national total for expenditure on physicians' services determined the estimated distribution of medical care expenditure by diagnostic category for Canada in 1986.

The cost of other professional health services (i.e. dentists, chiropractors, optometrists, physiotherapists, podiatrists, private duty nurses and osteopaths) are included as additional health expenditures not classified by diagnostic category in Table 9, Part B. In Table 11 and Figure 3, the grand total of medical care is the combined cost of physician services (Table 2) and other professional services (Table 9).

7.3 Hospital Care Expenditure

Hospital costs were derived from the following sources:

- 1) Statistics Canada. Hospital Morbidity: 1983-84 and 1984-85. Ottawa: Supply and Services Canada, 1989; Catalogue 82-206. (1984-85 Tables)
- 2) Health and Welfare Canada. National Health Expenditures in Canada 1975-1987 (Preliminary data). February 1990. Health Information Division, Policy, Planning and Information Branch. (Table 6, Total health expenditure by category, Canada, 1975 to 1987.)
- 3) Bureau of Pharmaceutical Surveillance. The Canadian Pharmaceutical Market 1986: Annual Review (Internal document). 1987. Drugs Directorate, Health Protection Branch, Health and Welfare Canada.

The 1984-85 percentage distribution of days spent in hospital according to the ICD-9 diagnostic category upon discharge was obtained from Statistics Canada's Hospital Morbidity catalogue

(Source 1). This distribution was then applied to the total 1986 hospital expenditure presented in preliminary data from National Health Expenditures in Canada 1975-1987 (Source 2).

The 1986 hospital care cost was an aggregate amount of expenditure spent by the federal and provincial governments, workers' compensation boards and the private sector. This total included the cost of hospital-supplied drugs (IMS Canada estimate of \$420.8 million in Source 3) which was, therefore, subtracted to avoid double counting. Other items provided by hospitals, such as internal administration, home care, appliances and prostheses and training of hospital workers, were not deducted as their contributing amounts were negligible.

Federal government hospital expenditures consisted of direct payments to service providers, excluding the tax-abatements and cash contributions to provinces, and services provided to special groups, e.g. veterans and armed

forces members, whose care was a federal responsibility. Provincial government hospital expenditures included the spending of federal cash contributions and tax-abatement proceeds.

Hospital expenditure by workers' compensation boards referred here only to hospital health care benefits. Other payments, such as wage compensation, pensions, disability allowances and death benefits were included in Section 3.5.2 and Table 5D. Additional non-hospital workers' compensation health care benefits were part of the other direct cost component estimates.

Private sector hospital costs represented amounts charged by hospitals for services rendered and not payable by the federal or provincial governments or a workers' compensation board. These amounts included differential charges for preferred accommodation, services to uninsured persons, services that were not medically necessary, and user charges.

7.4 Research Costs

The following sources were used to estimate the cost of health research in Canada by disease category for the fiscal year 1986-87:

- 1) Medical Research Council of Canada. Reference List of Health Science Research in Canada 1987-88. Ottawa, 1987.
- 2) Statistics Canada. The Consumer Price Index, September 1987. Ottawa: Supply and Services Canada, 1987; Catalogue 62-001. (Table 2, Consumer price index for Canada, all-items (not seasonally adjusted), 1972-1987, 1981=100.)
- 3) The Traffic Injury Research Foundation of Canada. TIRF Annual Report 1987. Ottawa. (1986 research expenditure)

The Reference List of Health Science Research in Canada 1987-88 provided research expenditure figures based on grants and awards made by federal, provincial and voluntary agencies for the

fiscal year 1987-88. In a few cases, 1986-87 expenditures were reported. The Reference List was compiled in July 1987 and, therefore, did not include any changes or additions made after that time. Also, there were some agencies (mainly local and regional) who chose not to be included. Although the Reference List was not exhaustive, it reflected the majority of grants and awards for health science research. A list of the granting agencies included is provided on the following page.

