

THE DIRECT ECONOMIC BURDEN OF SOCIO-ECONOMIC HEALTH INEQUALITIES IN CANADA

AN ANALYSIS OF HEALTH CARE COSTS BY INCOME LEVEL



PROTECTING AND EMPOWERING CANADIANS
TO IMPROVE THEIR HEALTH



**TO PROMOTE AND PROTECT THE HEALTH OF CANADIANS THROUGH LEADERSHIP, PARTNERSHIP,
INNOVATION AND ACTION IN PUBLIC HEALTH.**

— Public Health Agency of Canada

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HEALTH INEQUALITIES IN CANADA**

Également disponible en français sous le titre :
**LE FARDEAU ÉCONOMIQUE DIRECT DES INÉGALITÉS
SOCIOÉCONOMIQUES EN SANTÉ AU CANADA**

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This publication can be made available in alternative formats upon request.

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Cat.: HP35-38/2013E-PDF
ISBN: 978-1-100-22058-1
Pub.: 120217

ACKNOWLEDGEMENTS

This report was prepared by the Social Determinants and Science Integration Directorate of the Public Health Agency of Canada.

The Public Health Agency of Canada would like to thank all of the individuals and organizations who contributed to the research and the report. In particular, appreciation is extended to:

- The Statistics Canada team that developed the data on health costs by income level: Jillian Oderkirk, Claudia Sanmartin, Michelle Rotermann, Phillipe Finès and Claude Nadeau. Michael Wolfson and Russell Wilkins also provided important support and guidance.
- The advisors and reviewers who provided insightful and constructive comments: Hope Beanlands (formerly from the National Collaborating Centre for Determinants of Health), Alan Diener (Public Health Agency of Canada), Trevor Hancock (formerly from the BC Ministry of Health), Jean Harvey (Canadian Institute for Health Information), Alan Shiell (Centre of Excellence in Intervention and Prevention Science) and Emile Tompa (Institute for Work and Health).
- The consortium of individuals and organizations that provided the impetus to undertake this project, the momentum to keep the work going and good advice along the way. Over the course of the project, consortium members included: the Canadian Population Health Initiative of the Canadian Institute for Health Information, the National Collaborating Centre on Determinants of Health, the Canadian Public Health Association, the Canadian Medical Association, the Institute of Population and Public Health of the Canadian Institutes of Health Research, the Assembly of First Nations, the Conference Board of Canada, Statistics Canada, the Nova Scotia Department of Health Promotion and Protection, the British Columbia Ministry of Health, the First Nations and Inuit Health Branch of Health Canada, and the British Columbia Provincial Health Services Authority.

OVERVIEW

WHAT IS THE PURPOSE OF THIS REPORT?

People who enjoy higher social and economic positions relative to others based on their income, education or occupation tend to be healthier. As such, they generally need and use fewer health care services, resulting in lower health care costs. This report examines health care cost differences between socio-economic status groups in order to estimate what these differences cost the Canadian health care system. This estimate is called the *direct economic burden of socio-economic inequalities in health*.

WHY IS THIS RESEARCH VALUABLE? This report offers the first national-level estimate of the contribution of health inequalities to health care costs. Highlighting the costs of poor health informs Canadians about potential economic gains from improving health and reducing health inequalities by addressing the social, economic and environmental conditions that strongly influence health.

HOW WAS THIS RESEARCH CARRIED OUT?

This study tests the feasibility of a new approach to collecting data on both health costs and socio-economic characteristics, such as income. Income is used to measure socio-economic status because it is a widely accepted indicator of socio-economic position, and because data linking income and health is most widely available in Canada. The report uses data on three health services, acute care in-patient hospitalizations, prescription medications and physician consultations. These three services represent a quarter of all health care expenditures.

WHAT ARE SOME OF THE KEY FINDINGS OF THIS RESEARCH?

- Health care costs generally decline as income rises. This pattern holds for women and men.
- For the health care services included in the report, socio-economic health inequalities cost the health care system an estimated \$6.2 billion annually. This represents over 14% of total annual expenditures on acute care in-patient hospitalizations, prescription medications and physician consultations. Health care costs could be potentially reduced by \$6.2 billion if all Canadians had the same health care utilization and cost patterns as those in the highest income group.
- The lowest income group accounts for 60% (\$3.7 billion) of the health care costs of socio-economic health inequalities.

WHAT THE REPORT DOES NOT INCLUDE:

- This report does not include all health services due to a lack of data.
- This study does not identify or recommend specific actions to reduce health inequalities.
- This report does not state that reducing income differences will reduce differences in health care costs. Reducing costs would require Canadians to change their use of health care.
- This report does not state that health care cost differences between income groups are solely due to level of income.
- The data in this study cannot be used to assess the relationship between income and health, including whether having a lower income causes poorer health, or the reverse.

KEY AREAS FOR FURTHER RESEARCH

To continue to build knowledge of the economic impact of health inequalities in Canada, key areas for further research include evaluating the benefits, costs and outcomes of specific measures to reduce health inequalities, and understanding the impact of health inequalities on factors other than health care costs, such as productivity or expenditures on social programs. As well, a better estimate of the full health care costs of socio-economic health inequalities could be made if available data were expanded to cover more health services.

EXECUTIVE SUMMARY

Individuals who are less healthy and those who are more likely to be exposed to health risks tend to require more health care. Canadian research indicates that individuals with lower incomes, less education or lower occupational skill levels tend to be less healthy than those who enjoy greater advantages in these areas.^{1, 2, 3} This uneven distribution of health across different socio-economic status groups is referred to as *socio-economic inequality in health*.

Evidence of the economic cost of health inequalities enhances our understanding of the benefits associated with efforts to reduce these inequalities. However, the data needed to generate such evidence is challenging to obtain. In Canada, a lack of data linking health costs and socio-economic characteristics has limited assessment of the degree to which health costs are associated with socio-economic inequalities at the national level.

In order to build evidence on the cost of socio-economic health inequalities, the Public Health Agency of Canada worked with Statistics Canada to test the feasibility of a *bottom-up* approach to compiling national health cost data. The bottom-up approach relies on individual-level data, which allows costs to be calculated by individual-level characteristics not always found in other data sources. This includes indicators of socio-economic status (SES) such as level of education or income. In this study, the health care costs incurred by five income groups were examined for a single year (2007–2008).^{*} Each income group (or quintile) represents approximately 20% of the Canadian population.

Estimates of health care costs by income level make it possible to assess one dimension of economic impact: the *direct economic burden* of socio-economic inequalities in health in Canada. The direct economic burden measures the influence of socio-economic health inequalities on expenditures within the health care system. It represents the estimated reduction in health care costs that could result if all Canadians had the same health care utilization and cost patterns as those in the highest income quintile.[†]

In this report, income was used as the proxy measure for SES because data linking health costs to income are more broadly available in Canada than data for other dimensions of SES. However, this approach does not imply that the presence of health care cost differences between income groups is solely due to level of income, or that income (re)distribution is the primary policy lever for reducing health inequalities.

The health care services included in this report were limited to those for which individual-level data were available at the national level: acute care in-patient hospitalizations, prescription medications and physician consultations (general practitioner and specialist). Together, these three services represented about one-quarter of all health care expenditures in Canada in 2007–2008. Expanding available individual-level data would improve the calculation of the direct economic burden of socio-economic health inequalities.

Statistics Canada produced a Technical Report for the health costs by income level project. This report provides further detail about the sources of data used, the development of health cost estimates by income level and the limitations of currently available data. The Technical Report is a useful reference document that should be considered alongside this report. To obtain an electronic copy of this report, please email us at: publications@hc-sc.gc.ca

^{*} Due to considerations regarding available data, there are some exceptions to the use of 2007–2008 as the reference year for the report. For more information, see Section 3 on Data and Methods.

[†] See Figure 4 on page 21 for a graphic illustration of the way the economic burden of socio-economic inequalities in health in Canada was calculated for this report.

KEY FINDINGS

- Total costs by health care component**
 Total age-standardized costs for the three health care services in this report are \$43.8 billion. Acute care in-patient hospitalizations make up half of this amount (50%), prescription medications are 40% and physician consultations are 10%.^{*}
- Socio-economic gradient in health care costs**
 The costs of acute care in-patient hospitalizations and physician consultations generally follow a gradient, meaning that health care costs decline as income rises. Canadians in the lowest income quintile have the highest age-standardized average health care costs.
- Comparing health care cost gradients**
 The difference in health care costs between SES groups is more pronounced between low and middle-income Canadians, than between middle and high-income Canadians.
- Magnitude of the direct economic burden**
 Socio-economic health inequalities impose a direct economic burden of at least \$6.2 billion annually, or over 14% of total expenditures on acute care in-patient hospitalizations, prescription medication and physician consultations.
- Distribution of the direct economic burden**
 Canadians in the lowest income group account for 60% (\$3.7 billion) of the total direct economic burden. Improving the health of the lowest SES group could have a significant impact on the costs of socio-economic health inequalities in Canada.

- Health care cost patterns by sex**
 Health care costs are generally highest in the lowest income quintile for both women and men.
- Health-adjusted life expectancy by income level**
 According to the World Health Organization, **health-adjusted life expectancy (HALE)** is defined as the "average number of years that a person can expect to live in 'full health' by taking into account years lived in less than full health due to disease and/or injury"[†]. The more comprehensive HALE data included in this report revealed a socio-economic gradient: HALE generally declines as income decreases.

CONCLUSION

This report provides the first national-level estimate of the direct economic burden of socio-economic inequalities in health in Canada. The burden is an indication of the magnitude of the costs associated with health inequalities — which in turn speaks to the significance of these inequalities for policy development. A better understanding of the direct economic burden can be helpful in considering the balance of health expenditures between prevention and treatment, as well as investments in other important social supports that facilitate healthy lifestyle choices.

^{*} Differences in costing methods and the population groups covered by the data must be considered when comparing total cost estimates in this report with other cost estimates. For more information, see Section 4.

[†] World Health Organization. Health status statistics: mortality [Internet]. Geneva (CH): World Health Organization; [cited 2016 Apr 11]. Available from: <http://www.who.int/healthinfo/statistics/indhale/en/>

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1. INTRODUCTION

In 2008 the World Health Organization (WHO) released the *Report of the Commission on Social Determinants of Health*.⁴ This report detailed the relationship between health inequalities and social determinants of health, including income, social status, education and literacy, employment and working conditions, childhood experiences and aspects of the physical environment. The Commission called upon governments to act on these social determinants to narrow the gap in health outcomes between those who are the most and the least healthy.

The WHO Commission's report did not include a fully developed economic argument to help governments and researchers assess the levels and types of investments required to achieve this goal. Assessing the economic impacts of health inequalities would provide information to inform the development of policies and programs to reduce these inequalities and improve population health.

A first step towards an improved understanding the economic impact of health inequalities is to estimate the economic burden of ill health associated with these inequalities. However, existing Canadian research on the costs of illness includes little information about the distribution of health care costs across socio-economic groups defined, for example, by level of income or education.⁵

The small number of Canadian studies that do investigate the economic costs of health inequalities related to socio-economic status (SES) have focused on specific health conditions or jurisdictions.⁶⁻¹⁰ These studies generally find that individuals with lower levels of income or education, lower occupational skill levels and lower social standing, tend to be less healthy and use more health care than those who enjoy greater advantages in these areas. This uneven distribution of health across SES groups is often referred to as *socio-economic inequality in health*.

THE OBJECTIVE OF THIS REPORT

The objective of this report is to begin to answer the question: What are the economic impacts of socio-economic inequalities in health in Canada? This report quantifies the magnitude of the economic impact of socio-economic health inequalities on health care expenditures — what is referred to as the *direct economic burden* of socio-economic inequalities in health. The analysis focused on an examination of health care costs incurred in a single year across five income groups (or quintiles), each representing approximately 20% of the Canadian population. Income was used as a proxy for SES because data linking health costs to individual or neighbourhood incomes are more readily derived in Canada than data for other SES measures such as education or occupation.