Unfortunately, the grants and awards were not classified by disease category. Therefore, the authors of this report used their professional expertise to assign each of the projects listed to a single diagnostic category. A "miscellaneous" category was created for all the expenditures which could not be classified by any disease. This included certain conferences, symposia and research scholarships and general research grants for faculties of medicine in various provinces. Dentistry and pharmacology/toxicology were also

added as separate non-ICD health-related categories. All 1987-88 research costs were deflated to 1986 value by applying the Consumer Price Index for all items. 1986 expenditure obtained from another source, TIRF Annual Report 1987, was added to the category of injuries, as well as to the total research cost.

The total health research cost estimate in Table 4 has some other limitations. It does not include foreign funding sources of Canadian research, government-contracted research, or research in the private sector, such as that carried out by pharmaceutical companies. Some of these other sources of health research expenditure not included in the Reference List have their aggregate amount shown in Table 9, Part C under research. The two amounts are combined for the grand total of research in Table 11 and Figure 3.

Health Science Research Granting Agencies Included in Table 4

Alberta Cancer Board
Alberta Cancer Foundation
Alberta Foundation for Nursing Research
Alberta Heritage Foundation for Medical Research
Alberta Lung Association
Alcoholism and Drug Addiction Research Foundation
Alzheimer Society of Canada
Arthritis Society
Association pulmonaire du Québec
Banting Research Foundation
BC Health Care Research Foundation
British Columbia Lung Association
Canadian Cystic Fibrosis Foundation
Canadian Diabetes Association
Canadian Foundation for Ileitis and Colitis
Canadian Fund for Dental Education

Canadian Heart Foundations
Canadian Liver Foundation
Canadian Lung Association
Canadian National Institute for the Blind: EA Baker Foundation
Canadian Red Cross Society
Cancer Research Society Inc
Diabetes Canada
Easter Seal Research Institute of Ontario
Fonds de la recherche en santé du Québec
Gerontology Research Council of Ontario
Health and Welfare Canada
Hospital for Sick Children Foundation
Huntington Society of Canada
Institut de recherche en santé et en sécurité du travail du Québec
JP Bickell Foundation
Juvenile Diabetes Foundation International - Canada
Kidney Foundation of Canada
Lung Foundation of British Columbia

Manitoba Health Research Council
Manitoba Lung Association
Medical Research Council of Canada
Multiple Sclerosis Society of Canada
Muscular Dystrophy Association of Canada
National Cancer Institute of Canada
National Institute of Nutrition
Newfoundland Lung Association
Ontario Cancer Treatment and Research Foundation
Ontario Lung Association: Ontario Thoracic Society Research Fund
Ontario Mental Health Foundation
Ontario Ministry of Health
Ontario Ministry of Labour
Physicians' Services Incorporated Foundation
PMAC Health Research Foundation
RP Eye Research Foundation
Saskatchewan Health Research Board

7.5 Pensions and Benefits

7.5.1 Canada/Quebec Pension Plans

The estimated 1986 distribution of payments for Canada Pension Plan (CPP) and Quebec Pension Plan (QPP) disability pensions by diagnosis class was calculated using the following sources:

- 1) Health and Welfare Canada. (Unpublished 1986 calendar year tabulations: Table, Canada Pension Plan net payments). Income Security Programs Branch, 1987.
- 2) Régie des rentes du Québec. (Unpublished tabulations of 1986 Quebec Pension Plan net payments by benefit type). 1987.
- 3) Health and Welfare Canada. (Unpublished Canada Pension Plan tabulations: Table 1, Distribution of disability pensions by class of principle diagnosis and by age, June 1986). Income Security Programs

Branch, 1987.

The 1986 totals of CPP and QPP net disability payments, obtained directly from Sources 1 and 2 above, were combined before determining their distribution by diagnostic category. The June 1986 CPP data (Source 3) were considered most representative of the annual average distribution of disability pensions, and were, therefore, used to calculate the percentage distribution by diagnostic category for Table 5A. This distribution was then multiplied by the CPP/QPP total net disability payments for 1986.