WHAT IS NEW AND DIFFERENT ABOUT THIS STUDY?

- It is the first Canadian study to use national-level health care cost data by income level.
- It builds on existing Canadian health care cost data by linking costs with socio-economic status (measured by income).
- By considering the distribution of costs across income groups, it provides a more rigorous analysis of the relationship between health and income than previously available research.
- Measuring health costs and income at the individual level allows for more in-depth analysis in the future. Individual-level data held by Statistics Canada can be used to compare population groups, or to analyze factors associated with high or low health care costs.
- Using household income (where possible) allows for more precise sorting of individuals into income quintiles compared to previous studies that relied on average neighbourhood income.

The direct economic burden is an estimate of the reduction in health care costs that might result if all Canadians had the same health care utilization and cost patterns as those in the highest income quintile. The top income group is used as a comparator because this group tends to enjoy the best health and as such, incurs the lowest health care costs. Comparing to an optimal scenario is a common approach in health research, including cost of illness studies,^{5, 11} economic impact studies^{5, 12-14} and calculations of Quality and Disability Adjusted Life Years.¹⁵

This report is unique in that it uses a *bottom-up* approach to compile the national-level health and health cost data needed to calculate the direct economic burden of socio-economic inequalities in health. The bottom-up approach begins with individual-level health data. This approach is distinct from the top-down approach used in most cost of illness studies that relies on total cost figures.^{5, 16} Part of the purpose of this study was to assess whether a bottom-up method could be used to generate the national-level data needed to calculate the direct economic burden.

Individual data allow an assessment of the relationship between health costs and individual-level characteristics (such as income level). This is essential in the analysis of socio-economic health inequalities.¹⁶ As individual-level data are not collected for all health care services, the analysis in this report was limited to the cost of acute care in-patient hospitalizations, prescription medication and physician consultations (general practitioner and specialist). To date, individual data are only available for these three components on a pan-Canadian basis.

It is important to note that estimating the direct economic burden of socio-economic inequalities in health does not necessarily require determining whether the health care utilization and cost patterns of lower-income groups can approximate those of the highest income quintile. Available data do not allow for an analysis of the specific factors that drive existing differences in health care utilization and costs between income groups. As such, this report cannot assess how lower-income groups might achieve similar health costs to those in the highest income quintile, or the policy and program investments that would be needed to achieve this end.

However, assessing the direct economic burden of socio-economic inequalities in health provides a useful starting point for estimating what society might gain if we could reduce these inequalities. These potential gains are much broader than just the possibility of reduced health care system costs. Gains might include the benefits of more productive, creative and healthy individuals who contribute to the economic growth and well-being of society. Articulating these benefits can also help to understand the balance of health expenditures between prevention and treatment, as well as investments in other important social supports that facilitate healthy lifestyle choices.

WHAT IS COVERED IN THIS REPORT?

Section 2, *Health costs and socio-economic status in Canada* briefly outlines the types of costs associated with ill health and existing evidence concerning socio-economic inequalities in health, focusing on income. This section also discusses existing Canadian and international research that connects cost information to socio-economic health inequalities.

Section 3, *Data and methods* describes the three health care cost components included in this study: acute care in-patient hospitalizations, prescription medications and physician consultations. The data sources and methods by which cost estimates by income level were generated are reviewed, along with the approach used to calculate the direct economic burden of socio-economic inequalities in health. Study limitations are outlined.

Section 4, *Key findings* assesses the results of the investigation of national health costs by income level, by sex and for specific age groups. The size of the direct economic burden and its distribution across five population groups with different household incomes is presented.

Section 5, *Discussion* reflects on the significance of the findings in this report and proposes next steps to further advance understanding of the economic impact of socio-economic inequalities in health.

The final section, *Conclusion* briefly summarizes the report.

2. HEALTH COSTS AND SOCIO-ECONOMIC STATUS IN CANADA

This section reviews the range of costs associated with ill health and the existing research that links these costs to socio-economic status (SES). It also discusses socio-economic inequalities in health in Canada, with a specific focus on income. Income is the proxy measure of SES used in this report to analyze differences in health utilization and cost patterns.

THE COSTS OF ILLNESS

There is a wide range of costs associated with illness, disease and injury. In 2009, the Public Health Agency of Canada estimated that the economic burden of ill health in Canada totaled \$188 billion.* Some of these costs are incurred at the individual level because those who are less healthy or who are more likely to be exposed to health risks tend to require more care. However, ill health also has broader economic implications. Disability and premature mortality undermine productivity in the workforce and compromise other important social roles such as caregiving and volunteering. As a result, the costs of ill health are borne not only by individuals and families, but also by Canadian society as a whole through impacts on systems and institutions.

Economists group the costs of illness into three broad categories:

1. *Direct costs* include expenditures within the health care system. They are defined as the value of goods and services for which payment is made and resources used in treatment, care and rehabilitation related to illness or injury.⁵ Direct costs are associated with visits to health practitioners and hospitals, prescription medications, supportive therapies and treatments, home and nursing care, institutionalized care and other similar expenditures.
2. *Indirect costs* are defined as the value of economic output lost because of illness, injury-related work disability or premature death. Indirect costs of ill health are estimated to be at least as high (and often higher) than direct costs.^{5, 17}
3. *Intangible costs* include jeopardized individual well-being or a reduction in health-related quality of life due to ill health.[†] Health has intrinsic value. Therefore, healthy individuals enjoy life more fully in social roles outside of paid work (e.g. parenting, community involvement, leisure activities and home maintenance).

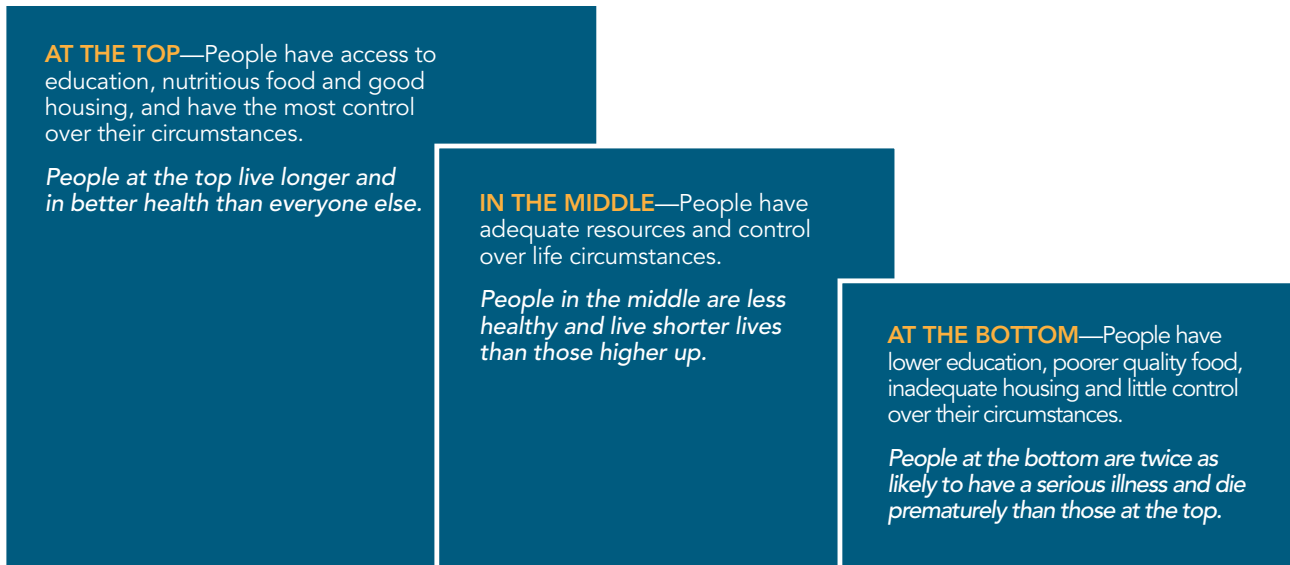
SOCIO-ECONOMIC INEQUALITIES IN HEALTH

Socio-economic inequalities in health are patterns of systematic differences in the health of SES groups. SES is a measure of one's place within broad social and economic hierarchies and is based on indicators such as income, education or occupational skill level.[‡] Socio-economic health inequalities are often presented as a *gradient* in health outcomes. This gradient illustrates the consistent pattern that appears within data on socio-economic inequalities in health: namely, that higher SES groups tend to be healthier than those in groups below them (Figure 1).

* This estimate is in 2000 Canadian dollar terms.

[†] See WHO 2009¹¹ for a discussion of the economic consequences of ill health and WHO 2001¹⁸ for a social model of health.

[‡] SES includes a range of factors such as income or wealth, education, employment, occupational skill level and social class. Although each indicator of SES can be examined individually they are interrelated. Educational attainment can influence one's type of employment and associated job security, wages and social status.^{19, 20} In Canada, data show a strong association between adjusted household income and educational attainment²¹ and between educational attainment and future earnings/retirement income.²²

FIGURE 1: The socio-economic gradient in health

Source: Public Health Agency of Canada. Reducing health inequalities: A challenge for our times. Ottawa: Public Health Agency of Canada; 2011. Available at: <http://nccdh.ca/resources/entry/reducing-health-inequalities-a-challenge-for-our-times>

Canadian and international research has repeatedly confirmed that health generally improves as income increases.^{1,2} Canadians with higher incomes tend to enjoy lower mortality rates,^{23,24} better self-rated health,^{1,25} higher health-adjusted life expectancy³ and lower rates of specific diseases.^{1,26,27} This pattern of improved health is maintained across each incremental gain in income.

One reason for the association between income and health is that the poorer health of some Canadians may itself result in lower levels of income. Ill health or disability can reduce income by compromising the ability to engage in paid work. The financial impacts of short- or long-term disability are acknowledged in publicly financed disability benefits, workers compensation benefits and long-term disability provisions in many private extended health benefit plans.

Conversely, some evidence suggests that living and coping with lower income may itself lead to poorer health by increasing the possibility of ill health, disease or injury.^{19,28–35} One reason may be that lower-income individuals experience greater material disadvantage which prevents them from accessing goods and services that facilitate a healthy lifestyle.²⁰ For example, adequate income is needed to purchase nutritious food and good quality, safe housing.

Material disadvantage may also create barriers to accessing health care services because of inadequate transportation or child care, inability to afford additional out-of-pocket fees or to take time off work for medical appointments.³⁶ There is also growing evidence that children's social, material and physical environments influence their health status and behaviour.^{37–41} Material deprivation during early and middle childhood can have short-term effects and may also influence education and employment outcomes into adulthood.⁴²

Low income may also lead to poor health because lower-income individuals are more likely to experience chronic stress as a result of negative social environments, lower levels of social support and more exposure to stressful events.^{33,43–46} Over time, stress can stimulate physiological responses that directly impair the body's ability to adapt. Stress can also indirectly affect health-related behaviour. For example, attempts to deal with stress may lead to coping behaviours such as overeating, alcohol use, smoking and overspending.*^{31,43,45}

* Stress may also help to explain evidence that weak labour force attachment can itself compromise health and that persistent unemployment has as strong an effect on poor health as persistent poverty.⁴⁷

LINKING THE COSTS OF ILLNESS AND SOCIO-ECONOMIC INEQUALITIES IN HEALTH

Since the early 1990s, Health Canada and the Public Health Agency of Canada have produced a report entitled the *Economic Burden of Illness in Canada* (EBIC). This comprehensive national assessment of the direct and indirect health costs of various diseases and health conditions has consistently documented the high cost of ill health and provided important evidence for health policy and planning. Unfortunately, the method used to compile cost of illness data has not permitted a link between data on direct and indirect health costs and the SES of Canadians.

Similar to many cost-of-illness studies, EBIC utilizes a top-down costing approach. One advantage of the top-down approach is that it requires less detailed data and therefore is computationally less demanding. However, limitations in available data can also lead to challenges. For example, the top-down approach may not be able to consider the role of other risk factors given the absence of cost information by characteristics such as income level.^{16, 48} This means that top-down studies are typically unable to estimate the costs of potentially differential use of health care services by SES.