Table 5B presents additional pertinent CPP and QPP benefit payments from Sources 1 and 2 which could not be classified by disease category. These consisted of survivors' and orphans' pensions, lump sum death benefits, and payments to the children of disabled contributors. This aggregate amount was

added to the additional health expenditures not classified by diagnostic category in Table 9, Part A, as well as to the grand total of pensions and benefits in Table 11 and Figure 3.

7.5.2 Unemployment Insurance

Sickness and maternity benefits were the only health-related Unemployment Insurance benefits. 1986 totals were obtained directly from:

Statistics Canada. Unemployment Insurance Statistics, December 1986. Ottawa: Supply and Services Canada, 1987; Catalogue 73-001. (Table 5, Benefit activities, by type of benefit.)

Sickness benefits consisted of payments for two weeks to a maximum of fifteen weeks of illness. The recipient must have worked for a minimum of 20 weeks before receiving these benefits. Because the sickness benefits had no

breakdown by diagnostic category, this amount was added to the additional non-classified health expenditures in Table 9, Part A.

The inclusion of maternity benefits in this report was done in the interests of completeness, although the condition of pregnancy is not a disease. It is, however, health-related, and various health care costs are usually incurred at some point during pregnancy or delivery. The amount for Unemployment Insurance maternity payments was placed in the pensions and benefits component in the summary Table 10 under the category of pregnancy.

It should be noted that the expenditure on both of these UI benefits was included in the grand total of pensions and benefits in Table 11 and Figure 3.

7.5.3 Workers' Compensation

The 1986 national total of workers' compensation expenditure by diagnostic category was estimated using the following sources:

- 1) Statistics Canada. National Income and Expenditures Account: Annual

Estimates, 1977-1988. Ottawa: Supply and Services Canada, 1989; Catalogue 13-201. (Table 56, Government transfer payments to persons.)

- 2) Workers' Compensation Board of Ontario. (Unpublished data). Toronto, 1988. (Table, Compensation claims initially settled in 1986, number of claims and cost by ICD and type of disability.)

The 1986 total national expenditure on workers' compensation, initial and resettled claims combined, was obtained from the first data source listed above. As a transfer to individuals, this expenditure was an aggregate figure which included temporary disability, worker pensions and some fatal benefits. Workers' compensation expenditure for health care benefits were not included here, but were incorporated in various other direct cost components. Therefore, the national workers' compensation expenditure was underestimated in this section, but not in the total direct costs of diseases and injuries.

The other direct cost components which included some workers'

compensation health care expenditure were drugs (Table 1), medical care (Table 2), hospital care (Table 3) and many of the additional health expenditures not classified by diagnostic category in Table 9. The latter expenditures consisted of all the health care-related components in Part B (i.e. non-hospital institutions, home care, ambulances, dentists, chiropractors, optometrists, podiatrists, osteopaths, private duty nurses, physiotherapists, eyeglasses, hearing aids and other appliances) as well as public health, capital expenditure and miscellaneous health costs under the administration component in Part C.

In Table 5D, the percentage distribution by diagnostic category was based on the distribution of Ontario workers' compensation claims initially settled in 1986 (Source 2), after excluding their payments for health care benefits. In summary, the 1986 workers' compensation expenditure by diagnostic category for Canada was calculated by multiplying the Ontario percentage distribution by the 1986 national expenditure on workers' compensation claims, excluding health care payments.

7.6 Future Income Lost Due to Premature Mortality

The present value of future income lost due to premature mortality was estimated by using the following sources:

- 1) Statistics Canada. Income Distributions by Size in Canada, 1985. Ottawa: Supply and Services Canada, 1986; Catalogue 13-207.
- 2) Rice DP, Hodgson TA. Social and economic implications of cancer in the United States. Washington: US Government Printing Office, 1981; DHHS publication no. (PHS)81-1404. (Vital Health Statistics; series 3; no. 20).
- 3) Rice DP. Estimating the cost of illness. Washington: US Government Printing Office, 1966; PHS publication no. 947-6. (Health Economics Series; no. 6).
- 4) Shillington RE. Selected economic consequences of cigarette smoking (Internal document). Health and Welfare Canada, 1977.
- 5) Collishaw NE, Myers G. Dollar estimates of the consequences of

tobacco use in Canada, 1979. Can J Public Health 1984;75:192-199.