One alternative to the top-down method is a bottom-up approach. Bottom-up studies begin with information derived from the lowest level of health expenditure (typically individual records) to determine estimates of total costs for particular expenditure groupings.¹⁶ This report is the first in Canada to use a bottom-up approach at the national level to estimate costs associated with acute care in-patient hospitalizations, prescription medications and physician consultations. Other Canadian research that connects health costs with SES has covered only particular regions or jurisdictions and/or particular health conditions.

For example:

- The Manitoba Centre for Health Policy released a report in 2011 on adult obesity in the province using individual-level linked data. Results showed a significant increase in the prevalence of obesity and that socio-demographic factors (e.g. age, sex, education) were closely related to obesity levels, along

with where people lived, and marital and employment status. In contrast, household income was only weakly associated with obesity. With respect to health service usage, the report found that the health care system in Manitoba was not overwhelmed by a demand for services related to obesity because differences in usage between the obese, overweight and normal groups are relatively small.⁷

- In 2010, the Canadian Institute of Health Information (CIHI) examined disparities in hospitalizations for mental health conditions and in-patient visits for conditions that are treatable or controllable with timely and adequate primary care (ambulatory care sensitive conditions).[†] The CIHI study found that 33 to 40% of differences in hospitalization rates were accounted for by variations in hospital use between SES groups. Disparities by SES were generally higher for men than for women. The total cost of SES-related excess hospitalizations was estimated to be \$400 million. Approximately half of this amount was associated with the lowest SES group.⁶
- A 2009 study of health care costs in the Saskatoon Health Region concluded that low-income residents incurred 35% more health care costs[‡] than expected compared to middle- and high-income residents. This amounted to \$179 million in costs for the Saskatchewan health care system that would not have been incurred if those with low incomes had the same health care costs as middle-income residents.⁹
- A discussion paper by the Health Officers Council of British Columbia in 2008 estimated that health inequalities cost the provincial health care system \$2.6 billion annually.⁸ This estimate was based on the assumption that 20% of health care costs can be attributed to health inequalities. This percentage was suggested by the Canadian Advisory Committee on Population Health and Health Security in 2004 to approximate the impact of health inequalities.⁴⁹ A European Union study also estimated that health inequalities accounted for 20% of total health care costs.¹³

[†] The ambulatory care sensitive conditions included in this study were epilepsy, chronic obstructive pulmonary disease, asthma, heart failure and pulmonary edema, hypertension, angina and diabetes.

[‡] In this study, health care costs included hospital costs (including emergency room and day surgeries, but excluded administrative and support costs), prescription medication costs and general practitioner and specialist physician consultation costs.

- An Alberta study used a bottom-up approach in 2006 to estimate health care costs associated with specific adult risk factors (e.g. smoking, physical inactivity) and chronic disease states (heart disease, diabetes and Chronic Obstructive Pulmonary Disease). Just under 75% of the population exhibited one or more risk factors, while almost 11% had one or more of the three chronic diseases considered. Greater health care utilization and costs were observed in groups that exhibited risk behaviours and chronic disease states.¹⁰

Although an absence of pan-Canadian data linking health costs and socio-economic characteristics has limited progress on assessing the degree to which health costs are associated with socio-economic inequalities at the national level, international studies have confirmed that the burden of inequality is high. National-level data on the economic burden of socio-economic inequalities in health are available for the European Union (EU)¹³ and the United States (US).⁵¹

A study of 25 EU countries found that if all individuals enjoyed the same health status as those with higher levels of education, the decline in hospital and physician service usage would be equivalent to approximately €85 billion per year. The potential impact on overall health care costs was estimated at €177 billion (or 1.7% of GDP) annually.¹³ In the US, Dow and Schoeni⁵⁰ found that improving the health and longevity of less-educated Americans to the level achieved by those who attended college would yield an economic impact of \$1.007 trillion annually. Similarly, LaVeist, Gaskin and Richard⁵¹ concluded that health disparities between minority groups (African Americans, Asians and Hispanics) and the white population accounted for direct medical care expenditures of \$229.4 billion from 2003 to 2006. This represented 30.6% of total direct medical care expenditures over this period.

The magnitude of the economic burden of socio-economic health inequalities identified in international studies highlights the importance of estimating this burden in Canada.

THE ROLE OF INCOME IN THIS REPORT

In order to analyze the health care costs associated with socio-economic health inequalities, this report segments the Canadian population by income level and examines the health costs incurred by different income groups.* Income is directly related to material resources or circumstances and is typically expressed as household gross income per number of persons who depend on this income.

Measuring income at the household level tends to assume an even distribution of income according to needs within the household, which may or may not be the case.²⁰ Nevertheless, household income is a commonly used indicator of SES in North America because it is easily measured and because information on income is more widely available than data on other SES indicators such as education or occupation.^{† 25}

When dividing the Canadian population into income groups to assess socio-economic health inequalities, it should be noted that income is used as a *proxy measure* of SES. This does not mean that income is the only relevant dimension of SES, or the only valid measure of socio-economic health inequalities. Nor does it indicate that efforts to reduce the direct economic burden of socio-economic inequalities in health should target income (re)distribution. There is a wide range of policies and programs inside and outside the health sector that affect the SES of Canadians and potentially by extension, their health outcomes.

The fact that there are health cost differences between income groups does not mean that these differences are solely due to level of income. In other words, inter-quintile health-cost variation is not directly attributable to income. Use of acute care hospital services, prescription medications or physician consultations can be shaped by

* The process by which the Canadian population is divided into five income groups (or quintiles) is discussed in Section 3 Data and methods.

† In some instances, wealth may be a better indicator of SES than income. Income captures the resources available at a specific point in time while wealth measures the accumulation of assets over time. The relative importance of wealth versus income will change over the life course. For example, wealth may be a better indicator of SES when comparing individuals who are active in the labour market with retired individuals, given that lower post-retirement incomes may not accurately reflect accumulated wealth.¹⁹ However, data to support a measure of wealth are not as readily available as data on annual income.

many interrelated factors and SES (or more specifically income) is just one. The health care cost estimates included in this report are not adjusted for other factors associated with health care service use, including risk factors (e.g. smoking, obesity) and/or the presence of co-morbid chronic conditions.

In addition, the analysis in this report does not imply that reducing or eliminating differences in income will directly result in reduced health care usage, correspondingly

lower costs and a decreased direct economic burden. The potential for cost savings rests on a hypothetical scenario of altering the health care utilization and cost patterns of lower-income groups to match those of the highest income Canadians. Whether or not such changes can be achieved is a separate question and its answer is tied to assessing the outcomes of policy and program interventions to improve population health.

3. DATA AND METHODS

Defining the scope and analytical approach for this report and compiling the necessary data was a collaborative exercise supported by members of the consortium. This section reviews the data and methods used to generate health care cost estimates and health adjusted life expectancy (HALE) by income level, as well as the method used to calculate the direct economic burden of socio-economic health inequalities. The strengths and limitations of the study are also discussed.

In addition to the information on data and methods provided here, Statistics Canada produced a *Technical Report* for the health costs by income level project.²¹ This report provides further detail about the sources of data used, the development of health cost estimates by income level and the limitations of currently available data. The *Technical Report* is a useful reference document that should be considered alongside this report.

DATA

In Canada, there is no single national data source that covers both health care costs and individual-level characteristics such as income. In order to begin to assess the direct economic burden of socio-economic inequalities in health using a bottom-up approach, Statistics Canada used a range of available data to estimate health care costs by household income level. These data were limited to three health care services: acute care in-patient hospitalizations, prescription medications (non-hospital) and physician consultations (general practitioner and specialist). Together, these sectors represented approximately 26% of all health care expenditures in 2007–2008. Despite the limitations in available data for a broader range of health services, the information compiled by Statistics Canada for this report provides a more rigorous set of data for studying the distribution of health costs by income level than has previously been available in Canada.

A range of data sources were used including health surveys, administrative data and the census. Cross-sectional cost estimates for acute care in-patient hospitalizations, prescription medications and physician consultations were based on health care expenditure data from the *Canadian Community Health Survey* (2007–2008),⁵² the *Canadian Health Measures Survey* (2007–2009),⁵³ the *Discharge*

Abstract Database (2007–2008),⁵⁴ and the *Hospital Morbidity Database* (2005–2006);⁵⁵ and cost information from the *National Prescription Drug Utilization Information System* (2007–2008),⁵⁶ the *National Physician Database* (2007–2008),⁵⁷ and *Hospital Financial Performance Indicators* (2007–2008).⁵⁸ All national cost estimates were grouped by income quintile and were age-standardized.

Income quintiles were generated from information on household income derived from the *Canadian Health Measures Survey* (CHMS)⁵³ for prescription medications and the *Canadian Community Health Survey*⁵² for physician services. Since records from the *Discharge Abstract Database* (DAD)⁵⁴ and the *Hospital Morbidity Database*⁵⁵ (HMDB) did not contain individual-level income information, neighbourhood income data from the 2006 census⁵⁹ was used to generate an area-based income measure for acute care in-patient hospitalizations.

ACUTE CARE IN-PATIENT HOSPITALIZATIONS

The hospital cost estimates in this report include only acute care in-patient hospitalizations. Acute in-patient care accounts for 46.6% of hospital costs and is the largest hospital cost component in Canada.¹⁶ The data do not include the cost of other publicly-funded hospital services such as out-patient care, day surgeries, emergency rooms and care provided at rehabilitative, chronic care and mental health hospitals.

For all provinces except Quebec, information from the DAD and the 2007–2008 *Hospital Financial Performance Indicators* were used to generate the number and cost of acute care in-patient hospitalizations by income level. The HMDB was used for Quebec because of differences in hospitalization data availability and coding. The most recent year Statistics Canada had access to HMDB data was 2005–2006.²¹ Hospitalization data covered individuals of all ages.

PRESCRIPTION MEDICATIONS

CHMS data provided nationally-representative information about prescription medication use and individual-level household income. The cost of prescription medications was estimated using information from the CHMS combined with information from the *National Prescription Drug Utilization Information System* (NPDUIS).⁵⁶

All prescription medications dispensed outside of hospitals were included in the data for this report, including medications paid “out-of-pocket” or through extended health benefit plans. Prescription medication data covered individuals aged 6 to 79 years.

PHYSICIAN CONSULTATIONS

General practitioner (GP) and specialist physician (SP) cost estimates in this study refer to fee-for-service consultations, and exclude procedures and tests provided by physicians, or clinical activities remunerated under alternative reimbursement plans (such as salary and capitation).*

The number of GP and SP consultations per year and the distribution by income level was based on self-reported data from the *Canadian Community Health Survey* (CCHS).⁵² CCHS data included individuals aged 12 years and older. Costs per GP or SP consultation were drawn from the *National Physician Database* (NPDB).⁵⁷

OTHER HEALTH CARE SERVICES

Canadians use a range of health care services in addition to acute care in-patient hospitalizations, prescription medication and physician consultations. Although it is likely these additional services are unevenly distributed across SES groups, they were not included in this report because national-level cost data by SES were unavailable in 2007–2008. The following health services were not included:

- Non-insured health services paid for privately through out-of-pocket fees or extended health plan premiums (except for prescription medications). For example, care provided by other health professionals such as dentists, optometrists, chiropractors and physiotherapists.
- Care provided in other institutions such as nursing homes, long-term care and residential care facilities.

The absence of information on expenditures for these health services affects the calculation of the direct economic burden. For example, higher-income Canadians are generally better able to afford fees for preventive, supportive or treatment services that are not covered by the publicly-funded health care system. Access to these services may delay or reduce the need for acute care in-patient hospitalizations, prescription medication or physician consultation.

Also, services such as out-patient day surgery can be used as a substitute for in-patient hospitalization which means that the use of out-patient services may reduce the use of in-patient care. For example, research suggests that higher SES Canadians make greater use of out-patient day surgery facilities.⁶⁰ Considering only acute care in-patient services may therefore underestimate hospital service utilization (and the associated costs) of higher-income Canadians. An underreporting of costs would bias the results presented in this report.

Including a broader range of health services would expand data on the distribution of health care costs and as a result, improve the calculation of the direct economic burden. This would require expanding the collection of individual-level data on health services and associated costs.

HEALTH ADJUSTED LIFE EXPECTANCY

Statistics Canada also examined mortality and morbidity to estimate health adjusted life expectancy (HALE) by income level for individuals of all ages. HALE is the number of years in full health that an individual can expect to live given current morbidity and mortality conditions. Data to calculate HALE were drawn from the *Canadian Census Mortality Follow-up Study* and census metropolitan areas (CMAs) (to create life tables), and from the CCHS and CHMS (to estimate morbidity).

* In 2007–2008 payments made under alternative payment schemes varied considerably across jurisdictions, ranging from 13% in Alberta to 47% in Nova Scotia and 93% in the Northwest Territories.⁵⁷ Despite the exclusion of these items, the figures compiled by Statistics Canada for this report on costs per physician consultation are believed to be the best currently available in Canada.

METHODS

This report is the first national analysis of the direct economic burden of socio-economic inequalities in three health care services using a bottom-up costing method. A bottom-up approach begins with data from individual records and reports. Health care costs are estimated at the individual level and then combined across expenditure categories to generate total cost estimates. This is in contrast to the more frequently used top-down approach which begins with total cost information for a given type of expense that is broken down into expenditure categories using various techniques.¹⁶

Cost of illness studies that rely on a top-down approach can include a broader range of health services because total cost information tends to be available for many cost categories. However, this information typically lacks individual-level characteristics or identifiers such as common indicators of socio-economic status (e.g. income or education). The inability of a top-down approach to evaluate the relationship between health care costs and individual-level characteristics limits its utility, particularly when assessing health inequalities.²¹ Part of the purpose of this study was to assess the feasibility of using a bottom-up approach to measure the direct economic burden of socio-economic inequalities in health at the national level.

Individual-level costs were weighted (where necessary) and aggregated to the population level to generate national-level cost estimates. For example, since the surveys used to generate prescription medication and physician consultation cost estimates were based on samples of respondents, the data were weighted and aggregated to the 2007–2008 Canadian population, with some exceptions.* The hospital data used in the report is a virtual census of all acute care in-patient hospitalizations, so weighting was unnecessary to generate estimates.

Total health care costs presented in this report were age-standardized using the direct method⁶¹ to the 2006 census⁵⁹ to control for potential differences in the age composition of income quintiles (e.g. a higher number of older people who tend to have higher health expenses).

* Estimates based on the CHMS reflect the household population 2007–2009. Estimates based on the HMDB are for 2005–2006, and are used for Quebec only. For more detailed information on the sources and formulae used to calculate health care costs, see Statistics Canada's Technical Report.²¹

Per capita costs were used to compare across age and sex subgroups. Per capita costs were calculated by dividing total non-age-standardized health care costs by the total number of respondents of the particular age group, sex and income quintile.

DIRECT COSTS BY HEALTH CARE COMPONENT

This section describes the way in which costs were calculated for the three health care components included in the report: acute care in-patient hospitalizations, prescription medication and physician consultations. Caution should be exercised when making direct comparisons between these cost estimates and other analyses of health care costs. Comparisons should consider differences in methodologies (e.g. top-down versus bottom-up) and the populations covered. Details on the benchmarking completed by Statistics Canada for the cost estimates included in this report are described in Section 4: *Key findings*.

ACUTE CARE IN-PATIENT HOSPITALIZATIONS

Information from the 2007–2008 *Discharge Abstract Database (DAD)*⁵⁴ was combined with information from 2007–2008 *Hospital Financial Performance Indicators* (cost per weighted case) to estimate the cost of acute care in-patient hospitalizations by income level. Counts of hospitalizations for Quebec residents were calculated from the 2005–2006 *Hospital Morbidity Database (HMDB)*,⁵⁵ multiplied by the average cost of the corresponding age, sex and income quintile categories calculated for non-Quebec records.

Hospitalization cost estimates account for both the number of hospital patient-days and the intensity of care received while in hospital. Each hospital discharge record includes a resource-intensity weight (RIW) representing the anticipated resource use of each patient within a clinically similar group of patients. In order to estimate the cost of acute care in-patient hospitalizations, the RIW was multiplied by the average cost per weighted case (CPWC) value corresponding to the province or territory (excluding Quebec) in which the hospital stay occurred. The CPWC for the Yukon was used to estimate costs for hospitalizations occurring in Nunavut and the Northwest Territories.

Resource Intensity Weighted (RIW) hospital discharges*

Data source: *Discharge Abstract Database (DAD) 2007-2008*



Cost per Weighted Case (CPWC)

Data source: *Hospital Financial Performance Indicators 2007-2008*

*Calculations and data source/year were modified for Quebec records due to differences in data availability.

It is likely that this approach to calculating acute care in-patient hospitalization costs underestimated the direct cost of hospital care, given that physician fees associated with the hospital service were not captured.[†]

PRESCRIPTION MEDICATIONS

In order to estimate the annual cost of prescription medications by income level, nationally-representative, person-specific *Canadian Health Measures Survey (CHMS)*⁵³ data on prescription medication use were combined with *National Prescription Drug Utilization Information System (NPDUIS)*⁵⁶ data on the estimated average daily cost of medications. Daily costs were calculated by applying Drug Identification Numbers (DIN) to the utilization information supplied by CHMS

respondents.[‡] Estimated total annual prescription medication costs were generated by multiplying typical daily costs by 365 (days). This approach did not assume that the same individual took the medication for the entire year. The estimate represents the number of individuals at the population level who took a medication on a given day. Survey weights were used to ensure that estimates were representative of the Canadian household population.

Due to the small sample size of the CHMS, there was significant variation in prescription medication cost estimates. The reliability of these data will improve as additional years of CHMS data collection take place.

{ Number of people currently (today/ yesterday) taking medication by DIN

Data source: *Canadian Health Measures Survey (CHMS) 2007-2009*



Estimated average daily cost by DIN of beneficiaries who claimed at least one day's supply

Data source: *National Prescription Drug Utilization Information System (NPDUIS) 2007-2008*

} X 365

[†] Physician remuneration costs were not captured because of the challenge of compiling national level information on these costs given the different ways in which physicians are paid (e.g. some physicians are compensated under an alternative payment plan, while others are compensated on a fee-for-service basis). A more comprehensive estimate of direct hospital costs would also include physician fees associated with the hospital stay ⁶².

[‡] Cost information was unavailable for approximately one-quarter of DINs. To minimize the extent of missing cost information, imputation was used whereby the average costs of related drugs sharing the same Active Ingredient Group (AIG) were substituted.²¹

PHYSICIAN CONSULTATIONS

Data from the 2007–2008 *Canadian Community Health Survey* (CCHS)⁵² were combined with information from the *National Physician Database* (NPDB)⁵⁷ to estimate the cost of general practitioner and specialist physician consultations by income level. The CCHS provided nationally-representative physician consultation data by income level of the patient. The NPDB provided the associated average costs of the consultations in the Canadian health care system. Counts of physician consultations were produced from the CCHS using data weighted to the 2007–2008 Canadian population.

CCHS data are self-reported by respondents and individual characteristics can affect their ability to accurately recall and report health system contacts. For example, research has found that males with lower SES, in poorer health or aged 75 years and older, have more difficulty accurately recalling health service use.^{63,64}

DEFINING INCOME QUINTILES

Health cost estimates were grouped into nationally-defined income quintiles, each representing 20% of the Canadian population. Household income was adjusted by household size using an equivalence scale to represent individual income. To calculate income quintiles, adjusted household income equivalents were ordered from lowest to highest. The distribution was then divided into five equal groups, each containing approximately one-fifth of records. Quintile 1 refers to the lowest income 20% of the Canadian population, while quintile 5 refers to the highest income 20%.* Efforts were made to ensure as much consistency as possible even though data availability required the use of different sources for income information across the three health care services included in the report.

Number of general practitioner/
specialist physician consultations

Data source: *Canadian Community Health Survey (CCHS) 2007-2008*



Average cost per consultation/visit

Data source: *National Physician Database (NPDB) 2007-2008*

For acute care in-patient hospitalizations, household income was defined using an area-based approach because hospitalization records do not contain individual-level information on household income. Average neighbourhood income data from the 2006 census⁵⁹ were linked to hospital data by means of a patient's postal code, allowing hospital records to be assigned to an income quintile.

* In order to minimize the impact on final cost estimates, household income quintiles derived from area-based incomes were substituted for the 5% to 16% of the CCHS and CHMS records used in the prescription drug and physician consultation cost estimates which were missing household income and/or household size.

For physician consultations and prescription medications, a “person income” was defined as self-reported pre-tax household income from all sources adjusted by an equivalence scale to account for differences in household size. The source of income information for prescription medications was the CHMS. Approximately 95% of CHMS respondents self-reported their household income (exact or interval), which was then adjusted for household size to represent individual income. Remaining respondents were assigned an area-based income measure (average neighbourhood income).

Income quintile information for physician consultations was derived from the CCHS. Approximately 85% of CCHS respondents self-reported their household income (exact or interval), which was then adjusted for household size to represent individual income. As with prescription medications, remaining respondents were assigned an area-based income measure.

The use of area-based approaches for income measurement is an accepted practice in health research.^{23, 65, 66} There is evidence that gradients derived from area-based versus individual-based approaches are similar, although gradients in area-based studies tend to be less steep.^{67–69} However, individual-level information does permit more precision in the construction of income quintiles compared to the area-based approaches used in previous studies.^{1, 3, 6}

Table 1 presents the nationally-defined upper income boundaries for each income quintile based on CCHS data. Although these upper income boundaries are directly attributable only to physician consultations (and may differ slightly from the quintile boundaries for hospitalizations and prescription medications) they provide useful representative information about the income groups analyzed in this report.

In order to help interpret income quintiles, Statistics Canada provided population profile information for the members of each group that included socio-demographic and health status characteristics based on CCHS 2007–2008.²¹

- **Sex:** Higher-income quintiles contain a greater proportion of males. For example, males are overrepresented compared to females in the two highest income quintiles (51.8% in quintile 4 and 54.5 % in quintile 5).
- **Marital status:** Members of lower-income quintiles (1, 2, 3 or 4) are more likely to be single, separated or divorced.
- **Education:** Higher income level groups contain a greater the proportion of individuals who report achieving higher levels of education.
- **Home ownership:** Owning a home is strongly associated with income. While only about 50% of those in the lowest income quintile report owning a home, the rate increases to 90% among Canadians in the highest quintile.

TABLE 1: Upper boundaries of nationally-defined income quintiles[†]

QUINTILE 1	QUINTILE 2	QUINTILE 3	QUINTILE 4	QUINTILE 5
\$21,000	\$34,286	\$47,059	\$65,217	No limit

[†] Source: Canadian Community Health Survey, 2007–2008.⁵² These national level income cut-offs do not take into account income differences between provinces. Quintiles represent per-person income equivalents, calculated based on reported annual pre-tax household income, and adjusted for household size using an equivalence scale. For example, quintile 5 includes single-person households reporting incomes of more than \$65,217, two-person households reporting incomes over \$91,304, or three-person households reporting incomes over \$110,869.

- **Health and health behaviours:** Individuals in the lower-income quintiles are more likely to:
 - Be exposed to second-hand smoke and/or to be smokers.
 - Have lower levels of physical activity.
 - Have higher rates of hospitalization in the last 12 months.
 - Have higher rates of doctor-diagnosed chronic diseases, such as diabetes or high blood pressure.