- 6) Statistics Canada. Life Tables, Canada and Provinces, 1980-82. Ottawa: Supply and Services Canada, 1984; Catalogue 84-532.
- 7) Statistics Canada. Causes of Death, Vital Statistics Volume IV, 1986. Ottawa: Supply and Services Canada, 1988; Catalogue 84-203.
- 8) Statistics Canada. The Consumer Price Index, September 1987. Ottawa: Supply and Services Canada, 1987; Catalogue 62-001. (Table 2, Consumer price index for Canada, all-items (not seasonally adjusted), 1972-1987, 1981=100.)

The present value of future income by age and sex was derived from 1985 age- and sex-specific data on the average annual income of individuals (Source 1), using methods suggested in the articles listed above as Sources 2-5. An individual with income was defined as anyone 15 years of age or over who received some

money income during the reference year. Therefore, it was considered that no income was earned between the ages of 0 and 14. Adjustments were made for future productivity gains (2% per year) and discounted future earnings of 6% per year (Source 4).

The income foregone due to premature mortality for each individual, by sex and age group, was then calculated by accumulating the adjusted value of future income through the years up to one's life expectancy (Source 6). The resulting values were then multiplied by the number of deaths in 1986 for each diagnostic category, by age and sex (Source 7). No distinction was made between those in or those out of the labour force at the time of death. Results were summed to obtain a final estimate of foregone income. The present value of future income lost due to premature mortality was updated to 1986 value by applying the Consumer Price Index, All Items, to the 1985 estimate (Source 8).

7.7 The Annual Value of Time Lost Due to Chronic Disability

The following sources were used to estimate the value of income lost in 1986 due to a major or minor activity limitation:

- 1) Health and Welfare Canada and Statistics Canada. Canada Health Survey, 1978-79 (Unpublished tabulations: Section V, Activity Limitation). 1983.
- 2) Wilkins R, Adams OB. Healthfulness of Life: A Unified View of Mortality, Institutionalization, and Non-institutionalized Disability in Canada, 1978. Montreal: The Institute for Research on Public Policy, 1983.
- 3) Statistics Canada. Income Distributions by Size in Canada, 1985. Ottawa: Supply and Services Canada, 1986; Catalogue 13-207.
- 4) Statistics Canada. Cancer in Canada, 1978. Ottawa: Supply and Services Canada, 1981; Catalogue 82-207. (Estimated population, by sex and age group, Canada and provinces, June 1, 1978.)
- 5) Health and Welfare Canada and Statistics Canada. The Health of Canadians: Report of the Canada Health Survey. Ottawa: Supply and Services Canada, 1981; Catalogue 82-538. (Table 67, Population by age and sex, by major activity and activity limitation, Canada, 1978-79.)
- 6) Statistics Canada. Canada Year Book, 1988. Ottawa: Supply and Services Canada, 1987; Catalogue 11-402E. (Table 2.11, Population by age distribution, 1976, 1981 and 1986.)
- 7) Statistics Canada. The Consumer Price Index, September 1987. Ottawa: Supply and Services Canada, 1987; Catalogue 62-001. (Table 2, Consumer price index for Canada, all-items (not seasonally adjusted), 1972-1987, 1981=100.)
- 8) Statistics Canada. Mental Health Statistics, 1985-86. Ottawa: Supply and Services Canada, 1989; Catalogue 83-204. (General hospitals, separations, 1984-85: Table 6, Length of stay, by age and sex; Psychiatric hospitals, 1985-86: Table 6, Length of stay, by age and sex.)

It was assumed that time lost by persons not in the labour force was valued at the same rate (using age- and sex-specific average annual income) as working time lost. Any activity limitation was counted (with weight adjustment)

rather than just work-related activity limitation.