CALCULATING THE DIRECT ECONOMIC BURDEN

To estimate the direct economic burden of socio-economic inequalities in health, average expenditures for the lower-income quintiles (quintiles 1–4) were compared to expenditures for the highest income quintile (quintile 5). The direct economic burden was then estimated as the sum of the differences in age-standardized health care costs between quintile 5 and each of the other quintiles.

All economic impact studies must measure the current or future economic burden against an alternative scenario (or counterfactual). This counterfactual provides the comparator situation against which the burden can be calculated.¹¹ In this report, the counterfactual assumed that direct health costs could be reduced if all Canadians experienced the same health care utilization and cost patterns as the highest income quintile. The top quintile was used as the reference group for this hypothetical scenario because on average, the members of that group have the best health status. Enjoying better health means that this group generally needs and uses fewer of the health care services considered in this report and therefore, incurs the lowest health care costs.

Using the best possible scenario as the comparator is a common approach in cost of illness studies that typically measure potential savings resulting from the complete absence of particular health conditions.^{5, 11} This approach has also been used in other economic impact studies, including assessments of the economic impact of health inequalities.^{12–14} Comparing to an optimal state also underlies calculations of Quality and Disability Adjusted Life Years.¹⁵

As with traditional cost of illness studies, estimating the direct economic burden of socio-economic health inequalities does not imply that this burden could decline to zero by reducing or eliminating health inequalities. Similarly, burden studies in general are not designed to assess the costs or benefits of particular policy or program interventions. The burden estimate provided in this report speaks to the magnitude of the costs associated with socio-economic health inequalities in Canada and as such, to their significance as a consideration in policy and program development.

HEALTH ADJUSTED LIFE EXPECTANCY (HALE) BY INCOME LEVEL

HALE uses the Health Utility Index (HUI) to weight years lived in good health higher than years lived in poor health. Thus, HALE measures both quantity of life and quality of life.⁷⁰

Life expectancy represents the number of years a person is expected to live if the sex, province and/or income quintile specific mortality rates for a given observation period (such as a calendar year) are held constant over the estimated life span. Life tables were built for each sex and income quintile combination using information from the *Canadian Census Mortality Follow-up Study*²⁴ for individuals aged 25 years or older, and from data for 27 census metropolitan areas (CMAs) for those under 25 years.²³

Information from the CCHS and CHMS were used to estimate morbidity measured as health-related quality of life (HRQL), using the Health Utility Index Mark 3 (HUI3).⁷¹ HUI3 measures eight basic domains or attributes of health status (vision, hearing, speech, ambulation, dexterity, emotion, cognition and pain) to synthesize both quantitative and qualitative aspects of health.

STUDY LIMITATIONS

There are a number of limitations to the data and methods used in this report. For more information, see the *Statistics Canada Technical Report*.²¹

- Health care service coverage:** As outlined above, a number of services were excluded from the health care cost data. This likely affected the calculation of the direct economic burden because the use of certain excluded services can decrease use of the services considered in the report. In addition, excluded services may be utilized at different rates by each socio-economic group. The estimate of the direct burden would have been improved if the available data had permitted consideration of a more comprehensive range of health care services.
- Age groups excluded:** CMHS data (for prescription medications) include only individuals aged 6 to 79 years. According to the 2006 census,⁵⁹ more than 1.1 million Canadians were aged 80 years or older, while another 2 million were aged 0 to 5 years. CCHS data (for physician consultations) exclude individuals under 12 years old. The exclusion of these age groups likely resulted in an underestimate of health care costs for all income quintiles.
- Populations excluded:** Both physician consultation and prescription medication data are currently collected only from household residents. As well, the CHMS and CCHS exclude certain population groups, such as members of Canada's Armed Forces, residents of institutions, individuals living on Indian reserves or in other Aboriginal settlements and residents of some remote areas. Several of these excluded populations likely contain a disproportionate number of low-income individuals. This may have resulted in an underestimate of health care costs for the lower-income quintiles.
- Racial and ethnic groups:** The data used in this report do not capture differences in health care costs between racial and ethnic groups. There was therefore, no opportunity to consider the cost implications of health inequalities experienced by vulnerable groups (such as Aboriginal populations). Similarly, the data did not support a discussion of the impact of ethnic or racial identity on access to health care services.
- Relationships between health and income:** The data on health care costs by SES presented in this report represent a single point in time. This prevented analysis of whether an individual's SES determined his or her health, versus the opposite causal relationship. As discussed in Section 2, there is evidence to suggest that health status is directly influenced by socio-economic position. Nevertheless, this study did not infer causation.
- Aggregate-level data:** The data in this report are at an aggregate level. Other than socio-economic position (represented by income), these data could not be used to isolate the various factors that may have influenced health care utilization and associated costs. These factors include lack of access to health services (due to geographic isolation or time/resource constraints) and health choices or behaviours that tend to increase health risks (such as smoking or physical inactivity). Some of these factors are likely influenced by socio-economic position.
- Cross-sectional nature of the data analysis:** Although a reduction in socio-economic inequalities in health is a desirable public health goal, its consequences with respect to health care costs are not straightforward. Although the economically disadvantaged have increased health care costs, they also live shorter lives on average. This may result in higher health care costs over the life course. This long term effect was demonstrated in a study of health care costs among smokers and non-smokers.¹⁰⁰

4. KEY FINDINGS

This section presents key findings on health and health care costs by income level in Canada including the distribution of health costs across five income groups and the estimated direct economic burden of socio-economic health inequalities.

TOTAL COSTS BY HEALTH CARE COMPONENT

Table 2 outlines the total age-standardized costs for the three health care services included in this study. It is

important to note that all health care cost estimates are at the national level and were age-standardized to the 2006 census.⁵⁹ Age-standardization ensured that cost differences did not reflect variability in the age composition of income quintiles (e.g. a higher number of older people who tend to have higher health expenses).

Caution should be exercised when making direct comparisons between total cost estimates in this report and other health care cost analyses. Comparisons should consider methodological differences (e.g. top-down versus bottom-up) as well as differences in the populations covered.

TABLE 2: Age-standardized costs by health care component

HEALTH CARE SERVICE COMPONENT	AGE-STANDARDIZED COSTS (MILLIONS)	
	\$ (% OF TOTAL)	95% CONFIDENCE INTERVAL
Acute in-patient hospitalizations	\$22,048.7 (50%)	N/A
Prescription medications	\$17,399.4 (40%)	\$15,722.8–19,076.0
Consultations with:		
– General practitioner physician	\$2,760.5 (6%)	\$2,719.2–2,801.7
– Specialist physician	\$1,597.9 (4%)	\$1,541.5–1,654.3
Total — all components	\$43,806.5	\$42,311.1–45,301.8

It is possible to compare the total unadjusted hospitalization cost estimate in this report (\$17,054.5 million excluding Quebec) with the estimate developed by the Canadian Institute for Health Information (\$17,046.6 million excluding Quebec) in *The Cost of Acute Hospital Stays by Medical Condition in Canada*.¹⁶ Both estimates used individual records, common data sources and bottom-up costing approaches. As well, both studies were limited to services provided in acute care hospitals. By contrast, because of differences in methodology and the population covered, the hospital costs in this report cannot be directly compared to CIHI figures in *National Health Expenditure Trends, 1975–2010*.⁷² CIHI's estimate was generated using a top-down approach and as such included a broader range of hospital services (e.g. emergency and out-patient services) and types of hospitals (e.g. those providing extended or chronic, rehabilitative, convalescent, or psychiatric care).

Similarly, total unadjusted prescription drug cost figures in this report (\$17.4 billion) are lower than those from two other sources: \$22.0 billion in *Drug Expenditure in Canada, 1985–2009*⁷³ and \$19.0 billion in *The Canadian Rx Atlas*.⁷⁴ These comparator studies included groups who were excluded from this report: people aged 80 years or older, the institutionalized population and children under 5 years old. These excluded groups account for approximately 15% of total prescription medication costs in Canada.^{75–77} When the comparator estimates are reduced by 15%, they fall within the 95% confidence intervals for prescription medication costs presented in this report.

The unadjusted costs presented in this report for general practitioner (\$2.7 billion) and specialist practitioner (\$1.6 billion) consultations are far below CIHI's physician cost estimate (\$22.9 billion) reported in *National Health Expenditure Trends, 1975–2010*.⁷² The CIHI figure included a much broader range of physician services due to the use of a top-down costing approach. As well, the CCHS (the primary data source for physician costs in this report) excludes some heavy-user groups, such as the institutionalized population,⁷⁸ people living on reserves^{79, 80} and children under 12 years old.⁸¹

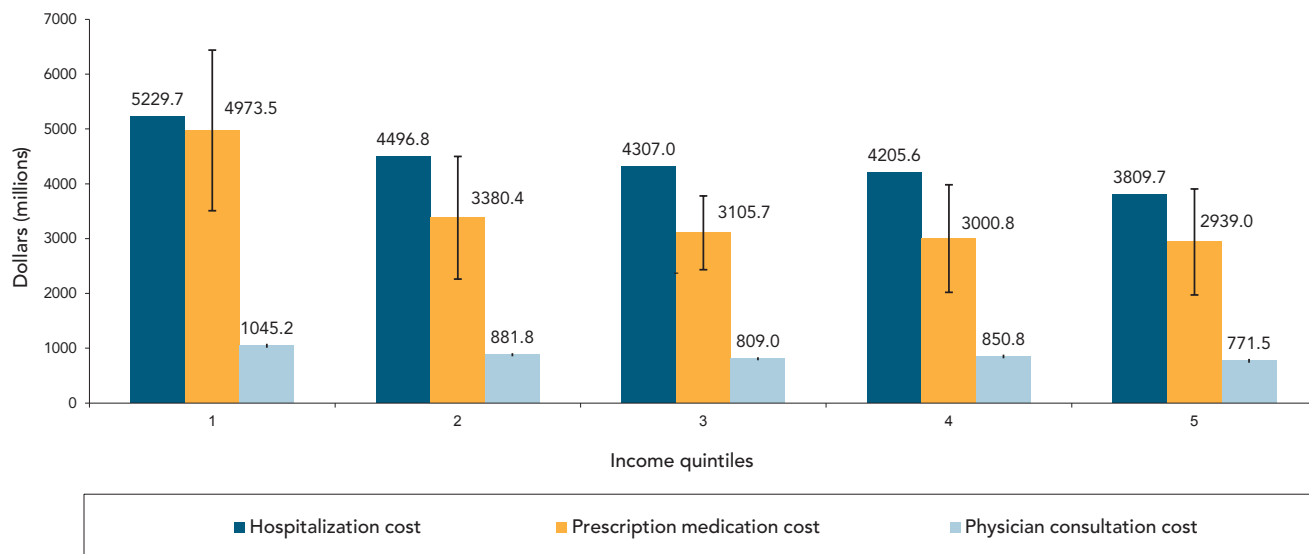
SOCIO-ECONOMIC GRADIENT IN HEALTH CARE COSTS

The data in this report indicate that the lowest income 20% of Canadians (quintile 1) have the highest age standardized costs for hospitalizations and physician services. The highest income 20% of the population (quintile 5) incurs the lowest costs. The age-standardized prescription medication costs for quintile 1 are statistically higher than for quintiles 3, 4 or 5.

These findings are consistent with other Canadian research that has identified a relationship between socio-economic status (SES) and health care utilization and costs (see Curtis and MacMinn⁸² for an overview; Kephart et al.⁸³ for Nova Scotia; Lemstra et al.³⁰ for Saskatoon region). As discussed in Section 2, this relationship follows a pattern, often referred to as the socio-economic gradient. Those with lower SES often have poorer health and therefore, tend to need and use more health care services.^{36, 84} Lemstra et al.⁹ and Dunlop, Coyte and McIsaac⁸⁵ also found that Canadians with lower SES are more likely to have higher health care utilization even after controlling for differences in rates of disease.

Acute care in-patient hospitalization costs for the lowest income quintile totaled \$5.2 billion, which is 37% higher than the costs of quintile 5 and 21% higher than the costs of quintile 3. This finding is consistent with other Canadian evidence that lower-income groups are more likely to use hospital services than those with higher SES and once in hospital, tend to spend more days there.^{1, 9, 72, 86–88}

FIGURE 2: Age-standardized annual health care cost by component



Note: Vertical error lines (whiskers) show the 95% confidence interval.

Prescription medication costs for quintile 1 are estimated at almost \$5 billion, compared to \$3.1 billion for quintile 3 and \$2.9 billion for quintile 5. This finding is consistent with conclusions from other Canadian research. For example, a Saskatchewan study found that low-income groups were 36–45% more likely to receive prescriptions compared to middle- and high-income groups.⁹ Similarly, a study from Manitoba found that low-income elderly residents comprised a growing share of “high-cost users” of prescription medications. These high-cost users accounted for 5% of the population that takes prescription medications, and incurred 41% of the total expenditures.⁸⁹

Physician consultation costs (general practitioner and specialist) for the lowest income quintile are estimated at over \$1 billion per year for 2007–2008. This is higher than estimates for all other income quintiles. On average, Canadians in the lowest income quintile incur 35% more physician costs than those in quintile 5 and almost 19% more than those in quintile 2.

There are differences across income groups in general practitioner (GP) physician consultations versus consultations with specialist physicians (SP). For example, GP services are used more by those in lower-income quintiles compared to more affluent groups. There is no prominent pattern in SP use across income groups, though the data do indicate that the lowest income group incurs higher SP costs than any other income group.*

The data in this report support the general conclusion found in Canadian research that GP services and associated costs tend to be higher for lower SES groups.⁹⁰ Lemstra et al.⁹ nuanced this conclusion by pointing to inequality in initial physician contact. They found that low-income residents of Saskatoon were 5 to 7 % less likely to visit a physician over a one-year period compared to middle and high-income residents. Yet once this first contact was made, low-income individuals were much heavier users of physician services.

* Specialist practitioner consultation cost differences between quintiles 1 and 2, quintiles 1 and 3 and quintiles 1 and 5 are statistically significant.

Evidence from existing literature about the distribution of SP costs across income groups is mixed. It is therefore not surprising that no clear pattern emerges in the data in this report. For example:

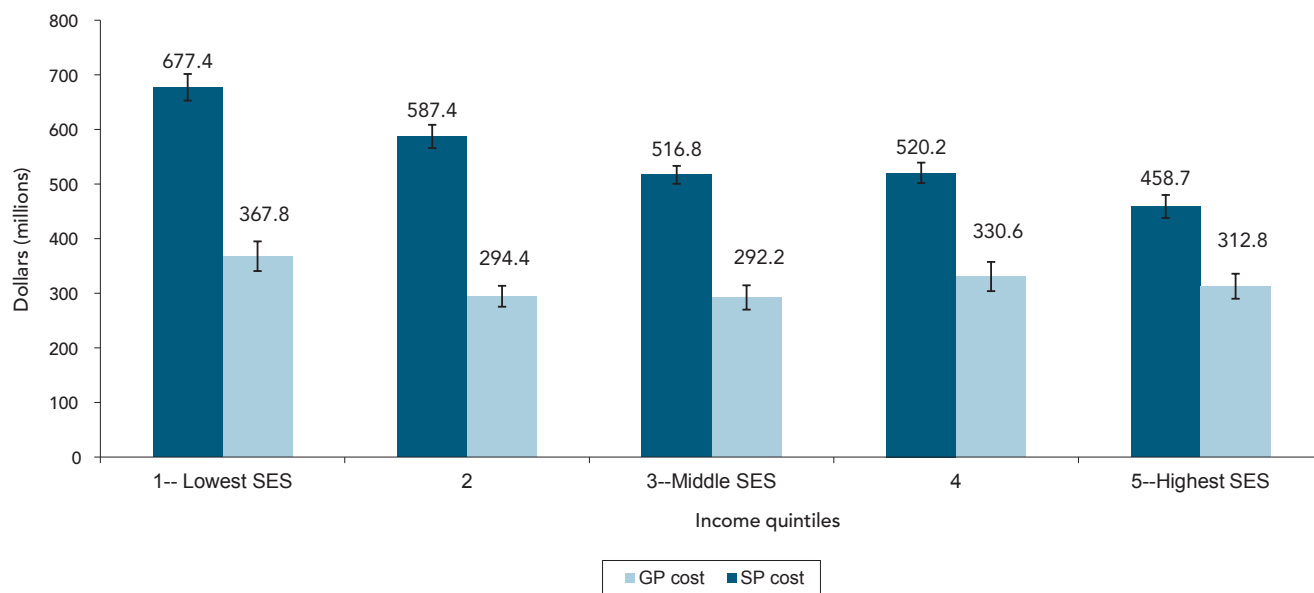
- Dunlop et al.⁸⁵ (using the 1994 National Population Health Study) and Curtis and MacMinn⁸² (using data from several sources between 1978 and 2003[†]) found that SP care is used more often by higher SES groups than by lower SES groups in Canada.
- Veugelers and Yip³⁶ (for Nova Scotia) and Roos and Mustard⁸⁷ (for Manitoba) found no significant

differences in SP use across income groups despite the observation that lower-income individuals are generally expected to have a greater need for care.

- Finkelstein⁹¹ found that lower-income groups in Ontario have higher SP care expenditures compared to higher-income groups.

There are several factors that may explain this inconclusive evidence, including differences in SP use between men and women and across age groups. In addition, some SP services may be used more often by lower-income groups and others by higher-income Canadians.

FIGURE 3: Age-standardized annual costs of general practitioner and specialist consultations



Note: Vertical error lines (whiskers) show the 95% confidence interval.

[†] Data sources: The 1978 *Canada Health Survey*, the 1985 and 1991 *General Social Survey*, the 1994 and 1998 *National Population Health Survey* and the 2001 and 2003 *Canadian Community Health Survey*.

COMPARING HEALTH CARE COST GRADIENTS

The unequal distribution of health care costs is generally more pronounced between low- and middle-income Canadians than between middle- and high- income Canadians. The cost ratios presented in Table 3 compare the low- to middle-income gradient in health care costs with the middle- to high-income gradient. The 1.37 ratio

between the total costs of quintile 1 compared to quintile 3 indicates that the lowest income Canadians incur 37% more costs than middle-income Canadians. By comparison, there is no statistically significant difference between the total costs in quintile 3 compared to quintile 5. For each health care service component, Table 3 shows that the cost differences between the middle and high-income quintiles are smaller (or not statistically significant) compared to the cost differences between low- and middle-income groups.

TABLE 3: Age-standardized cost ratios

HEALTH CARE SERVICE COMPONENT	COST RATIO OF LOW- TO MIDDLE-INCOME (Q1–Q3)	COST RATIO OF MIDDLE- TO HIGH-INCOME (Q3–Q5)
Acute care in-patient hospitalizations	1.21	1.13
Prescription medications	1.60	N/A*
Consultations with:	1.29	N/A*
– General practitioner physicians	1.31	1.13
– Specialist physician	1.26	N/A*
Total — all components	1.37	N/A*

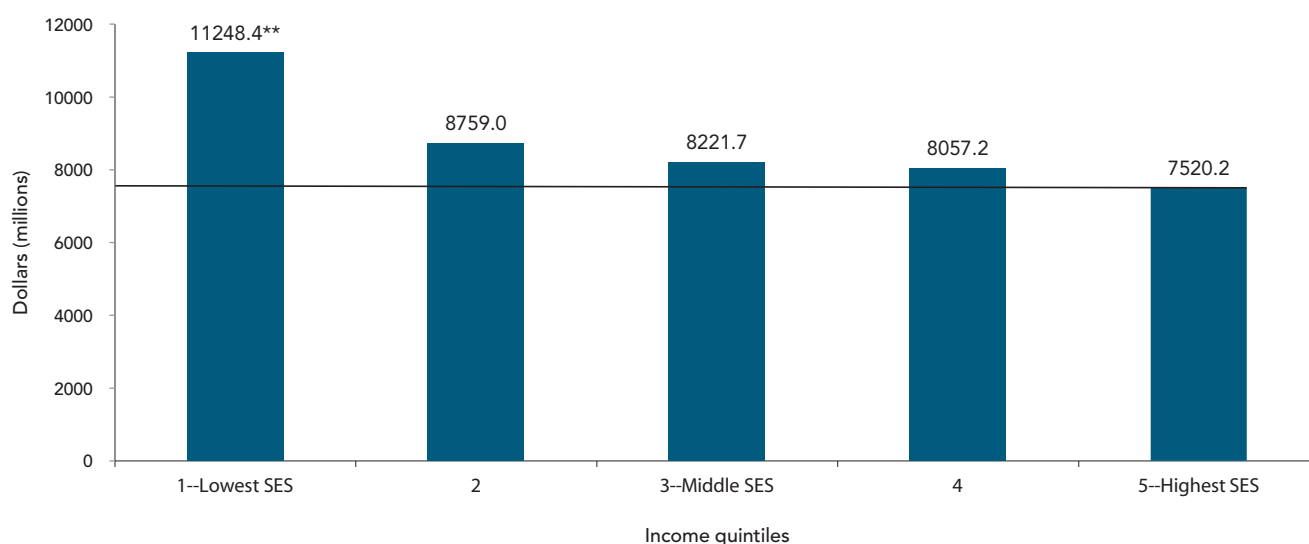
* The costs of respective quintiles are not statistically significantly different from each other.

MAGNITUDE OF THE DIRECT ECONOMIC BURDEN

Socio-economic inequalities in health impose a direct economic burden of at least \$6.2 billion, or over 14% of total annual expenditures on acute care in-patient hospitalizations, prescription medications and physician consultations. This is equivalent to \$190.50 per capita annually. The magnitude of the direct economic burden is illustrated in Figure 4 in the area above the horizontal line.

As outlined in Table 4, the estimated direct economic burden of \$6.2 billion exceeds the total 2008 public sector health expenditures for each of six provinces (Prince Edward Island, Newfoundland, New Brunswick, Nova Scotia, Saskatchewan and Manitoba). It is also greater than the combined 2008 public sector health expenditures of the three territories.

FIGURE 4: Estimated direct economic burden in total age-standardized health care costs*



Note: Vertical error lines (whiskers) show the 95% confidence interval.

* Health care cost is a sum of costs associated with acute care in-patient hospitalizations, prescription medications and physician consultations (general practitioner and specialist) incurred in a single year.

** Indicates a statistically significant difference between the cost of the given quintile and the cost of quintile 5 at the 95% confidence level.

TABLE 4: Public sector health expenditures by province/territory, 2008*

PROVINCE/TERRITORY	PUBLIC SECTOR HEALTH EXPENDITURES (\$ BILLIONS)
Prince Edward Island	\$0.5
Newfoundland	\$2.1
New Brunswick	\$2.8
Nova Scotia	\$3.6
Saskatchewan	\$4.1
Manitoba	\$4.9
Alberta	\$14.4
British Columbia	\$15.7
Quebec	\$25.6
Ontario	\$45.7
Territories	\$0.87

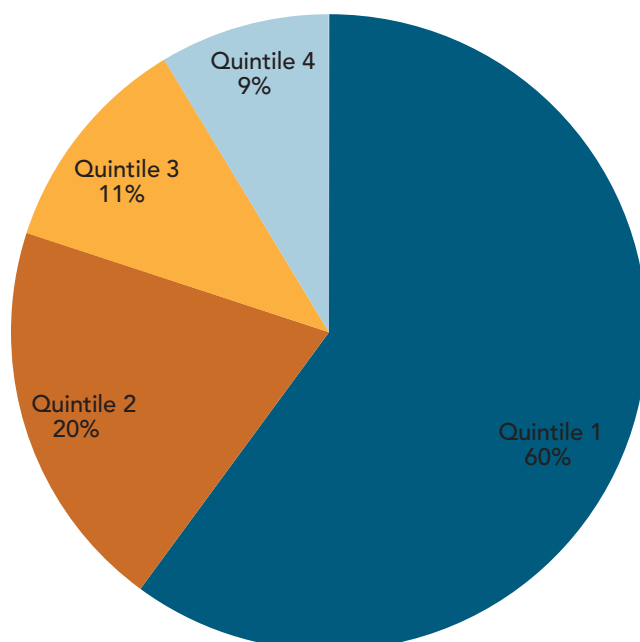
* Source: CIHI, *National Health Expenditure Trends, 1975 to 2010*.⁷² p. 27.