Estimates of days of activity limitation were obtained from unpublished tabulations of Section V of the 1978-79 Canada Health Survey (Source 1). While Section V classified ranges of duration from less than a month to limitation since birth, any limitation greater than a year's duration was considered as only one year of limitation for the purposes of this report. Activity limitation of less than a year was divided into half-, two-, five- or nine-month intervals by taking the middle month within the survey's established intervals. The resulting month intervals of activity limitation by diagnostic category were then divided by twelve months to determine the accumulated years of activity limitation in each category.

Section V of the Canada Health Survey included several degrees of limitation. Using Wilkins and Adams' methods (Source 2), the weights 0.3, 0.4, and 0.5 were applied to the proportion of the population with "some limitation", "major activity limitation" (work, housework, school), and "inability to perform major activity", respectively. This was done on the assumption that a day of disability did not necessarily mean that all activities were relinquished for that day.

The resulting figures, multiplied by the 1985 age- and sex-specific average annual income from Source 3 (assumed equal for both those in and those not in the labour force), determined the total value of time lost due to chronic disability. Since the Canada Health Survey was a sample survey, the ratio (1,000) of the 1978 population aged 15 and above (Source 4) to those of the surveyed population (Source 5) was applied in order to make an overall estimation for the country. The results were further adjusted to reflect the population growth between 1978 and 1986 by multiplying the ratio (1.1) of the population age 15 and above in 1986 (Source 6) to those 15 and over in 1978 (Source 4). The value of time lost was then updated to 1986 by applying the Consumer Price Index, All Items (Source 7), to the 1985 estimate.

When using the Canada Health Survey, Statistics Canada suggests that any estimated number of days less than 16 should be excluded from use as the

small number will create too much variance of the actual amount. This warning was ignored for our report, and all available data were used. As a result, the costs of health problems that were not a great burden on lost income due to activity limitation (e.g. headache) might be somewhat too low or too high.

Besides accounting for the household population, the Canada Health Survey also represented household members temporarily staying in hospitals, except that long-term stay patients (91 days and over) were not included. Therefore, other methods were used to account for this long-term stay population and the associated morbidity cost. Indians on reserves, and the Northwest Territories and Yukon populations were also excluded from the Survey.

The mentally disabled accounted for a large portion of the institutionalized population; hence, only their annual value of time lost was estimated as foregone income of the institutionalized population. It should be noted that quite a few persons in nursing homes and other residential care facilities are probably there for reasons of mental health, but data on these facilities by diagnostic category were not available. Therefore, the results tend to underestimate, to some extent, the true volume of the problem of mental health among the elderly.

The value of time lost for the mentally disabled population was based on the sum of the following populations:

- a) the household population with activity limitation due to psychiatric impairment (already calculated by the Activity Limitation method using Canada Health Survey data);
- b) patients of psychiatric hospitals aged 15 and over with stays over 90 days for mental health reasons; and
- c) patients 15 and older with stays over 90 days in the psychiatric ward of general hospitals for mental health reasons.

To estimate the morbidity cost for the mentally disabled, institutionalized population, it was assumed that they would have earned the same age- and sex-specific annual income as the non-institutionalized population, were they not institutionalized.

Since the Canada Health Survey accounted for household members temporarily staying in hospitals, it was necessary to avoid double counting those lengths of stay. Hence, only lengths of stay 91 days and over, by age and sex, in general hospitals (psychiatric wards, 1984-85) and psychiatric hospitals (1985-86) were combined to calculate total age- and sex-specific days of care for both types of residents (Source 8). Length of stay over 365 days was considered as only one year by

multiplying 365 days by the age- and sex-specific number of residents in the "365+ days" category. A weight of 0.5 was then applied, assuming that one day in hospital was as serious a restriction in activity as a "major activity-loss day."

To determine the number of work years lost due to institutionalization, the total days of care were divided by 365 days. The total work years lost were then multiplied by the 1985 age- and sex-specific annual income data adjusted

by the 1986 Consumer Price Index, to arrive at the annual value of time lost from institutionalization due to mental disorders. The result was added to the diagnostic category of mental diseases already containing the result from (a) above, as well as to the total estimated annual value of time lost due to inability or restricted ability to perform a major or minor activity (calculated earlier using Canada Health Survey data).