DISTRIBUTION OF THE DIRECT ECONOMIC BURDEN

As shown in Figure 5, the lowest income quintile contributes 60% of the \$6.2 billion total burden. The lowest income quintile generates the largest portion of total age-standardized costs for acute care in-patient hospitalization, prescription medications and physician consultations.[†]

Age-standardized health care costs for the lowest income quintile are estimated at \$11.2 billion compared to \$7.5 billion for those in the highest income quintile (Figure 4). This \$3.7 billion difference between the lowest and highest income quintiles represents the contribution of the lowest income quintile to the direct economic burden of socio-economic health inequalities.

[†] The health care cost difference between quintile 1 and quintile 5 is statistically significant. There is no statistically significant difference between the cost incurred by each of the other quintiles and quintile 5.

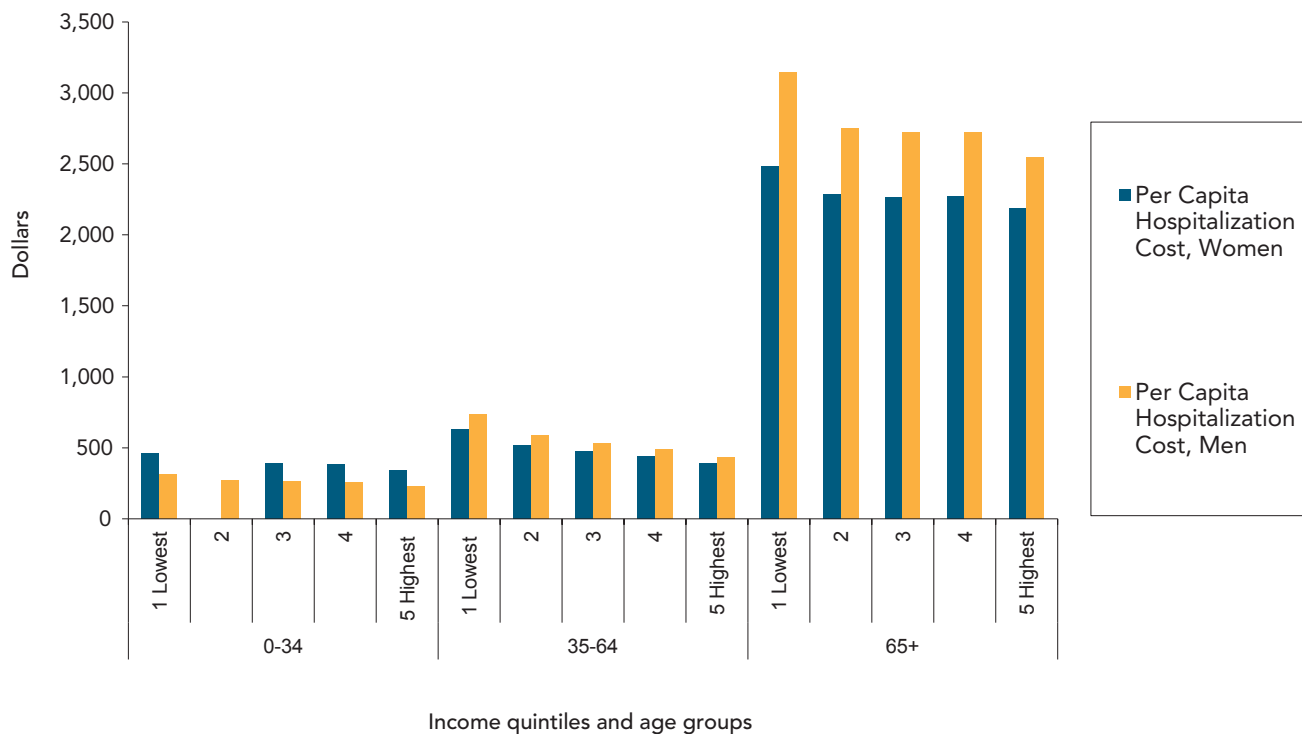
FIGURE 5: Contribution of quintiles 1–4 to the total direct economic burden

HEALTH CARE COST PATTERNS BY SEX

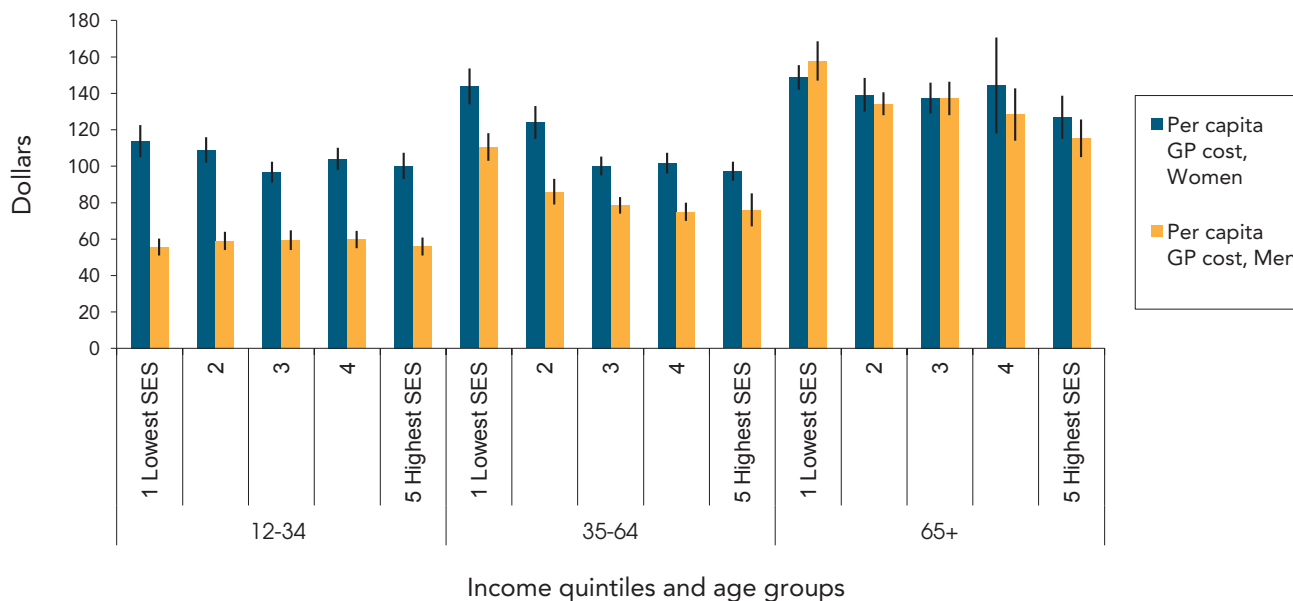
The pattern of health care cost distribution across income quintiles persists in per capita[‡] results by sex. The lowest

income quintile has the highest per capita costs for acute care in-patient hospitalizations and GP consultations for both men and women. Per capita hospitalization costs and GP consultation costs for both men and women decrease as income rises for each age category with few exceptions (Figures 6 and 7).

FIGURE 6: Per capita hospitalization cost by age and income



[‡] When comparing subgroups, it is necessary to rely on per capita costs rather than total costs to account for the number of individuals in each sex/income/age subgroup. Per capita costs are derived from the data directly (e.g. for survey data, total non-age-standardized costs for each group were divided by the weighted number of survey respondents in that group to obtain the per capita cost).

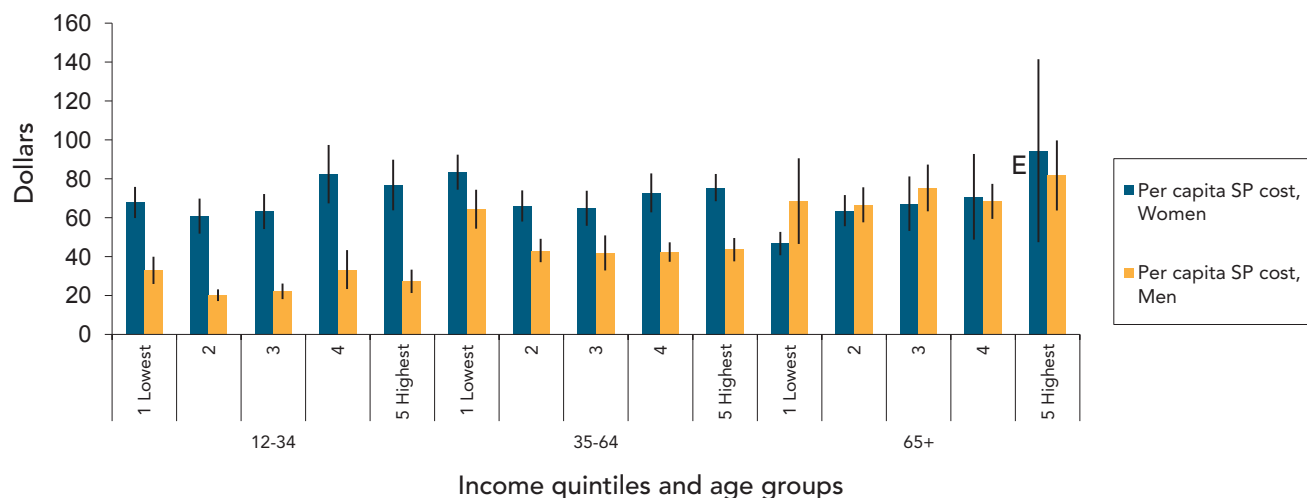
FIGURE 7: Per capita general practitioner consultation cost by sex and age

Note: Vertical error lines (whiskers) show the 95% confidence interval.

As illustrated by Figure 8, it is difficult to detect an overall pattern of SP utilization and associated costs by sex. Per capita SP costs for women are generally higher in more affluent groups compared to those with lower incomes. This is particularly pronounced for those aged 65 years and older.

On a per capita basis, women generally utilize more hospital, GP or SP care than men (Table 5). However per capita hospitalization costs by age group are higher for men in all but the 0 to 34 year age category. This is the age when women are more likely to receive pregnancy and childbirth related health care. Women's higher consumption of physician services and hospital care compared to men's is at least partially explained by their need for reproductive health services.^{92, 93}

FIGURE 8: Per capita specialist consultation cost by sex and age



Note: Vertical error lines (whiskers) show the 95% confidence interval. The letter “E” indicates that the estimate is made with caution due to high sampling variability associated with this estimate.

TABLE 5: Comparison of per capita annual costs, men and women, dollars

SEX	ACUTE CARE IN-PATIENT HOSPITALIZATION		GENERAL PRACTITIONER CONSULTATION		SPECIALIST CONSULTATION	
	Per capita cost	95% CI	Per capita cost	95% CI	Per capita cost	95% CI
Women	\$724	N/A	\$115*	\$113–117	\$70*	\$67–73
Men†	\$695	N/A	\$81	\$79–83	\$42	\$40–45

† Reference category

* Significantly different from estimate for reference category (p < 0.05).

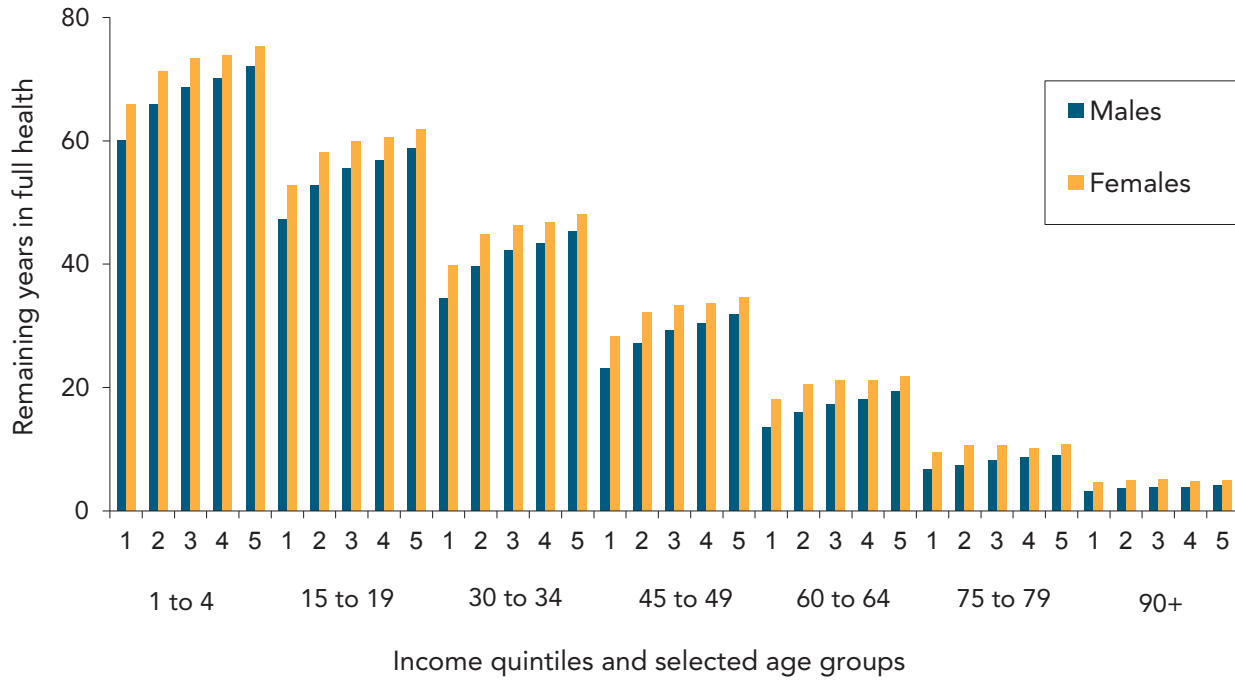
HEALTH ADJUSTED LIFE EXPECTANCY BY INCOME LEVEL

This study compiled new Canadian data on Health Adjusted Life Expectancy (HALE) by income level. HALE is a measure of overall population health that takes into account the effects of illness and disability on quality of life. It considers both the number of years of life anticipated as well as the quality of those years based on an individual’s health status. HALE data used in this study included children and young adults, whereas previously published Canadian studies contain HALE only for adults 25 years or older (e.g. McIntosh, Finès and Wolfson³).

The HALE data in Figure 9 reveal a socio-economic gradient, with HALE generally declining as income decreases (from quintile 5 to quintile 1). This gradient is present in each selected sex and age group with the exception of those aged 90 years or older.

Although a gradient pattern in HALE clearly persists across the population, income may be exerting a stronger effect on those at the bottom. The gap in HALE tends to be smaller between middle- and high-income households (from quintile 3 to 5), than it is between low- and middle-income households (from quintile 1 to 3).

FIGURE 9: Health adjusted life expectancy (HALE) by sex and age group*



5. DISCUSSION

The findings in this report demonstrate that health inequalities are costly to the health care system. They create a total direct economic burden of \$6.2 billion annually (or \$190.50 per capita). This amount exceeds the 2008 public sector health expenditures for each of the provinces of Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Manitoba, Saskatchewan and the combined expenditures in all three territories.

Canadians in the lowest of the five income groups considered in this report account for 60% (or \$3.7 billion) of the total direct economic burden. These Canadians generally experience higher levels of disease, illness and injury than those with higher incomes, and therefore need and utilize more health care services. This finding is consistent with other Canadian research on socio-economic status (SES) and health care utilization, including studies which illustrate that gradients persist even after controlling for other factors that influence health care usage, such as smoking and other risk factors.^{94, 95}

The poorer health of lower-income groups is related to their socio-economic status. They are generally less able to access the goods and services that support a healthy lifestyle (e.g. healthy food, safe housing) and are more likely to experience the negative health impacts of chronic stress, social exclusion and isolation. Improving the health of those in the bottom income group could have a significant impact on overall health care expenditures in Canada.

The uneven distribution of health care costs is most pronounced between the lowest and highest income Canadians where cost differences are largest. However, the health care cost gradients identified in the data for this report indicate that the economic implications of socio-economic inequalities in health are distributed across the entire population. While targeted measures may be needed to address the particular needs of the most disadvantaged and least healthy Canadians, policy responses must also consider how to mitigate inequalities at the population level.

It may be possible to avoid some of the direct economic burden of socio-economic inequalities in health. Unlike health inequalities that are linked primarily to individual biology or genetics, socio-economic health inequalities can be influenced by the health and social policies and programs societies choose to adopt.⁹⁶ Reducing socio-

economic inequalities can motivate interventions that focus on promoting health, preventing or delaying chronic disease, disability and injury and addressing the root causes of ill health, also known as social determinants of health. This was acknowledged by federal, provincial and territorial Ministers of Health in October 2010 in *Creating a Healthier Canada: A Declaration on Prevention and Promotion*.^{*} The Declaration emphasized that the health of a population is shaped by health promotion and prevention measures and by the environmental, social, economic and cultural conditions of Canadian communities. The importance of social determinants of health is further reinforced in the Chief Public Health Officer's reports on the state of public health in Canada, particularly the 2008 report *Addressing Health Inequalities*.

The evidence presented in this report underscores the importance of working to reduce systematic health inequalities between SES groups. Although the purpose of economic burden studies is not to advance or assess particular policies or programs that target the reduction of health inequalities, the magnitude of the direct economic burden is sufficient to merit consideration when assessing the potential costs and benefits of investments to improve population health.

This report is the first national-level analysis of the direct economic burden of socio-economic health inequalities, and as such helps to fill a key knowledge gap in Canadian research. As the first national analysis of health costs relying on a bottom-up approach, it also illustrates the feasibility of using this method to assess the economic impact of socio-economic inequalities in health.

Documenting the potential of a bottom-up approach for linking health data to socio-economic characteristics at the individual level is important for future health inequality research. Research of this type requires data on health care utilization that are linked to an expanded set of socio-economic characteristics or that contain detailed socio-demographic information. Addressing current limitations in available data will permit the use of a larger range of health care costs in future studies.

^{*} Note that Quebec is not a signatory to the Declaration. "It should be noted that although Quebec shares the general goals of this Declaration, it was not involved in developing it and does not subscribe to a Canada-wide strategy in this area"⁹⁷.

Although this report considers only the direct economic burden of socio-economic health inequalities on the health care system, a complete assessment would also include impacts on individual and national incomes, productivity levels, expenditures on social programs and the intrinsic value of good health that is lost due to the burden of health inequalities. Work is currently underway in Canada to assess some of the indirect and intangible costs associated with socio-economic health inequalities.

Additional research would also help to strengthen our understanding of policy responses that could reduce socio-economic health inequalities. For example, systematic reviews reveal that significant knowledge gaps remain when identifying concrete policy and program interventions that can influence population health through social determinants of health.^{98,99} Research to evaluate or model the impact of existing or planned interventions would help fill this gap. This includes building evidence of multiple and cross-sectoral outcomes, given that many policies and programs that target social determinants of health lie outside of the health care sector.*⁹⁹

* Some progress in this area is being made through the adoption of approaches such as Health Impact Assessment (HIA). HIA is a set of procedures, methods and tools by which a policy, program or project can be evaluated based on its potential effects on the health of a population. It is most frequently used to assess proposals outside of the traditional health sector and which do not target health as their principal goal. For more information, see: www.ncchpp.ca.

6. CONCLUSIONS

This report provides the first national-level estimate of the direct economic burden of socio-economic health inequalities in Canada. Understanding this burden helps to articulate the potential benefits of acting to reduce health inequalities. It may also help to inform decisions on the balance of health expenditures between prevention and treatment and investments in other social supports that can facilitate healthy lifestyle choices.

The data demonstrate that health care costs generally increase as individual income declines and that socio-economic health inequalities may cost Canada's health care system as much as \$6.2 billion annually, or over 14% of total annual expenditures on acute care in-patient hospitalizations, prescription medications and physician consultations. Canadians with the lowest incomes account for over 60% of the direct economic burden. Unlike other burden of illness studies that examine the costs of injury and ill health (e.g. *Economic Burden of Illness in Canada*), this report focused on the economic impact of systematic differences in health across socio-economic groups. In so doing, it has taken into account the fact that on average, lower-income groups tend to have poorer health than those with higher-incomes.

The direct economic burden of socio-economic inequalities in health underscores the importance of reducing health inequalities in Canada. This can be accomplished by supporting programs that promote health and prevent illness and disease, and by pursuing health and social policies that target the root causes of health inequalities (also known as social determinants of health). More work will be needed to develop a stronger understanding of the impact and costs of the specific policies and programs that will effectively reduce health inequalities.

GLOSSARY

Acute care in-patient hospitalizations

Hospital-based acute in-patient care is a key component of the continuum of health services in Canada. It provides necessary treatment for a disease or severe episode of illness over a short period of time (at least one overnight stay) with the goal of discharging patients as soon as they are deemed healthy and stable.*

Age-standardized costs

Age-standardized costs are total cost estimates that are age-standardized to represent identical percentages of individuals (from census 200659) in each age category by income group. Age-standardization minimizes the impact of differences in age structures when comparing subpopulations.

The age groups used for the three health care cost components included in this study varied slightly due to the different data sources used. Age categories for hospitalization data are 0–34 years, 35–64 years and 65 years and older. Age categories for prescription medication data are 6–34 years, 35–64 years and 65–79 years. Age categories for physician consultation data are 12–34 years, 35–64 years and 65 years and older.

Confidence interval

A confidence interval expresses the level of confidence in which the true value lies within a specified range of values. A 95% confidence interval can be described as follows. If sampling of a population is repeated indefinitely, and each sample leads to a new confidence interval for an estimate, then in 95% of the samples the interval will cover the true population value.

Direct economic burden of socio-economic health inequalities

The direct economic burden of socio-economic health inequalities represents the impact of socio-economic inequalities in health on three major components of annual health care expenditures.

Health Adjusted Life Expectancy (HALE)

Health Adjusted Life Expectancy (HALE) measures the average number of years that a person can expect to live in 'full health' by taking into account years lived in less than full health due to disease and/or injury. It considers both the anticipated number of years of life as well as the quality of those years based on a person's health status.

Income quintiles

To calculate income quintiles when using individual-level data, an estimate of household income is first adjusted for the number of individuals living in the household (household size). This generates a per person income that can be used to compare the incomes of individuals living in households of different sizes. Once per person incomes are calculated, these estimates can be ranked from lowest to highest and grouped into five income quintiles (quintile 1 being the lowest income and quintile 5, the highest income). Each quintile represents approximately 20% of the population. Income quintiles are often used as a proxy measure of socio-economic status.

Population health

Population health is an approach to health that aims to improve the health of the entire population and to reduce health inequalities among population groups. This approach looks at and acts upon the broad range of factors and conditions that have a strong influence on our health to reach these objectives.

Public health

Public health refers to the organized efforts of society to keep people healthy and prevent injury, illness and premature death. It is a combination of programs, services and policies that protect and promote the health of all Canadians. Public health programs target entire populations by identifying and reducing health threats through collaborative action involving many sectors of society.

* Canadian Institute for Health Information, available from: <http://www.cihi.ca/CIHI-ext-portal/internet/EN/TabbedContent/types+of+care/hospital+care/acute+care/cihi016785>, last accessed on February 15, 2012.

Social determinants of health

Social determinants of health are socio-economic, cultural and other factors within the broader determinants of health that relate to an individual's place in society.

Socio-economic health inequalities

Socio-economic health inequalities are systematic inequalities between different socio-economic status groups defined, for example, by income, wealth, education or occupation.

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