7.8 The Annual Value of Time Lost Due to Short-term Disability

The 1986 value of time lost due to short-term disability was estimated by using the following sources of information:

- 1) Health and Welfare Canada and Statistics Canada. Canada Health Survey, 1978-79 (Unpublished tabulations: Section I, Two-week Disability: Major Activity-loss Days, Cut-down Days). 1983.
- 2) Wilkins R, Adams OB. Healthfulness of Life: A Unified View of Mortality, Institutionalization, and Non-institutionalized Disability in Canada, 1978. Montreal: The Institute for Research on Public Policy, 1983.
- 3) Statistics Canada. Cancer in Canada, 1978. Ottawa: Supply and Services Canada, 1981; Catalogue 82-207. (Estimated population, by sex and age group, Canada and provinces, June 1, 1978.)
- 4) Health and Welfare Canada and Statistics Canada. The Health of Canadians: Report of the Canada Health Survey. Ottawa: Supply and Services Canada, 1981; Catalogue 82-538. (Table 67, Population by age and sex, by major activity and activity limitation, Canada, 1978-79.)
- 5) Statistics Canada. Canada Year Book, 1988. Ottawa: Supply and Services Canada, 1987; Catalogue 11-402E. (Table 2.11, Population by age distribution, 1976, 1981 and 1986.)
- 6) Statistics Canada. Income Distributions by Size in Canada, 1985. Ottawa: Supply and Services Canada, 1986; Catalogue 13-207.
- 7) Statistics Canada. The Consumer Price Index, September 1987. Ottawa: Supply and Services Canada, 1987; Catalogue 62-001. (Table 2, Consumer price index for Canada, all-items (not seasonally adjusted), 1972-1987, 1981=100.)

As in the preceding section, it was assumed that time lost by persons not in the labour force was valued at the same rate (using age- and sex-specific average annual income) as working time lost. Any activity limitation was counted (with weight adjustment) rather than just work-related activity limitation.

The annual number of days lost due to short-term disability was determined from unpublished Canada Health Survey tabulations (Source 1) by accumulating, in each disease category, the sum of the number of days multiplied by the number of people in each category. This was done separately for both cut-down days (Section I-12) and major activity-loss days (Section I-11). These figures, multiplied by 26 two-week periods (the two-week period used in the Survey was representative of any two-week period within a year), gave an estimate of the annual number of days lost due to short-term disability. Since about 50% of the two-week disability days were attributable to persons with long-term activity limitations identified elsewhere in the Survey (Section V) and included in Table 7 of this report, the results were adjusted to avoid double counting.

Using Wilkins and Adams' reasoning (Source 2) that a day of disability did not necessarily mean that all activities were relinquished for that day, the weight 0.3 was applied to the annual number of cut-down days, and 0.4 to the number of annual major activity-loss days. The results were then combined and divided by 365 days to determine the number of years lost due to short-term disability. The ratio (1,000) of the 1978 population aged 15 and over (Source 3) to those of the surveyed sample population (Source 4) was applied in order to make an overall estimation for the country. A ratio of 1.1 was also applied to reflect the result of

the population growth on days lost between 1978 and 1986 (Sources 3 and 5). The resulting figures were then multiplied by the 1985 age- and sex-specific annual income (Source 6) to give an estimate of the annual value of time lost due to short-term disability. This figure was updated to 1986 by applying the Consumer Price Index, All Items (Source 7) to the 1985 estimated value of time lost.

The category "bed-days" in Section I-10 of the Canada Health Survey was not included in days of two-week disability. This was done to avoid any possible double counting of the population that spent time in bed while they were also being counted as having major activity-loss days. The reasoning for this was that the population losing major activity during the two-week period was likely confined to bed. If included, a large proportion of the population with bed-days would have been double counted.

The fact that the Canada Health Survey was a household survey and, therefore, not representative of the institutionalized population, should not have much effect on the short-term disability value of lost time, since this population contributed far more to income loss due to long-term disability. However, the non-representation of reservation Indians and the population of the Territories is of greater concern.

It should be noted that estimated number of days less than 16 were included in the calculations for short-term disability, contrary to the recommendation of Statistics Canada. As a result, estimates for health problems that were not major short-term disability problems might be somewhat less precise.

7.9 Additional Direct Health Expenditures

Additional 1986 direct health costs which could not be classified by diagnostic category were derived from the following sources:

- 1) Health and Welfare Canada. (Unpublished 1986 calendar year tabulations: Table, Canada Pension Plan net payments). Income Security Programs Branch, 1987.
- 2) Régie des rentes du Québec. (Unpublished tabulations of 1986 Quebec Pension Plan net payments by benefit type). 1987.
- 3) Health and Welfare Canada. Social Security Statistics, Canada and Provinces, 1960-61 to 1984-85. Ottawa: Supply and Services Canada, 1987. (Table 154, Veterans disability and dependents' pensions, federal payments by province and for Canada.)
- 4) Statistics Canada. Unemployment Insurance Statistics, December 1986. Ottawa: Supply and Services Canada, 1987; Catalogue 73-001. (Table 5, Benefit activities, by type of benefit.)
- 5) Health and Welfare Canada. National Health Expenditures in Canada 1975-1987 (Preliminary data). February 1990. Health Information Division, Policy, Planning and Information Branch. (Table 6, Total health expenditure by category, Canada, 1975 to 1987.)
- 6) Health and Welfare Canada. National Health Expenditures in Canada 1975-1985. Ottawa: Supply and Services Canada, 1987. (Table C-1, Estimated total expenditures in

medical and dental schools, by province, 1969-70 to 1984-85.)

- 7) The Association of Canadian Medical Colleges. Canadian Medical Education Statistics. Volume 9, 1987. (Table 65, Expenditures for biomedical research of Canadian faculties of medicine by source of funds, 1981/82 - 1985/86.)

The additional health expenditures not classified by diagnostic category were grouped into three direct cost components in Table 9. In the pensions and benefits component (Part A), the CPP/QPP data were combined amounts of 1986 Canada Pension Plan and Quebec Pension Plan payments obtained directly from Sources 1 and 2 (also presented in Table 5B). The expenditure on veterans disability and dependents' pensions was calculated by regressing the natural log of fiscal year expenditures from 1973-74 to 1984-85 (Source 3), and using the resulting models to estimate the 1986-87 value. 1986 Unemployment Insurance sickness benefits were acquired directly from Source 4 (also in Table 5C).

All of the expenditures listed under the health care-related component (Part B), as well as items 1, 2, 4 and 5 in the administration component (Part C), were taken directly from 1986 preliminary data for National Health Expenditures in Canada 1975-1987 (Source 5). The particular combination of contributions by federal, provincial or local governments, workers' compensation (health care benefits only) or the private sector are fully explained in Appendix B

of the report cited in Source 6 under the appropriate headings. The 1986-87 cost of medical and dental schools was estimated from the table specified in Source 6 by applying the Box Jenkin's ARIMA Time Series Model on expenditure figures from 1969-70 to 1984-85.

The 1985-86 research expenditure not classified by diagnostic category was for biomedical research carried out by Canadian faculties of medicine from funding sources reported by the Association of Canadian Medical Colleges (Source 7) which were not included in Table 4. These funding sources included the federal government (National Research Council, Natural Science and Engineering Research Council, and several other agencies and departments excluding Medical Research Council and Health and Welfare Canada), private industry (including pharmaceutical companies), local community sources, hospitals and universities, foreign and miscellaneous sources. Some of the organizations listed in Source 7 under provincial governments, provincial not-for-profit foundations and national not-for-profit foundations did not appear in the Medical Research Council data source used in Table 4, either. However, these costs were not included in the additional research expenditure because the dollar amounts were not broken down by organization. Therefore, this additional research expenditure in Canadian faculties of medicine is somewhat underestimated.